Assmang (Pty) Ltd: Beeshoek Iron Ore Mine

<u>DRAFT</u> Environmental Impact Assessment Report and Management Programme in terms of National Environmental Management Act, 1998 and the National Environmental Management: Waste Act, 2008 for:

<u>Beeshoek Mine Optimisation</u>

Report Purpose

For Stakeholder Review

Report Status

Final Draft

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Quality Control

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Executive Summary

Introduction

Beeshoek Iron Ore Mine (hereafter referred to as "Beeshoek" or "the Mine") is situated in the Tsantsabane Local Municipality, with neighbouring towns being Postmasburg, located 7km east of the mine and Kathu located 70km north of the mine.

Mining at Beeshoek was established in 1964 with a basic hand sorting operation. In 1975 a full Washing and Screening Plant was installed. Because of increased production, Beeshoek South, a southern extension of the Beeshoek Mine, was commissioned during 1999 on the farms Beesthoek and Olynfontein.

Assmang (Pty) Ltd is the holder of the new order rights in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) in respect of high-grade hematite iron ore deposits at Beeshoek on the farms Beesthoek and Olynfontein. The mining method currently entails an opencast mining operation, which consists of five (5) active opencast pits (Village Pit, HF Pit, BF Pit, East Pit, and BN Pit). Although other opencast pits are dormant at this time, these are continuously assessed in terms of their economic value. The current resources of the Mine are approximately 97.17 million tonnes with a reserve of about 26.18 million tonnes.

Beeshoek can be broadly categorised as follows:

- Northern mining area (North Mine): This area comprises active as well as historical mining areas. A number of small quarries and mine residue dumps of various categories are located within this area. The area also includes the existing iron ore beneficiation plant, tailings storage facility (slimes dam), as well as the North Opencast Pits;
- Main Offices, village (since demolished) and recreational area; and
- Southern mining area (South Mine): This area comprises large opencast pits and associated Waste Rock Dumps (WRDs). The Village Pit and associated WRD are the main activities in this area. This area also includes a crushing and screening area as pre-preparation of the Run of Mine (ROM) iron ore before being routed by overland conveyor to the Iron Ore Beneficiation Plant located at North Mine.

Project Description

Section 23(1)(a) of the MPRDA states in Section 1(a), that subject to subsection 4, the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. The mine has been awarded a Mining Right by the Department of Mineral Resources (DMR; now Department of Mineral Resources and Energy (DMRE)) and therefore has an obligation to give effect to the following:

- The ongoing development and improvement of the Mining Work Programme which details the planned mining activities to be followed in order to mine the mineral resource optimally; and
- Optimal mining of minerals must be undertaken, as the Minerals and Petroleum Board may recommend to the Minister to direct the holder of a mining right to take corrective measures if the Board establishes that the minerals are not being mined optimally in accordance with the Mining Work Programme. The Minister may, on the recommendation of the Board, suspend or cancel a mining right if the Minister is convinced that any act or omission by the holder justifies the suspension or cancellation of the right.

Beeshoek Mine has actively investigating opportunities for the continued and sustainable mining of iron ore reserves within the approved Mining Rights Area. This application for Environmental Authorisation specifically gives effect to that and includes the following projects:

1. Specific Demarcation of ROM Stockpiles on South Mine;
2. Amendments to the design of existing WRDs in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints;
3. Increase of Opencast Pit footprint areas, as well as the undertaking of detrital mining;
4. Beneficiation Optimisation Project:
    - Development of a Jig Plant (this area will be located in the vicinity of the current plant) for the beneficiation of discard and low-grade Iron Ore;
    - Development of a WHIMS Plant for the beneficiation of slimes; and
    - Development of a new surface water dam for the purposes of the Beneficiation Optimisation Projects (Jig and WHIMS Plants).
5. Upgrade of water management on site;
6. Development of a 2.8km railway line link between the existing Beeshoek Siding and the Transnet Freight Rail (TFR) siding.

The purpose of this project is to give effect to the Section 23(1)(a) of the MPRDA requirements for the optimisation of a Mining Right, as well as the implementation of the best practical environmental management measures for the operation and management of the Waste Rock Dumps. Further to this, the proposed Beeshoek Low-Grade Beneficiation Optimisation Project is to allow Beeshoek Iron Ore to optimise the mining process and reduce mineral waste on site (in line with the National Waste Management Hierarchy), by implementing two additional Beneficiation Projects, namely a new WHIMS Plant to rework the existing slimes from the Slimes Dam and a new Jig Plant to rework the existing low-grade stockpile (Discard Dump). This project will have numerous economic and environmental benefits.

Key Changes to the Scoping Report submitted to Stakeholders and the Competent Authority

As a result of the outcomes of various of the specialist studies, as well as the comments received from the stakeholders the following amendments have been made to the project layout.

1. Specific Demarcation of Run of Mine (ROM) Stockpiles on South Mine:
   - No change
2. Amendments to the design of existing WRDs in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints;
   - No change
3. Increase of Opencast Pit footprint areas, as well as the undertaking of detrital mining;
   - The size of the proposed expansion of the Village Pit to the west of the current pit has been reduced to allow a buffer of at least 500m from the Kolomela Mine access road. The area previously earmarked within the 500m buffer area will currently only be considered for exploration activities. Only upon the completion of exploration further considerations on pit expansions will be given into this area.
   - The proposed Future Pit to the south of the mine has been excluded due to the presence of various cryptic wetlands and a recharge system which requires further investigation. This area has now been identified as a strategic exploration area to ensure that the applicant continues with strategic drilling activities to identify the most strategic resources in consideration of the sensitive ecosystems present.
4. Beneficiation Optimisation Project (WHIMS and Jig Plant):
   - No change
5. Development of supporting infrastructure such as power lines, roads, pipelines and improvements to storm water management systems where applicable;
   - No change
6. Development of a 2.8km railway line link between the existing Beeshoek Siding and the Transnet Freight Rail (TFR) siding.
   - It is important to note that various discussions are being undertaken between Transnet and the Applicant. These discussions would define the direction the project moves in, i.e. immediate commissioning upon authorisation, potential delay in commissioning, or not commissioning the project. However, for the purposes of this EIA report, the assumption is made that this project will proceed, and for this reason should the project proceed the following is considered:
     - Construction of a rail way link line to connect the Kolomela direct link line (connecting to the Orex Line) and the Sishen/Postmasburg rail way line at Beeshoek Iron Ore Mine – Beeshoek Siding.
     - Construction of the northern link to allow train movement from the Sishen/Postmasburg rail way line directly onto the abovementioned link line.
     - The project will further include a new access road to the Tommy's Field Airport. This access to Tommy's Field Airport will either be through level crossings over the rail line or a bridge through the formation beneath the rail line.
     - Borrow pits and laydown areas will be established temporarily for the purposes of the construction phase.

Listed Activities

In terms of the National Environmental Management Act (Act No. 107 of 1998) NEMA, there are three (3) listing notices which should be considered for this application. These listing notices were amended during April 2017. This amendment did not repeal the 2014 listed activities, but purely amended certain listings. Listing Notice 1 (Regulation 983) activities require a Basic Assessment Process, whereas Listing Notice 2 (Regulation 984) activities require a full Environmental Impact Assessment (EIA) Process. Listing Notice 3 (Regulation 985) activities require a Basic Assessment Process if the area falls within certain geographic zones. Beeshoek Mine is not characterised by gazetted Endangered Ecosystems, Critical Biodiversity Areas (CBAs) or located in proximity to a Protected or Conservation Area and for this reason Listing Notice 3 is not applicable to the Mine.

Considering the above, the following listed activities will be triggered:

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	EIA LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985)*	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE ACTIVITES Section 21 Water Uses
Project 1: Consolidation of Run of Mine (ROM) Stockpiles on South Mine	The ROM stockpile area on South Mine will be demarcated as a combined ROM stockpile area for both on-grade, off-grade and BIS. Overall Area: 35ha (Note that no clearance of vegetation is required; this area is located on the north-eastern perimeter of the West Pit WRD (now referred to as the Village Pit South WRD) in a legally disturbed area). The current Water Use Licence (WUL) allows for the following ROM deposition on the stockpile in question – note that the deposition of ROM will not increase in annual throughput: - South Contaminated ROM 1: 4 450 000t/a - South Contaminated ROM 2 Off-Grade ROM Stockpile, including BIS: 1 920 000t/a - ROM Stockpile: 720 000t/a	x	Part 1, Regulation 29: "An environmental authorisation may be amended by following the process prescribed in this Part if the amendment; Will not change the scope of a valid environmental authorisation nor increase the level or nature of the impact, which impact was initially assessed and considered when the application was made for an environmental authorisation; or Relates to the change of ownership or transfer of rights and obligations." The change in the footprint, combining the area for the purposes of an overall ROM footprint will trigger an amendment to the current layout.	**Not Applicable (N/A)**	**N/A**
Project 2: Amendments to the design of existing Waste Rock Dumps (WRDs) in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints	Village Pit North Waste Rock Dump (VP1): Current area approximately 70ha, to be increased with approximately 26ha (final area 96ha) to allow for final slope and footprint upon rehabilitation (clearance of about 25ha) – this will also remove the required Storm Water Dam, which was a recommendation in the associated Village Pit WRD EMPr, but has as of yet not been constructed, due to the low run-off in this area and recommendations in subsequent storm water management studies. The decommissioning of the Storm Water Dam will not trigger a listed activity as the "active activity" does not entail an "operational component". Planned operational height is 111m (upon rehabilitation 112m). GF Waste Rock Dump: Current area approximately 48ha, to be increased by about 6ha (final area about 54ha) to allow for final slope and footprint upon rehabilitation. Based on the location of this WRD between the Discard Dump and the existing Slimes Dam it is unlikely that any clearance will be triggered. Planned operational height is 82m (upon rehabilitation 84m). East Pit Waste Rock Dump: Current area approximately 144ha, to be increased by about 26ha (final area about 170ha) to allow for final slope and footprint upon rehabilitation (will involve clearance in excess of 25ha). Planned operational height is 94m (upon rehabilitation 94m).	x	**<u>Listing Notice 1, Activity 12:</u>** The development of—dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or 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. **<u>Listing Notice 2, Activity 15</u>**: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity. **<u>Listing Notice 2, Activity 19</u>**: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand,	It is assumed that Category A, Activity 15: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which requires a prospecting right or mining right in terms of the MPRDA is <u>not relevant as no additional mining rights are required and the activities entail the expansion of approved facilities</u>. For that reason: Category A <u>waste activities, Activity 13</u>: The expansion of a waste management activity listed in Category A or B of this Schedule which does not trigger an additional waste management activity in	Yes – Section 21(g) for the WRD expansions and potential Section 21 (c)&(i) for the presence of various dry pans in the area. GN 704 Exemption requirements for the operation of unlined Mine Residue Deposits.

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	West Pit Waste Rock Dump (now referred to as the Village Pit South WRD): Current area approximately 80ha, to be increased with about 55ha (final area 135ha) to allow for final slope and footprint upon rehabilitation (will likely involve clearance of about 35ha). Planned operational height is 98m (upon rehabilitation 106m). HF Waste Rock Dump (new dump on historic dump footprint): Current area approximately 20ha and used for BIS stockpiling, to be reused to allow for HF Pit waste rock disposal, as well as final slope and footprint upon rehabilitation. This area is located on an existing WRD footprint (no additional clearance therefore required). Planned operational height is 39m (upon rehabilitation 63m). Discard Dump: Current area approximately 28ha, to be increased to about 60ha. This area is located within the mining area, between WRDs, the Slimes Dam and Opencast Pits, and no clearance will be required. The heigh of the facility is planned to be up to 60m. The current WUL allows for the following deposition – note that the deposition of material will not increase in annual throughput, however the life of mine and total capacity/footprint will increase: - Village Pit North Waste Rock Dump: 31 500 000t/a - West Pit Waste Rock Dump (now referred to as the Village Pit South WRD): 21 413 403t/a - GF Waste Rock Dump: 7 721 766/a - HL Waste Rock Dump: 10 983 334t/a - BIS ROM North 1 – 2 950 000t/a (on historic HF WRD) - East Pit Waste Rock Dump: 68 850 000t/a - Discard Dump: 9 000 000t/a		shells, shell grit, pebbles or rock of more than cubic metres from watercourse.	terms of this Schedule, is more relevant.	
Project 3: Increase of Opencast Footprint Areas, as well as the undertaking of detrital mining for shallow iron ore reserves, including transportation routes (Haul roads). During this phase ongoing exploration will be	Village Pit (VP North) will be expanded by 203ha in the future to 269ha and will further include two satellite pits: Pit East and Pit South, with areas of about 37ha and 22ha, respectively. Clearance of vegetation will be required. The depth of the VP North is planned at 180m, with depths of VP East and VP South planned at 160m and 60m, respectively. To the west of the proposed Village Pit expansion area, an area for specific target exploration drilling has been demarcated. This area is about 170ha in extent.	x	**Listing Notice 1, Activity 12:** The development of—dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or 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.	**N/A**	Yes – Section 21 (c)&(i) for the presence of various dry pans in the area. Section 21 (j) for the abstraction of water for safe mining conditions, and the use thereof as Section 21(a) water uses. There is a further potential for an additional dewatering tank at the Village Pit – this will be a Section 21(g) water

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undertaken.	East Opencast Pit will not result in an increase in the footprint but rather in the depth of mining within the mining shell. The depth of East Pit is planned at approximately 220m. Around the East Pit potential strategic iron ore resources have been identified. The area in question is about 976ha. Various wetland systems are present within this area, as well as a potential recharge zone. Due to the presence of these sensitive ecosystems, strategic exploration drilling will be undertaken to determine the potential resources within this area. The drilling will be undertaken in terms of a management plan to ensure the least amount of disturbance to these wetland systems. The BF Pit will be expanded from about 30ha (comprising of 3 pits) to about 86ha. Approximately 25ha may require clearance. The depth of the BF Pit is planned at 180m. A Detrital Mining area of about 238ha will be established – it should be noted that entire area will not be utilised, only where minerals are found to be economically viable. Clearance of vegetation will be required. Mining in the detrital area is planned between 20m and 40m in depth. One new haul road is proposed: - Village Haul Road: 1,100m at a width of 30m (about 3.3ha). The road will be located in areas mostly disturbed with existing mining activities or along existing roads.		**Listing Notice 1, Activity 24**: The development of a road—with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road—which is 1 kilometre or shorter. **Listing Notice 2, Activity 15**: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity. **Listing Notice 2, Activity 19**: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than cubic metres from watercourse.		use.

Project 4: Development of the Beneficiation Project which will comprise of a WHIMS Plant and Jig Plant at Beeshoek	- WHIMS Plant
	  - WHIMS Construction Laydown Area: approximately 1.5ha.
	  - Within the laydown area, a 2 500m² Staging Stockpile comprising low grade feed material will be located. This material will be processed material (i.e. raw material) derived from the Slimes Dam. All waste (oversize and slimes) will be disposed of onto the existing Slimes Dam and no new Mine Residue Stockpile will be developed.
	  - WHIMS Plant Clarifier with a capacity of 9 700m³.
	  - WHIMS Plant footprint, including access road of 160m in length (approximately 4ha).
		Yes –
		Tailings Pipeline between WHIMS Plant and Slimes Dam.
			Listing Notice 1, Activity 10: The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (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—such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial	Category A Activity 15: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which requires a prospecting right or mining right in terms of the MPRDA. This will be applicable at the WHIMS Plant for the new transfer	Yes – Section 21 (g) and (b) water uses
					WHIMS: 1 000m³ Process Water Tank; 9 700m³ Clarifier; 5 000m³ Central Process Water Dam; 1 000m³ Potable/fire Water Tank; Emergency Plant Stockpile (20m³ at any given time); Staging Stockpile (capacity 6 000m³) and

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	○ WHIMS Plant Central Process Dam: 0.4ha, with capacity of 5 000m³. ○ WHIMS Plant Emergency Product Stockpile: 21m² within WHIMS Plant footprint area. ○ WHIMS 1mm Product stockpile: 300m² within the WHIMS Plant footprint area. ○ Tailings Pipeline HDPE: 315mm diameter at 750m³/hr (208.3l/s): ▪ 1.1km pipeline from the WHIMS Plant Clarifier to the northern perimeter of Slimes Dam; ▪ 1.4km from the WHIMS Plant Clarifier to the southern perimeter of the Slimes Dam; and ▪ existing pipeline of 1.3km to be rerouted from the existing Beneficiation Plant Thickener directly to the WHIMS Plant. ○ Return Water Pipeline HDPE, 280mm diameter at 400m³/hr (111l/s): 1.1km (rerouting of existing pipeline from Slimes Dam to WHIMS Plant Clarifier). ○ Process Water Pipelines (throughput below 120l/s): 350mm diameter - 1.3km [replacement of existing pipeline with new pipeline from Central Water Dam to new Process Water Tank (2 000m³ – see project 5 below) adjacent to exiting Beneficiation Plant Clarifier]. ○ Water from Central Water Dam to existing Beeshoek Plant: 200mm mild steel – 1.3km at 400m³/hr (111l/s). ○ New potable water pipeline 140mm diameter – 1.6km in length with a throughput of 28l/s from the steel potable water tank (100m³) at the new Jig Plant to combined steel potable water/fire water tanks (approximately 1000m³) at the WHIMS Plant. ○ Overland Powerline: 22kV powerline of approximately 700m in length. New Jig Plant ○ New Jig Plant footprint: approximately 2.6ha on already disturbed areas. ○ New Jig Plant Construction Laydown Area: 2ha on existing Discard Dump footprint. ○ Feed from the existing Discard Dump (low-grade material fed into a loading bin by means of front-end loaders and conveyed to the Washing and Screening Plant).		discharge or slimes inside a road reserve or railway line reserve.	and feed stockpiles (specifically the Staging Stockpile, which will be a designed facility). The reworking of the discard, low grade material and slimes are existing approved activities on site in terms of the approved EMPr, 2009. However for the purposes of the application, these activities will be clearly described and listed. Note that the Jig Feed Stockpile (intermediate stockpile) will not trigger new WMLs as these will be placed on existing approved WRD footprints and are regarded as ROM feed stockpiles. All final low grade will be deposited back onto the Discard Dump. However the Arising Stockpile and Low low grade stockpile will be regarded as new WMLs as these will be derived from the current Discard Dump.	1mm Product Stockpile (capacity 1 000m³); Sewage Conservancy Tank of 6m³. Jig: 100m³ Potable Water Tank; Intermediate Stockpile (capacity 5 500m³); Arising Stockpile (capacity 6 000m³) and Low low grade Stockpile (capacity 118m³); Sewage Conservancy Tank of 6m³.
		Potentially – provision is made for the storage of chemicals where required within the confines of the Plant footprint areas.	**<u>Listing Notice 1, Activity 14:</u>** The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.		
		Yes – the current design indicates the need for road development (Road 1 and 2) at the Jig Plant which will be around 1km. For the purposes of this application this listed activity is included for design planning.	**<u>Listing Notice 1, Activity 24</u>**: The development of a road—with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road—which is 1 kilometre or shorter.		
		Yes (WHIMS Plant).	**<u>Listing Notice 1, Activity 27</u>**: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous		

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	○ Washing and Screening Plant. ○ Crusher building containing a high pressure grind roll (HPGR) crusher. ○ Jig located in the Jig building. ○ MCC and transformer bay. ○ Re-routed existing water pipelines (buried, internal diameter 450mm). ○ Slurry from the new Jig Plant will be pumped to the existing Plant Thickener (no new activities triggered). ○ New process water tank (located near existing Plant Thickener) – 2,000m³ (this forms part of Project 5). ○ Stockpiles [comprising of both material from the Discard Dump (also referred to as a Low Grade Stockpile] and arising low grade material from the existing Jig Beneficiation Plant). The stockpiles created from material reclaimed from the existing Low Grade Stockpile (Discard Dump) and the stockpile created with the arising material (low grade) from the existing Jig Beneficiation Plant are intermediate stockpiles created within the footprint of the existing Discard Dump (the Low Grade Intermediate Stockpile and the Arising Stockpile). Material from these intermediate stockpiles is transported to and fed into the new Jig Plant loading bin located south of the existing Low Grade Stockpile. Low low grade material from the new Jig Plant is then conveyed back to the Low Grade Stockpile footprint, deposited onto the ground and then moved back towards the existing Discard Dump. The three (3) stockpiles associated with the new Jig Plant include the following: ▪ Low Grade -32+1mm Stockpile (Intermediate) (0,5ha) located between the existing Low Grade Stockpile (Discard Dump) and the new Jig Plant loading bin on the existing Low Grade Stockpile foot print. Low grade material transported to and from the intermediate stockpile by means of front end loaders. ▪ Arising -32+1mm Stockpile (Intermediate) (0.6ha) located between the to be constructed arisings conveyor discharge position and the new Jig Plant loading bin and within the existing Low Grade Stockpile footprint. Low grade material transported from the Arising -32+1mm Stockpile by means of front end loaders. ▪ Low low grade material from the new Jig Plant will be conveyed by means of earth moving equipment to positions		**<u>vegetation</u>** is required for— except for the undertaking of a linear activity.		
		Yes, new clarifier at the current Jig Plant.	**<u>Listing Notice 1, Activity 34</u>**: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding— (i) where the facility, infrastructure, process or activity is 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; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day.		
		Depending on the final road layout, certain existing roads may be redesigned.	**<u>Listing Notice 1, Activity 56</u>**: The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre—where the existing reserve is wider than 13,5 meters; or where no reserve exists, where the existing road is wider than 8 metres.		
		Yes, a WUL will be required for the construction of the Central Water Dam	**<u>Listing Notice 2, Activity 6</u>**: 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.		

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	EIA LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985)*	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE ACTIVITES Section 21 Water Uses
	adjoining the existing Discard Dump within the existing footprint (i.e. waste from the new Jig Plant to return to the approved Discard Dump footprint). No new stockpiles will be constructed outside of the demarcated Discard Dump or other Type 3 Stockpile footprints, these will however be demarcated as part of the EMPr and WUL processes. The area of the Low low Grade Dump (stockpile) (115m²). ○ Jig Plant Conveyors: ▪ Approximately 25m conveyor from existing plant conveyor system to feed Jig Plant to transport arising low grade material and discard (not considered dangerous goods). ▪ Approximately 330m conveyer to feed the new Jig Plant from Discard Dump feed bin. ▪ This excludes in-lant conveyors). ○ New Jig Plant Roads interlinked: ▪ Road 1: 240m with a width of 30m. ▪ New Jig Plant Road 2: 700m with a width of 30m. ▪ Road 3: 280m with a width of 30m. ▪ Road 4: 135m with a width of about 30m ▪ Decommissioning of existing haul road: approximately 1000m in length and 30m wide. ▪ (this excludes roads to be constructed on the Plant terraces). ○ Overhead Powerline: 22kV powerline of approx. 620m. ○ Rerouting of underground electrical cable: 22kV of approx. 380m. Power supply will comprise of 22kV powerlines. Electricity will be sourced from the existing Beeshoek Substation. Minor upgrades will be undertaken within the footprint area of this substation and the feeding Eskom Substation, but no listed activities will be triggered in this regard. Clearance (potentially 5.6ha), note that the clearance associated with the road does not contribute to the listing activity for clearance: ○ Road 1 – potential clearance of 0.1ha (considered disturbed area). ○ WHIMS Laydown Area: approximately 1.5ha. ○ WHIMS Plant footprint, including access road of 160m: approximately 4ha.	at the WHIMS Plant, stockpiles and potentially for smaller transfer tanks within the two plant systems.	This will be specific to new dirty water tanks and new Process Water Dam.		

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	EIA LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985)*	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE ACTIVITES Section 21 Water Uses
	○ WHIMS Plant Central Process Water Dam: 0.4ha, capacity less than 50 000m³.				
Project 5: Water Management	The Mine will also establish additional water storage tanks on site which will include: - An additional storage tank for clean water at the current D300 tank on South Mine. The current intended capacity is about 250m³. - A new additional storage tank near the existing BN Tank of 500m³. The purpose is to provide sufficient storage space for water from the approved in-pit dewatering activities. - 4 x 10m³ plastic tanks at the existing clarifier and thickener area to allow for the storage of water in the water balance system of the mine to capacitate the plant process to start up without delay. - 1 x 2 000 m³ process water tank adjacent to the existing Clarifier connected with a "balancing pipe" to allow for the storage of water in the water balance system of the mine to capacitate the plant process to start up without delay. - Existing Dam: Steel Dam; 250m³ with capacity to store process water and allow for the storage of top-up water. - Existing Dam: Zinc Dam:; 90m³ with capacity to store input water where required. - A new dewatering tank at the Village Opencast Pit.	x	**<u>Listing Notice 2, Activity 6</u>**: 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.		Yes, Section 21(g) for the storage tanks as listed under the project description: - Twin Tank at D300 for potable water; - BN Tank; - Plastic Tanks; - Process Water Tank; - Steel Dam; and - Zinc Dam.
Ancillary infrastructure: Topsoil stockpiles	With the expansion of area, soil layers will be stripped and placed on the existing topsoil stockpiles near the detrital area.		**<u>Listing 1, Activity 27</u>:** The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— except for the undertaking of a linear activity.	-	
Project 6: Development of a railway line and associated service road.	The line (main western line) will comprise a 2.8km main link line of approximately 5.5m in width with a 5m bulk fill (varies along the alignment). The line will tie from the existing TFR Postmasburg line at the Beeshoek Iron Ore Mine, crossing over the road accessing Tommys Field Airport. The existing R385 road will be lifted into the road over rail system to allow for the railway line to cross under the R385 regional tar road before linking to the existing TFR Yard that services Kolomela Mine. Considering that one 4m access road will be constructed along the alignment with an 8m buffer on either side	x	<u>**Listing Notice 1, Activity 12:**</u> The development of—dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse;	**N/A**	**N/A**

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	EIA LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985*)	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE ACTIVITES Section 21 Water Uses
	of the railway line, the approximate extent of the development is 9ha (85 400m^2). A second line will be constructed (the northern link line), which will tie into the existing OREX line between Beeshoek and Khumani Iron Ore Mine. This line is approximately 1.3km in length with similar dimensions as the main western line. This latter line is about 2ha is extent. Two access roads will be constructed, one linking to Tommys Field Airport and one to the northern link line and from there to Tommys Field Airport. These will have a width less than 8m and respectively lengths of 550m and 420m. A Rail Contractor Laydown area will be required (Laydown 1). This will be located in an existing disturbed area to the south of the Mine's landfill site. Two laydown areas will be required for the bridge construction, which will require clearance. The South laydown area is located to the east of the remnants of the previously decommissioned R385 road, at an area of 0.8ha. The North laydown area is located just north of this area, north of the existing R385 road, at an area of 1ha. Borrow material will be required for the construction of the railway line and bridge. The borrow material will be sourced from within the mine boundary, at existing opencast pits, such as from the Village Opencast Pit, the existing quartzite stockpile and the existing manganese stockpiles. Two (2) other borrow pit areas have also been identified next to the bridge laydown areas (north and south). These two areas will require clearance of 1.1ha each. A last borrow pit area will be considered, which will not require clearance as this is an existing borrow pit area, previously utilised in the construction of the R385 deviation. During the construction phase, currently planned for about 14 months, a temporary two-way deviation road of less than 1km, will be provided for vehicles travelling on the R385 during the construction of the road bridge.		(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.		
		x	**Listing Notice 1, Activity 24**: The development of a road—with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road—which is 1 kilometre or shorter.		
			Listing Notice 1, Activity 27: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan (likely only around the area of the bridge construction – although this could also be regarded infrastructure as part of the railway line system however in the event that it is required, this will not change the project scope).		
			Listing Notice 2: Activity 12: The development of railway lines, stations or shunting yards excluding — (i) railway lines, shunting yards and railway stations in industrial complexes or zones; (ii) underground railway lines in a mining area; or (iii) additional railway lines within the railway line reserve.		

Aim and Motivation of the Project

To allow Beeshoek to optimise the mining process and reduce mineral waste on site (in line with the National Waste Management Hierarchy), the Mine wishes to optimise the use of existing mineral resources, and implement two additional Beneficiation Projects, namely a new WHIMS Plant to rework the existing slimes from the Slimes Dam and Jig Plant to rework the low grade material from the mining operations, as well as from the existing Low Grade Stockpile (Discard Dump) and lastly to improve on the supply of iron ore resources to various markets. This project will have numerous economic and environmental benefits.

Economic Benefit:

Section 23(1)(a) of the MPRDA states in Section 1(a), that subject to subsection (4), the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. The Mine has been awarded a Mining Right by the DMR (now the DMRE) and therefore has an obligation to give effect to the following:

- The ongoing development and improvement of the Mining Work Programme which details the planned mining activities to be followed in order to mine the mineral resource optimally; and
- Optimal mining of minerals must be undertaken, as the Minerals and Petroleum Board may recommend to the Minister to direct the holder of a mining right to take corrective measures if the Board establishes that the minerals are not being mined optimally in accordance with the Mining Work Programme. The Minister may, on the recommendation of the Board, suspend or cancel a mining right if the Minister is convinced that any act or omission by the holder justifies the suspension or cancellation of the right.

The project will ensure that low grade minerals in the existing Low Grade Residue Stockpiles (Slimes Dam and Discard Dump) can be reworked, thereby also reducing the volumes of waste stored on site, and reducing the associated financial rehabilitation requirements and potential, although found limited, potential environmental impacts.

Social Benefit

It is important to understand that the optimisation project is a strategic project, specifically to ensure the sustainable life of mine for Beeshoek.

The project is not a capital investment to increase production, but rather to ensure an opportunity for the continuation of current opencast pit operations, as well as to implement opportunities for the reworking of low grade stockpiles. This last mentioned reworking is to supplement production to meet the annual production commitments. The project will thus not result in an increase of employment numbers, but rather the sustainability of the continuation of the mining operations supporting the current work force.

In conclusion to this point, the benefit specifically to the Local Municipality and community in terms of this project, is the fact that Beeshoek Mine's life of mine will increase from the current disclosed 5 years to a possibility of 15-20 years. This will ensure the continuation of the existing commitments made in the Social and Labour Plan (SLP). Should this project be successful it will further continue in the revision of the SLP once the current 5 year period has passed, allowing for a continuation of Beeshoek's' involvement in the Socio-Economic Development of the Tsantsabane Local Municipality.

As this project is purely an optimisation project limited additional job creation opportunities will be available during the construction phase. However, for the operational phase, the staff compliment will likely revert back to the current staff compliment, with limited new positions required. This project is to ensure a sustainable increase in the life of mine, not increase in production. This project will in fact allow for the continuation of mining activities, which will rather secure the employment of the current staff compliment. It is anticipated that between 4 to 18 skilled individuals and approximately 23 to 72 unskilled personnel would be required on a monthly basis during the construction/start-up period of approximately 8 months. Approximately 18 to 34 existing employees within management positions would also be involved. Overall, the construction phase (initial and early works) of approximately 8 months would, during its peak periods, result in 122 positions of which 70 would fall in the unskilled category, 18 in the skilled and 34 in management positions[1]. The construction of the railway link line and bridge at the R385 would add to the total job opportunities and could increase the construction staff complement. It should, however, be noted that a portion of these would still consist of the existing permanent employees.

A temporary increase in the concentration of workers will thus occur e.g., during the construction of the haul roads and decommissioning of the existing sections of haul roads, construction of the railway link line as well as the service relocations. New opportunities for short-term contract work could thus be generated for some periods of time as

[1] Assmang Iron Ore & DRA (2020) Beeshoek LG Optimisation DFS: Manpower Histogram

there would be around 20-70 unskilled personnel required at certain stages for the new mining infrastructure. This figure could increase with the construction of the railway link line and bridge at the R385. Locals could be part of the specialist contractor teams involved in the short-term contracts. The construction of the railway link line could change these figures. The existing employment profile and staff compliment will be sustained during the operational period. No significant additional inflow of workers is thus expected. Beeshoek will function in a way as to continue the constant positive impact in terms of employment through their procurement and Human Resources department, who manages the employment in line with the relevant Score Cards.

The Mine has a dedicated procurement and Human Resources (HR) department, who manage the employment in line with the relevant Score Cards. Strong emphasis is place on the involvement of local labour. The mine will further ensure that local labour is sourced where possible during the construction phase. It is highly unlikely that this project will result in an influx of job seekers as not new areas will be opened for construction and no new substantial opencast pts are being developed. The new plants are regarded as an addition to the existing North Mine beneficiation plant. In terms of the SLP (2019-2024) the mine sets out targets to reach the Mining Charter (2018) procurement target of mining goods of 70% from South African companies with 21% spent on majority HDI owned companies (current contribution 6%); 5% on women and or youth owned companies (current contribution 1%) and 44% to be spent on Broad Based Black Economic Empowerment (B-BBEE) compliant companies (current contribution 13%). In terms of procurement of services the SLP sets a target of 80% procurement from South African based groups in line with the Mining Charter (2018) of which 50% must be spent on majority HDI owned companies; 15% on women owned companies; 5% youth owned companies and 10% to be spent on Broad Based Black Economic Empowerment (B-BBEE) complaint companies.

The Beeshoek Optimisation project will extend the life of mine and will result in the continuation of the existing operations and will therefore enable the following:

- The continuation of job and income opportunities with subsequent positive economic spin-offs;
- Continuation of central tax revenues;
- Positive impact in terms of the socio-economic development of the area and reducing poverty levels through continued employment; and
- Socio-economic investments targeted at the local community through local economic development projects, as well as through capacity building and training.

Giving effect to Waste Reduction:

The reworking of the mineral waste gives effect to the Waste Management Hierarchy as presented in the National Waste Management Strategy, November 2011 and also the draft Strategy of 2020. This 2011 Strategy states the following:

- A challenge experienced is the lack of a policy and regulatory environment that does not actively promote the Waste Management Hierarchy.
- The report states that while the elimination of waste in its entirety may not be feasible, it is possible through the systematic application of the Waste Management Hierarchy to reach a point within the next few decades where re-use, recycling, recovery and treatment overtake landfills as preferred options for waste management.
- The first goal presented in this strategy as a strategic goal is to "promote waste minimisation, reuse, recycling and the recovering of waste" by focusing on implementing the Waste Management Hierarchy, and with the ultimate aim of diverting waste from landfill.

The following is an abstract of Section 2.3 of the National Waste Management Strategy:

The Waste Management Hierarchy in the National Waste Management Strategy is summarised as follows:

- Waste avoidance and reduction;
- Re-use;
- Recycling;
- Recovery; and
- Treatment and disposal.

The foundation of the hierarchy, and the first choice of measures in waste management, is avoidance and reduction. This step aims for goods to be designed in a manner that minimises their waste components. Also, the reduction of the quantity and toxicity of waste generated during the production process is important.

The next stage of the hierarchy is re-using waste. Re-using an article removes it from the waste stream for use in a similar or different purpose without changing its form or properties.

After re-use comes the recycling of waste, which involves separating articles from the waste stream and processing them as products or raw materials.

These first four stages of the waste management hierarchy are the foundation of cradle-to-cradle waste management. This approach seeks to re-use or recycle a product when it reaches the end of its life span. In this way, it becomes input for new products and materials. This cycle repeats itself until as small a portion as possible of the original product eventually enters the next level of the waste management hierarchy: recovery.

As a last resort, waste enters the lowest level of the hierarchy to be treated and/or disposed of, depending on the safest manner for its final disposal.

Taking this strategy further, is the current draft National Waste Management Strategy of 2020. This strategy also focusses on the Circular Economy. A circular economy redefines economic growth by moving away from a take-make-waste industrial model to one that decouples economic activity from the environment and supports a just transition to renewable energy sources. The three key principles of a circular economy are: design out waste and pollution, <u>keep products and materials in use</u> and regenerate natural systems. The two (2) strategic entry points of the waste sector into waste minimisation and the circular economy is waste prevention and waste as a resource, as briefly explained below.

- Waste Prevention (as highlighted in the 2011 National Waste Management Strategy) – this emphasises avoiding and reducing waste before substances, materials and products are discarded.
- Waste as a Resource (key focus in the draft Strategy) – this focuses on stimulating a secondary resources economy based on recycling and recovery of materials and energy from waste i.e. interventions that take place after a product or material has become waste. Circularity can deliver substantial material savings throughout value chains and production processes, generate extra value, transformation of industry towards climate-neutrality, long-term competitiveness and unlock economic opportunities. In terms of the waste management hierarchy practices, recycling of waste for reuse and recovery of materials is prioritised over recovery of energy from waste. The main economic driver lies in exploiting the full potential value of waste.

<u>Giving effect to an approved Environmental Activity as part of Environmental Management and Impact Reduction:</u>

The 2004 Beeshoek Environmental Management Plan (EMP) clearly states that the mine residue present on site or produced by the Mine can be categorised as follows:

- Waste material: products that cannot be sold and which are deposited separately as such or used as backfill;
- Non-saleable material: product which cannot be marketed in its present form but which through treatment could become saleable;
- Contaminated material: "impure" product stockpiled separate for beneficiation to render it marketable; and
- Discard: waste material from the on-site iron ore beneficiation plant is discarded on a designated Discard Dump for reuse (i.e. reworking).

The 2004 EMP further explains the mine's intention to rework all contaminated (as from the EMP – which refers to low-grade material) iron ore stockpiles present on the mine site in order to optimise iron ore resource utilisation. Reworking relates to the following dumps: Dumps labelled on Drawings 5540-001 and 5540-002 as CD-N1 (this is the current WRD North Area) and CD-S1 (this is the current Contaminated ROM Dump on South Mine), respectively.

In Section 1.7.3 of the new order (aligned) EIA/EMP, 2009 the Estimated Reserves are discussed. It states that: "Additional iron ore is available in the contaminated dumps on the mine site and these will be reworked to meet the mine's remaining planned life of mine." The specific contaminated dumps are not stipulated in this EMP, and therefore when referring to the definition of contaminated material in the 2004 EMP as presented above, this will depend on the nature of the material and grade which will render it marketable. The EMP further commits in Section 7.3.2 to "Rework all the contaminated iron ore stockpiles present on the mine site in order to optimise iron ore resource utilisation."

In terms of the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEMWA), and associated regulations which came into effect on 24 July 2015, which included Mine Residue Stockpiles as listed Waste Management Activities, all such activities that commenced prior to 24 July 2015, may be regarded as lawful and need not be authorised (regulation 7(1) of GN 921 contains the relevant transitional requirements). Prior to the NEMWA Regulations of 2015, the reclamation of residue for re-use did not require EMP amendments, as it fell within the definition of mining (as defined in the MPRDA), especially in this instance where no separate infrastructure (e.g. crushing plants) was constructed that had to be reflected in the EMPs.

Logistics to Improve infrastructure to supply Export Market demands

For the purposes of the railway line link, the project will allow Beeshoek greater flexibility to also export ore through Saldanha Port. In order to realise this, additional infrastructure links are required, as there is currently no rail connection between Beeshoek and the Kolomela Direct Link Line.

Alternatives Considered

No alternatives are applicable to the Project 1 – Demarcation of ROM stockpiles, as this project is purely for specific demarcation purposes.

No alternatives are applicable to the Project 2 – Design of WRDs, as this project relates to the existing facilities and redesigning of these to allow for further future deposition.

For Project 3, the activities are all located within the existing Mining Area. The activities considered in this application are linked to approved and established sites and therefore no property alternatives or location alternatives are relevant.

The expansions and additions of satellite pits (for Village Pit) are important for the continuation of the Beeshoek Mine. By not undertaking this project, the mine plan of five (5) years will remain and the opportunity to continue mining at Beeshoek will be lost. This will result in the loss of all socio-economic benefits the mine is offering to this Local Municipality.

Changes have been made to the planned opencast footprints to allow for further strategic exploration due to the presence of various sensitive ecological and water systems (i.e. cryptic wetlands). Large portions of the planned opencast pit footprints on the South Mine have been reduced on the South Mine to allow for more strategic exploration to ensure that opencast operations target very specific areas for future mining opportunities. This does not project that mining will not be conducted in these areas, but that further test work must be completed in order to ensure that the most suitable mine plan is developed considering environmental, economic and social considerations.

Activities are planned within the existing mining footprint. Limited design and layout opportunities are present.

For Project 4 – Optimisation of the Beneficiation Process, no technological alternatives are relevant to this project. The WHIMS and JIG Plant projects will make use of proven technologies utilised within the Assmang mining system. The location of these facilities is also prescribed by the location of the existing beneficiation infrastructure.

Project 5 – Water Management has no alternatives, as this projects are implementing the recommendations by the Water Balance and Water Conservation and Demand Management Plan, iLeh, 2021. The project allows for the storage and distribution of water within the mine area to protect water losses and improve storage capacity. The intent of this project is not to increase water abstraction from the groundwater resources, but to rather improve water management on site. This is specifically relating to utilising available water allocations and agreements. In terms of the WUL, 2018, the mine has a total of 5 655 371m^3/a approved as Section 21(a) – groundwater abstraction and use. This will be reduced in the amended Water Use Licence Application (WULA), 2021 to 5 652 724m^3/a. A large portion (70%) of this allocation is to allow dewatering for safe mining practices. Due to the reduction in groundwater levels to south of the mine, dewatering volumes have been reduced for Village Pit. However an increase volume has been included for the remining of the HF Pit. Note that overall water abstraction is still in line with the WUL, 2018.

The Mine is dependent on water supply from external sources to ensure sustainable supply. A bulk water supply scheme from the Vaal River to the arid areas of the Gamagara valley near Postmasburg and north thereof was implemented by the then Department of Water Affairs [DWA; now the Department of Water and Sanitation (DWS)] to supply potable water to these areas and thus to enable the development of the large scale mining operations in areas such as Beeshoek, Lime Acres, Sishen, Mamatwane, Hotazel and Black Rock. Beeshoek is not currently using potable water from the Vaal Gamagara Water Supply Scheme, but rather sourced from Kolomela Mine directly. All potable water is sourced from boreholes drilled on the mine property. Beeshoek receives extraneous mine water from the Sedibeng Pipeline that originates from Kolomela Mine. This water is made available to Beeshoek according to an agreement reached with Anglo American dated 28 November 2012 in lieu of groundwater loss at Beeshoek due to the impact of dewatering at Kolomela Mine. The agreement allows the use of 320m^3/hr, of water from the pipeline which is equivalent to a maximum rate of 2,8 million m^3/a. Kolomela Mine is responsible for the cost of abstracting this water from the Sedibeng pipeline. The Sedibeng Pipeline agreement contributes 32% of the available water resources.

The Project 6, alternatives are limited and mostly relating to the no-go option. For the purposes of the railway line link, the project will allow Beeshoek greater flexibility to also export ore through Saldanha port. In order to realize this, additional infrastructure links are required, as there is no rail connection between Beeshoek and the Kolomela Direct Link Line. The Railway line project is still in planning and feasibility stage. It is important to note that various discussions are being undertaken between Transnet and the Applicant. These discussions would define the direction the project moves in, i.e. immediate commissioning upon authorisation, potential delay in commissioning, or not commissioning the project. However, for the purposes of this EIA report, the assumption is made that this project will proceed. Alternatives in terms of the railway line is subjected to discussions between TFR and the mine. Only one option is available for the link line, and that is the link between the existing Beeshoek Siding and the TFR. The routing of the link line options is fairly similar and only involves minor adjustments to the alignment to improve tie in considerations into the existing railway line systems. No environmental constraints have been identified in this area.

No-Go Alternative: Section 23(1)(a) of the MPRDA states in Section 1(a), that subject to subsection (4), the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. This project specifically gives rise to this requirement, and results in the optimisation of mineral waste deposition, beneficiation, water management and the logistical requirements for product transportation.

Various optimisation activities are planned for the mine as previously discussed. By not allowing this project to proceed, the Mine will lose the opportunity to rework current waste streams and thereby reducing the dirty water footprint.

In addition to this, this project plans to optimise the exploration of mineral resources to which the Mine has the Mineral Rights to. By not allowing the expansion of opencast operations, the Mine will not be in a position to optimally work within its allocated Mineral Resource boundaries.

The opportunity to effectively and efficiently export iron ore resources via the Saldanha port will further be lost should the allowance for the railway line link not realise.

The projects in question will have a substantial socio-economic benefit within the local area, and also regionally. No fatal flaws or environmental concerns, which cannot be addressed with sound and proper management have been identified. Should the proposed project not proceed, the status quo in terms of the existing social impacts in the area would therefore remain. The life of mine would then not be extended and the mine would cease to operate over a shorter period of time.

The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region.

As the Beeshoek Mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

The ‘no-go alternative’ should thus not be considered from a social point of view as the negative social impacts anticipated with the Beeshoek optimisation project are deemed low. The negative impacts would further respond to mitigation as proposed. The proposed activities further fall within the mining rights area and the area is already characterised by and surrounded by various mining infrastructure.

The Beeshoek Optimisation project will extend the Life of Mine and will result in the continuation of the existing operations and by not allowing this project, the following opportunities will be lost:

- The continuation of job and income opportunities with subsequent positive economic spin-offs;
- Continuation of central tax revenues;
- Positive impact in terms of the socio-economic development of the area and reducing poverty levels through continued employment; and
- Socio-economic investments targeted at the local community through local economic development projects, as well as through capacity building and training.

Application and Consultation Process

The application for the Environmental Authorisation Process was submitted to the DMRE, the Competent Authority for this project, on 12 February 2021. A letter of acknowledgement from the DMRE has to date not been received, however a screenshot that the application has been uploaded onto the SAMRAD system was provided indicating the date of 25 February 2021. A Section 102 EMPr Amendment Application was submitted to the DMRE.

A meeting was held with the DMRE on 19 March 2021, during which time the DMRE indicated that the potential railway line project be included into an Addendum Application and that the draft Scoping Report must be updated to include this project (Project 6) and be resubmitted to the stakeholders for comment. This is the purpose of this report.

In terms of stakeholder consultation the following were undertaken:

- A project notification was sent to all stakeholders on the current Beeshoek Stakeholder Database;
- In accordance with GNR 982 Section 41(2)(a-b), a site notice was developed in Tswana, Afrikaans and English and placed at six (6) locations in order to inform surrounding communities and adjacent landowners of the proposed project. The site notices were placed on 12 February 2021 and at visible locations close to the site.
- In accordance with GNR 982 41(2)(c) of Chapter 6 an advert was placed in the Kathu Gazette. The advert was place in both Afrikaans and English in the above newspapers on 13 February 2021.
- The Scoping Report was made available on public review for a period of 30 days from 22 February 2021 to 24 March 2021). Note, that any comments received up until the EIA Phase will be considered for inclusion into the Final EIA Report.

As a result of the Addendum Application and Addendum ESR, a second round of notices and advertisement, as well as the distribution of BIDs were placed, English, in the same areas as before. These notices were placed on 26 March 2021.

To date the following comments have been raised as part of pre-consultation with authorities:

No.	Theme: General Comments / Issues			
	Issue Raised	**Date and How Issue Was Raised**	**Commentator**	**Response**
Archaeology, Palaeontology				
1	The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit notes the pending assessment of the impact to heritage resources and requests the following: Assessment of the impact to heritage resources must comply with section 38(3) of the NHRA, as required by section 38(8) of the NHRA; The archaeological component of the assessment must include a field-based assessment conducted by a qualified archaeologist; As the project footprint is located in areas of moderate to very sensitive as per the SAHRIS PalaeoSensitivity map, a field-based Palaeontological Impact Assessment must be conducted as part of the EIA phase of the EA application. The report must comply with the 2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessment s and must be compiled by a qualitied palaeontologist.	Letter sent via email. Letter dated 12 March 2021	SAHRA	Based on the SAHRA Paleontological map the area is of moderate to high paleontological sensitivity and a separate study was conducted for this aspect (Bamford 2021). This study concluded that it is extremely unlikely that any fossils would be preserved in the Campbell Rand Subgroup stromatolites or in the loose sands of the Quaternary. There is a very small chance that fossil may occur in palaeopans in the ancient rocks and therefore recommended that a Fossil Chance Find Protocol should be added to the EMPr. Please refer to Section 2.e.iii.11.
Ecology and Rehabilitation				
2	Is additional topsoil added to assist to mitigate against siltation?	11 May 2021 Focus Meeting	Kolomela Mine	Rehabilitation at Beeshoek has proven that a soil and rock mixture has been successful in the establishment of self-vegetation.
3	Fountain grass used as vegetation cover at Beeshoek Mine is a problem for Kolomela Mine.	11 May 2021 Focus Meeting	Kolomela Mine	The mine has further appointed a specialist company to assist with the implementation of a strategic Alien Invasive Species programme to manage the presence of alien species specifically fountain grass.
4	NCDENC has requested the following to be included in the report: - List of Protected Species (nationally and provincial legislation). - Using of the 2020 updated Centre of Endemism – link to be provided. - Number of protected species (or at least some sort of percentage) in order for the department to determine impact extent and potential offset requirements. - Number of protected species (or at least some sort of percentage) in order for the department to determine impact extent and potential offset requirements.	24 May 2021 Focus Meeting	DEFF	All datasheets requested by the DFEE have been considered in the Ecological Studies. The current ecological study has not undertaken the identification of each of the protected species, but has determined whether these are present and where the areas of highest concern are. The specialist has indicated where species were encountered on site, which will provide an indication of which protected species were more common and where these are located. The reason for this, is due to the timeframes of the various activities. Clearance will only be undertaken when specific areas are required. Especially for the opencast and WRD projects, detailed mapping of protected and threatened plant species will be undertaken during various phases and timeframes. Prior to the clearance activities, the mine will ensure that a detailed species identification be conducted for the necessary tree removal permits.
5	Recharge zone to the east of the East Pit is regarded as a sensitive water setting and will be incorporated as an ESA according to DEFF.	24 May 2021 Focus Meeting	DEFF	To be treated as part of sensitive area when exploration is conducted. The 1:100 year floodline will be retained and no activities will be undertaken in this area before further investigations into this area is not undertaken.
6	The specialists must note that the landowners understand how to farm in a desert type climate, even though the specialists indicate that the general setting is not ideal for arable or grazing practices.	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	Noted, please refer to Section 2.e.iii.4.d.
Storm Water Management				
7	Surface water flows from the southern section of the farm Ploegfontein. Kolomela has to protect the pans on their property to the south of the Beeshoek mine	11 May 2021 Focus Meeting	Kolomela Mine	The Beeshoek Mine is undertaking ongoing rehabilitation of the East Pit WRD slopes. The rehabilitation of East Pit waste rock dump will address any additional siltation concerns. In addition to this the mine will commit to the establishment of enviro-berms down gradient of the footprint up

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	boundary. Kolomela Mine is thus concerned about siltation as water drains to the Ploegfontein area			until vegetation has established. Run off has also been determined to be very low due to the arid conditions in this region.
Water Supply				
8	Will the new projects impact on the water supply pipeline, which runs in a northerly direction, west of the East Pit WRD?	11 May 2021 Focus Meeting	Kolomela Mine	The mining activities will not impact on the pipeline. It is important that the East Pit WRD will only increase due to the rehabilitation angle requirements.
Groundwater				
9	Impact & influence on neighbour farm (Aucampsrus) which is close to Beeshoek's current mining activities.	26 February 2021 Completion of BID Registration form and submitted via email.	Surrounding Landowner: Altus Viljoen Aucampsrus farm	A detailed groundwater study, including a numerical model has been undertaken as part of the EIA studies to assess the impact of mine dewatering (for safe mining conditions). Other studies includes the Socio-Economic Assessment and Air Quality Assessment.
10	The preliminary findings of the groundwater study found that drawdown at Village pit is anticipated to be insignificant as the drawdown would be between 5 – 10 metres, 2km to the west. A 2m lowering is not problematic, but the yield is affected. The specialists must do a pump test at his boreholes. There is not enough data on the yield of the boreholes in the area. The groundwater levels are good, but the yield is low. Detailed data on the yield must be captured and assessed. The mines tend to shift the responsibility with regards to the impact elsewhere.	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	Beeshoek Mine has monitoring holes up-gradient of the Village Opencast Pit. The Mine will conduct pump tests of the land owners property.
11	Changes in the locations of boreholes can have impacts and must thus be monitored.	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	It should be noted that dewatering of pits remains within the specific aquifer compartments for such dewatering. No impact is expected on groundwater for the change of boreholes, which are specifically placed to ensure safe mining conditions.
12	What is the depth of the water levels in the boreholes?	24 May 2021	Mine to the North East of Beeshoek	Please refer to Section 2.e.iii.8.d of this report.
13	The TLM is concerned about the impact of mining on the groundwater resources in the TLM. The presentation confirmed that mining in this area does have an impact on the water resources. This thus impacts on the aquifer capacity of the area especially in the area of Boichoko. As a result, the TLM has to source water from Sedibeng Water to fulfill the needs of their communities. This has a negative financial impact on the TLM and puts them in further debt with Sedibeng Water. Water related concerns have been discussed with the Department of Water and Sanitation (DWS). The expansion of Beeshoek Mine will thus impact on the groundwater resources which would indirectly impact on the service delivery ability of the TLM. Compensation measures in this regard must be considered.	25 May 2021	Tsantsabane Local Municipality	It is important to note that the Mine is not expanding, but that the existing pits are further developed. The preliminary studies have considered the impact of Beeshoek Mine on the groundwater levels. The numerical model is considering the current groundwater levels to determine the potential impact of Beeshoek on groundwater levels. During the meeting with the municipality it was made clear what the extent of impacts on groundwater could be, and maps in this regard was also provided. The meeting clearly stated that no impact of groundwater dewatering is expected towards the eastern portion of the mine. The study currently states that no drawdown is expected for future mining of the East Pit, and that drawdown at Village pit is predicted to extent to 2k from the pit but in mostly a westerly direction for a drawdown of 5-10 m. The study further states that HF Pit is predicted to have a minor impact limited to the immediate surroundings of the pit itself. The study currently does not foresee any impact based on this optimisation project on the community.

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				In addition to this, the Mine is not applying for any increase in groundwater abstraction or supply water from groundwater abstraction. There is also no intention of increasing the Sedibeng allocation. The current optimisation project is specifically considering the optimisation of the internal water reticulation circuit to reuse water within the beneficiation project more effectively and for this reason the water management projects are also included. A large opportunity to reuse water is from the reworking of the exiting Slimes Dam as well. The groundwater specialist will be available during the second round of consultation to provide further clarification. In addition to this the groundwater reports will also be made available to the Tsantsabane Local Municipality for review.
Air Quality and Vibrations				
14	How will blasting be controlled? Blasting does have dust impacts and could impact on his homestead (cracks). How does Beeshoek Mine notify landowners and other stakeholders when blasting will be undertaken? He is currently not notified by Beeshoek Mine when blasting is undertaken. The blasting activities impact on his travel movements due to traffic congestions and waiting periods on the local road.	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	Communication of blasts are being send out via email to surrounding stakeholders as well Management of blasting will continue as per the current proceudres. The effect of blasting and frequency does not change from the way it is currently managed. All blasting is communicated 24 hours in advance and times of blasting communicated. Blasting times will remain the same as it has been currently and in the past. Village pit blasting, specifically, will be scheduled outside of Anglo fixed flight roster and shift changes and as far as reasonably possible after Assmang office hours. The regional road will be closed and a notice boards with the following information, DANGER BLAST AREA – KEEP OUT / GEVAAR SKIETGEBIED BLY UIT are displayed. An arrangement has been made with Mr. Altus Viljoen to set up a mobile seismograph on his land for the next couple of blasts at Village pit to conduct several tests.
15	Over time, various community members in Boichoko have complained about the impacts of blasting on their health as well as on their homes' structures. The undertaking of a crack survey should be investigated to follow up on the complaints about blasting so that the impacts can be scientifically verified.	25 May 2021	Tsantsabane Local Municipality	Impact unlikely due to location of the Village Pit, and depth of East Pit, as well as location of HF Pit. To mitigate the concern, it is recommended that vibration monitoring be undertaken on the boundary of the mine – The Drill and Blast Supervisor is in the process together with the Technical Services Department to acquire and additional Seismograph for further monitoring. Beeshoek has already set up a seismograph to measure the vibration in this area.
16	What does Beeshoek Mine's dust monitoring programme entail? The landowners haven't had feedback on this issue in quite a while. With regards to the dust pollution in the area, it seems that the main impact is from Beeshoek Mine, but impacts from Kolomela Mine are also noted. He requested that additional dust buckets be placed at specific locations between his property and the Beeshoek mining activities, especially if the Eastern Pit will be used again. He suggested that dust buckets be placed at the southern border of Beeshoek Mine (e.g. southern sections of the farm Olynfontein Portions 2 and 4).	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	Beeshoek Mine has been measuring dust fallout since 2005. Monitoring is currently done at nine sites using the SANS 1929:2005 and ASTM Standard, D1739-98: Standard Test Method for the Collection and Measurement of Dust fall, Koeiespeen bucket has been removed due to vandalism in the area (bucket and station stolen). However, the fall out results for this area is extremely low. The Mine can provide dust fall out results to said farmer should this be required.

<table>
<tr><th rowspan="2">No.</th><th colspan="4">Theme: General Comments / Issues</th></tr>
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<tr><td></td><td></td><td></td><td></td><td>

Please also refer to Section 2.h.v of Part B (EMPr).</td></tr>
<tr><td>17</td><td>It must be noted that the proposed developments at Village Pit and the East Pit are in close proximity to the residential area of Boichoko. Residents of Boichoko have complained about asthma related illnesses and the impact of mining on their overall health.</td><td>25 May 2021</td><td>Tsantsabane Local Municipality</td><td>It should also be noted that the air quality study specifically considers the potential impact in terms of PM10 and 2.5 on sensitive receptors. No impacts in this regard have been found on sensitive receptors.
According to the Air Quality Model this is not the case, with dust fall out that is expected to reach areas outside the mine boundary significantly lower than National Ambient Air Quality Stndards (NAAQS) limits.
<table>
<tr><th>Receptor</th><th>Annual PM_{10}</th><th>24-hour PM_{10}</th><th>Annual $PM_{2.5}$</th><th>24-hour $PM_{2.5}$</th><th>Dust fallout</th></tr>
<tr><td>Boichoco</td><td>2.1</td><td>21.1</td><td>0.2</td><td>2.0</td><td>22</td></tr>
<tr><td>Maranteng</td><td>1.1</td><td>12.3</td><td>0.1</td><td>1.3</td><td>12</td></tr>
<tr><td>Newtown</td><td>1.4</td><td>14.7</td><td>0.2</td><td>1.5</td><td>15</td></tr>
<tr><td>Postdene</td><td>0.9</td><td>10.1</td><td>0.1</td><td>0.9</td><td>12</td></tr>
<tr><td>Postmasburg-North</td><td>1.1</td><td>13.0</td><td>0.1</td><td>1.3</td><td>13</td></tr>
<tr><td>Postmasburg-South</td><td>1.2</td><td>13.2</td><td>0.1</td><td>1.4</td><td>14</td></tr>
<tr><td>NAAQS</td><td>40</td><td>75</td><td>20</td><td>40</td><td>600</td></tr>
</table></td></tr>
<tr><td>18</td><td>If blasting would take place at Village Pit, it is anticipated that the dust impacts would increase.</td><td>11 May 2021 Focus Meeting</td><td>Surrounding Landowner: Altus Viljoen Aucampsrus farm</td><td>According to the Air Quality Model this is not the case, with dust fall out that is expected to reach areas outside the mine boundary significantly lower than NAAQS limits.</td></tr>
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Receptor	Annual PM_{10}	24-hour PM_{10}	Annual $PM_{2.5}$	24-hour $PM_{2.5}$	Dust fallout
Boichoco	2.1	21.1	0.2	2.0	22
Maranteng	1.1	12.3	0.1	1.3	12
Newtown	1.4	14.7	0.2	1.5	15
Postdene	0.9	10.1	0.1	0.9	12
Postmasburg-North	1.1	13.0	0.1	1.3	13
Postmasburg-South	1.2	13.2	0.1	1.4	14
NAAQS	40	75	20	40	600

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19	Why is the dust impact in a south-westerly direction? This wind direction is queried. The wind carrying dust is a north-westerly wind. The wind during the evenings is less strong which will have less impact to the southwest.	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	The wind direction is obtained scientifically from "Köppen-Geiger climate classification system Postmasburg experiences a hot desert climate which is well described by the 30-year historical data record available from the Meteoblue archived weather model data". This is a scientific model that requires scientific data that can be proven. The predominant wind direction is northwest to north-northeast with winds from other sectors less frequent. Winds are generally light with most of hourly winds less than 3.4 m/s. Stronger winds reaching more than 8 m/s are occur occasionally from the west-northwest to north-northwest sector.

Visual

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20	Concern that the height of the WRD (Village and East) would increase the negative visual impact experienced as a result of the spotlights on top of the WRDs (farmer on the south-eastern boundary). The visual impact is especially of concern for the nearby landowners	11 May 2021 Focus Meeting	Surrounding Landowner: Albertus Viljoen	A Visual Impact Assessment has been undertaken (please refer to Annexure 13). As part of the management measures, the Mine will ensure that lights are placed in such a manner as to be strategically focussed downwards or away from sensitive receptors.
Land Claims				
21	We confirm that as at the date of this letter (23-02-2021) no land claims appear on our database in respect of the property.	23 February 2021 Provision of official letter via email.	Commission on the Restitution of Land Rights	None
Meetings and Consultation				
22	This serves to acknowledge the receipt of your documents on the above matter. We request your availability to present to the Council Committee on Technical and Community Services the contents of the application and implications for the municipal area.	25 February 2021 Submission of an email request.	Municipal Manager, Mr. Mathobela – Tsantsabane Local Municipality	The Stakeholder Consultation Specialist is in engagement with the municipality to arrange a date a time for the requested meeting.
Impact on R385 and Kolomela Mine Access Road				
23	Impact of the railway line on the R385 regional road?	11 May 2021 Focus Meeting	Kolomela Mine	The design and implementation of the railway line will consider the need for continuous movement on the R385. As a result, temporary detour routes will be provided. Clear signage will be implemented in these areas. The road will cross over the proposed railway line, to ensure that during the operational phase no further constraints are place on the road infrastructure.
General				
24	How much stripping will be involved in mining activities?	24 May 2021	Mine to the North East of Beeshoek	Please refer to the volumes of waste to be placed on the WRDs in Section 2.c.ii.2. Stripping ratios in terms of mining strategy is not provided in the EIA,
25	Production of the plants and LoM	11 May 2021 Focus Meeting	Kolomela Mine	The current life of mine reserves are set at five (5) years. The Optimisation Project allows for a further 15 years of operation. The proposed projects are not implemented to increase production, but rather to ensure a sustainable product supply and reduce waste component. The capacity of the two plants is to ensure a sustainable product supply in order to achieve the 2.8Mt/annum production requirement. The two plants have the capacity to provide 1Mt/a to ensure a sustainable supply.
26	What is the financial impact of the project? What is the capital expenditure and investments in total and the projected outputs?	25 May 2021	Tsantsabane Local Municipality	It is important to understand that the optimisation project is a strategic project, specifically to ensure the sustainable life of mine for Beeshoek. This project is still in its planning phase, and has not been finality approved, as this will be pending the outcomes of the design considerations, approval of the Water Use Licence, as well as the approval of the Integrated Environmental Authorisation. The project is not a capital investment to increase production, but rather to ensure an opportunity for the continuation of current opencast pit operations, as well as to implement opportunities for the reworking of low-grade stockpiles. This last mentioned reworking is to supplement production to meet the annual production limits. The project will not result in an increase of employment numbers, but rather the sustainability of the continuation of the mining operations supporting the current work force.
27	The TLM would like to know what the capital investment of the projects and subsequent returns would be to understand the economic benefits to the TLM and community.	25 May 2021	Tsantsabane Local Municipality	

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				In conclusion to this point, the benefit to the municipality and community in terms of this project, is the fact that Beeshoek Mine's Life of Mine will increase from the current disclosed 5 years to a possibility of 15-20 years. This will ensure the continuation of the existing commitments made between the TLM and the mine from the Social and Labour Plan (SLP). Should this project be successful it will further necessitate the revision of the SLP once the current 5 year period has lapsed, allowing for a continuation of Beeshoek's' involvement in the Socio-Economic Development of the Tsantsabane Local Municipality.
28	Block 18 is located close to the tar road that is used as main access road to Kolomela Mine. What will the impact of the activities proposed at Block 18 be on this access road? Will safety become an issue?	11 May 2021 Focus Meeting	Kolomela Mine	A buffer of 500m will be placed around the Village Pit expansion – the Kolomela Mine access road will be outside of this buffer.
29	The main Eskom power supply line is located to the south of the mining area. Will the power line be affected	11 May 2021 Focus Meeting	Kolomela Mine	No activities will be undertaken closer to the Eskom powerlines running between Kolomela Mine and Beeshoek Mine. The only activities on the south of the Mine will be the continuation in depth of the East Pit and operation on the existing East Pit WRD. The exploration activities will not have an impact on the power line.
30	Exploration was concentrated at the Village Pit area. How much ore is located within the southern and eastern sections of the mining area?	11 May 2021 Focus Meeting	Surrounding Landowner: Albertus Viljoen	Exploration activities are planned, however are informed by information obtained from the actual exploration drilling. The focus was not solely on Village pit. Assmang annual reports are publicly available for further information.
Employment and Safety				
31	Will the project result in job creation?	11 May 2021 Focus Meeting	Kolomela Mine	This project is to ensure a sustainable increase in the life of mine, not an increase in production. This project will in fact allow for the continuation of mining activities, which will rather secure the employment of the current staff compliment. During the construction phase limited short-term opportunities will be created. The construction/start-up period is estimated for approximately eight (8) months. During the peak periods of the construction phase approximately 122 positions would be created for a short period of time. Of these, 70 would fall in the unskilled category, 18 in the skilled and 34 in management positions. The construction of the railway link line could change these figures. The mine has a dedicated procurement and HR department, who manages the employment in line with the relevant Score Cards. Strong emphasis is place on the involvement of local labour. The mine will further ensure that local labour is sourced where possible during the construction phase. It is highly unlikely that this project will result in an influx of job seekers as not new areas will be opened for construction and no new substantial opencast pts are being developed. The new plants is regarded as an addition to the existing North Mine beneficiation plant.
32	It is important to assess the social impacts with regards to the proposed Beeshoek Optimisation Project. It is anticipated that the proposed Beeshoek mining activities will result in population increases, even though no additional employment opportunities will be created as part of the project. Contractors usually use outsiders as part of the work force. These outsiders remain in the area resulting in more	25 May 2021	Tsantsabane Local Municipality	is important to understand the intent of this project. The project is purely an optimisation project. Additional job creation opportunities will be available during the construction phase. However, for the operational phase, the staff compliment will likely revert back to the current staff compliment, with limited new positions required. This project is to ensure a sustainable increase

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	unemployed people and the rapid development of informal settlements. This is of concern to the TLM as it would again impact on their service delivery ability.			in the life of mine, not increase in production. This project will in fact allow for the continuation of mining activities, which will rather secure the employment of the current staff compliment. The mine has a dedicated procurement and HR department, who manages the employment in line with the relevant Score Cards. Strong emphasis is place on local labour. The mine will further ensure that local labour is sourced where possible during the construction phase. It is highly unlikely that this project will result in an influx of job seekers as not new areas will be opened for construction and no new substantial opencast pts are being developed. The new plants will be regarded as an addition to the existing North Mine beneficiation plant.
33	Who is the landowner of the farm to the south of Koeispeen? He experiences safety problems at the boundary fence (south-eastern section) due to unauthorized access. Can Beeshoek also put up a higher fence and monitoring station similar to what Kolomela Mine has done at the landowner's boundary fence and that of Kolomela Mine?	11 May 2021 Focus Meeting	Surrounding Landowner	This is municipal land. The Mine has placed fences on its boundaries strategically as well as have a security company patrolling the fences daily.
Water Use Licencing				
34	No activity may occure within 1_100 year floodline of drainage lines without authorisation. No activity may occur within 500m of a pan/wetland (perennial/non-perennial) without authorisation.	Letter dated 16 June 2021	DWS, Ms. Feni Ntombizanele	Noted, where such an activity is considered, the relevant Section 21(c) and (i) water uses will be applied for. Please refer to Section 2.d.viii and Table 9.
35	Note that dewatering of a pit for the continuation of an activity or for the safety of people triggers section 21(j), any storage of waste water triggers section 21(g) and the use of removed water from the pit triggers section 21 (a) of the NWA. The IWWMP, civil designs and geohydrological report must be submitted to support the application.			No additional dewatering volumes are being applied for in the total approved volume. Please refer to Section 2.d.viii and Table 9.
36	The disposal of general waste and that of hazardous waste will be carried out in an environmentally safe way as to prevent and/or minimise the potential for pollution of water resources and collection of which should be done by an accredited waste collector. All applicable sections of the NEM:WA should be strictly adhered to.			Noted, included into the EMPr – refer to Table 85 to Table 88.
37	Section 19 and 20 of the NWA should be adhered to.			Noted, included into the EMPr – refer to Table 85 to Table 88.
38	Appropriate measures should be taken to prevent spillages of material such as oil, grease, and fuel. However, in instances of spillages, immediate steps must be taken to clean up the spilled substance and disposed off in a proper manner or acquire bioremediation substances that will treat the spill and dispose such materials at a permitted hazardous landfill site. The Department should be notified of such spills within 24 hours.			Noted, included into the EMPr – refer to Table 85 to Table 88.
39	All hazardous chemicals should be stored on a bunded area to prevent the contamination of both ground and surface water.			Noted, included into the EMPr – refer to Table 85 to Table 88.
40	Please note that a new WULA must be applied for through the E-WULAAS system and the new WUL will supersede the old WUL.			The WULA will be submitted via the E-WULAAS system when the Final EIA and EMPr is submitted. Noted, where such an activity is considered, the relevant Section 21(c) and (i) water uses will be applied for. Please refer to Section 2.d.viii and Table 9.

Summary of Specialist Study Outcomes

Please refer to the following table for the outcomes of the specialist studies.

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Soils, Land Use and Capability,	**General Discussion** The dominant land use within the Mining Optimisation Project is wildlife/wilderness, access roads and services roads as well as existing expansion project. No cultivated commercial agricultural activities were observed within the focus area and the immediate vicinity. For the railway line area the dominant land uses in the surrounding areas include mining, airfield, wildlife/wilderness, access roads and services roads as well as existing railway line. No cultivated commercial agricultural activities were observed within the study area and the immediate vicinity. The Mining Optimisation Project area traverses a Calcic and Anthropic catena with Coega/Knersvlakte, Mispah/Glenrosa being the dominant soil forms within the total investigated focus area. The remaining portions are occupied by Plooysburg/Vaalbos/Nkonkoni soil forms which occur in small patches within the focus area, with the Railway Line area comprising about 6.3% of these soils. The majority of the investigated Mining Optimisation Project area comprises extensively disturbed soils classified as Witbank/Cullinan formation which cover approximately 54.5%. These soils are considered as having poor physical characteristics which are not suitable for cultivated agricultural practices. The shallow soils of Coega/Knersvlakte (Cg) and Mispah/Glenrosa (Ms/Gs) formations collectively cover approximately 35.6% of the total investigated focus area. The occurrence of Hardrock/Lithic and Hard Carbonate material near and/or at the surface on these soil forms restricts root growth and creates conditions that are not conducive to the cultivation of most cultivated crops. Only 9.8% of the total investigated area is considered suitable for cultivated agricultural practices under intensive management practices (i.e. irrigation). For the Railway Line area shallow soils of Coega/Knersvlakte (Cg), Prieska/Addo and Mispah/Glenrosa (Ms/Gs) formations collectively cover approximately 51.9% of the total investigated study area and can be considered as having poor physical characteristics ideal in supporting cultivation agricultural practices. This is attributed to the occurrence of Hardrock/Lithic and Hard Carbonate material near and/or at the surface which restricts root growth and development. This creates conditions that are not conducive to the cultivation of most cultivated crops. Some portions of the study area are comprised of extensively disturbed soils classified as Witbank formation (41.8%). The relevant soil limiting factors within the focus area for land capability and land use potential include the following: - Shallow effective rooting depth due to shallow indurated bedrock of the Mispah/Glenrosa, Coega/Knersvlakte soil forms. As such, these soils are not considered to contribute significantly to agricultural productivity; - Seasonal waterlogging of the Kolke and Lepallane soil forms within the associated with the seasonal wetland features. Preservation of these soils for conservation purposes takes precedence, according to the National Water Act, 1998 (Act No. 36 of 1998); and - Lack of soil medium for plants and crop growth for the rocky outcrop, mine infrastructure, surface water areas and Witbank (Anthrosols) soil types. From a land capability point of view, the proposed Mine Optimisation project footprint is largely dominated by shallow soils with low agricultural potential soils with only minor areas comprising of High agricultural potential. At best, the Coega/Knersvlakte, Mispah/Glenrosa soil forms are suitable for marginal grazing. Although arable soils occur with the expansion project footprint (Plooysburg), given the climatic constraints of the area (Rainfall less than 400 mm) and lack of irrigation options, these soils are not likely to contribute substantially to national food production. Furthermore, high temperatures occurring in this area are also likely to cause crop wilting, thus affecting crop yield. Given these constraints the extent of the high productivity soils is not considered sufficient for viable cultivated commercial farming.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.4 & Section 2.e.iii.16 for the Soils, Land Use and Capability Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 6: Soils, Land Use and Land Capability

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Livestock commercial farming is marginal for one (1) landowner for the proposed area extent to be affected by mining activities, due to the grazing capacity low grazing capacity for this area (14 Hectares per animal). Although the grazing capacity indicated in the existing database is 14ha/LSU, based on the field investigation considering the veld condition (i.e., sparsity and palatability of grass) and occurring soils the grazing capacity is anticipated to be lower than indicated. Therefore, this area it is not considered sufficient for viable commercial farming unless intensive management practices are implemented. **Impact Statement** The proposed expansion projects will impact the soil resources in varying severities, with project 3 posing the highest impact significance due to its extent as well as the encroachment on high agricultural potential soils. Project 2 is anticipated to have the second highest impact while the remaining projects are anticipated to a limited impact since the majority of the development will occur on previously disturbed soils. Although there is occurrence of arable soils, low potential crop yields are foreseen for this area due to climatic constraints (i.e., limited rainfall) and lack of irrigation options. Nevertheless, protection of high agricultural resources (where feasible) is deemed imperative in efforts to conserve the finite agricultural resources in line with the CARA (CARA), 1983 (Act No. 43 of 1983). The surrounding areas within which the proposed expansion project is to occur are dominated by Iron Ore mines, and no cultivated agricultural activities occur in the immediate vicinity. This is largely attributable to the dominance of rocky outcrops and shallow soils which are not ideal for cultivated agricultural production. The proposed Mine Optimisation Project area is anticipated to lead to a relatively low cumulative loss of arable land and medium low cumulative loss of natural grasslands for grazing. Therefore, from a soil and land capability point of view, the addition to the cumulative impact footprint of the region is considered relatively minor. In terms of the railway line area, the proposed project is anticipated to lead to a relatively low cumulative loss of arable land and medium low cumulative loss of natural grasslands for grazing. Therefore, from a soil and land capability point of view, the addition to the cumulative impact footprint of the region is considered relatively minor. **Management Measures** The management measures presented in this report, focusses on: - Soil Stripping and Stockpile Management; - Soil Erosion and Dust Emission Management; - Soil Compaction Management; - Soil Contamination Management; and - Loss of Land Capability Management. **Specialist Opinion** The surrounding areas within which the proposed railway is to occur are dominated by Iron Ore mines, and no cultivated agricultural activities occur in the immediate vicinity. This is largely attributable to the dominance of rocky outcrops and shallow soils which are not ideal for cultivated agricultural production. In addition, lack of rainfall as well as limited irrigation options further disqualifies the area from being ideal for agricultural production. Therefore, based on the above-mentioned limiting factors, the proposed project is anticipated to lead to a relatively low cumulative loss of arable land and medium low cumulative loss of natural grasslands for grazing. Therefore, from a soil and land capability point of view, the addition to the cumulative impact footprint of the region is considered relatively minor.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Ecological Assessment	The mine is situated within the Savanna Biome and within the Eastern Kalahari Bushveld Bioregion. The mine occurs in three vegetation types, namely the Postmasburg Thornveld (western Portion), Kuruman Thornveld (Eastern Portion) and the Kuruman Mountain Bushveld (Eastern Boundary) – all three vegetation types are Least Concern ecosystems and currently Poorly Protected. For the Terrestrial Biodiversity Theme (Online Web Based National Environmental Screening Tool), the Beeshoek Mine is considered to have a very high sensitivity. The triggered sensitivity features include an Ecological Support Areas (ESA), and a Freshwater ecosystem priority area. The Beeshoek Mine is further located in the Griqualand West Centre (GWC) of plant endemism and the Gamagara Corridor. Based on the results of the field investigation six (6) broad habitat units were distinguished for the Beeshoek Mine Optimisation Project: 1. Calcrete Shrubland: 2. Modified Habitat Unit: 3. Moisture-driven Habitat: 4. Open Thornveld Habitat Unit: 5. Rupicolous Habitat Unit: 6. Non-watercourse habitat: Of the AIPs recorded during the field assessment, 12 species are listed under NEMBA Category 1b and two under Category 2. The remaining species are not listed under NEMBA but species such as *Bidens bipinnata, Chenopodium album* and *Tagetes minuta* are considered problem plants having a negative impact on indigenous floral communities within disturbed and degraded areas. Based on conservation significance, presence of various SCC (refer to Section 2.e.iii.5.h) and the level of habitat degradation, the floral sensitivity of the habitat units indicate that the Modified Habitat Unit is of **Low and Moderately Low Sensitivity**, the Calcrete Shrubland is of **Intermediate Sensitivity**, the Watercourses (Cryptic Wetlands and Episodic Drainage lines) of **Moderately High Sensitivity**, the Non-watercourses (Preferential Flow Paths, Seasonal Depressions and Recharge zone) of **Moderately Low and Intermediate Sensitivity**, the Open Thornveld varied between **Intermediate and Moderately Low Sensitivities**, and the Rupicolous Habitat varied between **Moderately Low and Moderately High Sensitivities**. The proposed Beeshoek Mine activities will impact on these habitat units to varying degrees. When considering the conservation significance, presence of SCC and the level of habitat degradation (refer to Section 2.e.iii.5.h), at the Mine Optimisation Project the faunal sensitivity of the habitat units indicate that the Modified Habitat Unit is of **Low and Moderately Low Sensitivity**, the Natural Habitats are of **Intermediate Sensitivity** and the Watercourses and Non-watercourses of **Moderately High Sensitivity**. From a fauna perspective, the proposed Railway Line Link Project will result in the clearance of faunal habitat (vegetation) that predominantly ranges from **intermediate** to **low sensitivity**. The preferential flow path is deemed to be of **moderately high sensitivity** for fauna, and will be impacted upon at the various road and railway crossing point. This preferential flow path provides niche habitat and surface water for fauna in the local area and as such, is considered to be of increased importance, even though artificial. **Impact Statement** Floral SCC recorded within the focus area included species protected under the National Forest Act, 1998 (Act No. 84 of 1998, as amended in September 2011) (NFA), NEMBA TOPS regulations, and Schedule 2 protected species of the NCNCA. Mining activities associated with Project 1, 2 and especially Project 3 are anticipated to have an unfavourable impact on floral SCC. Projects 4 and 5 will minimally impact on floral SCC. Faunal SCC observed and expected to occur on site include species protected under TOPS as well as being listed either as protected or specially protected in Schedules 1 and 2 of the NCNCA. Project 3 will have the greatest impact on potential faunal SCC as a result of the increased areas where vegetation clearance will take place.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.5 for the Ecological Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 7: Ecological Study

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th><th>Specialist recommendations that have been included in the EIA report</th><th>Reference to applicable section of report where specialist recommendations have been included.</th></tr>
<tr><td></td><td>Separately, the five projects will vary considerably in the significance of the impact ratings on floral and faunal ecology associated with the Beeshoek Mine. Collectively, the impacts are anticipated to be significant on both floral and faunal habitat and diversity, as well as on SCC.

Most significant impacts to affect the floral and faunal habitat integrity and species diversity within the Beeshoek Mine include, but are not limited to, the following:

- Mining activities within sensitive habitat such as Cryptic Wetlands (though limited to only two pans), species-rich Rupicolous Habitat (floral) and large stretches of untransformed Calcrete Shrubland. Considering that the Postmasburg Thornveld, Kuruman Thornveld and Kuruman Mountain Bushveld are endemic vegetation types (Skowno et al, 2019) and the fact that there are several additional mining expansions planned in the region, further impact on the remaining extent of the currently least concern, but poorly protected, vegetation types could increase their threat status;
- Continued expansion resulting in fragmented habitat, the loss of movement corridors and breeding habitat for faunal species;
- Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint;
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora, altering favourable habitat conditions for the establishment of indigenous species and limiting faunal species utilisation of these area;
- Rehabilitation efforts are likely to result in sub-optimal recovery of the landscape to pre-mining conditions, resulting in residual impacts to floral and faunal communities;
- Increased human populations in the surrounding area leading to greater pressure on natural floral and faunal habitat both within the Beeshoek Mine and the surroundings, whilst increased human numbers are likely to lead to increase persecution rates on fauna, notably snaring and informal hunting activities;
- Placement of mining infrastructure within floral and faunal SCC habitat;
- Destruction, removal or harvesting of floral SCC during construction and operational activities; and
- Potentially poorly implemented and monitored rescue and relocation of SCC that will be affected by the proposed project, leading to unsuccessful rescue efforts and loss of SCC individuals.

Most significant impacts at the Railway line project are considered to be:

- Clearance of habitat with numerous individuals of nationally and provincially protected floral species;
- Habitat fragmented and resulting in reduced movement of species and reduced dispersal opportunities for plant species;
- Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint;
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species.
- Disturbance, fragmentation and alteration of floral SCC habitat;
- Destruction, removal or harvesting of floral SCC during construction and operational activities; and
- Potentially poorly implemented and monitored rescue and relocation of SCC that will be affected by the proposed project, leading to unsuccessful rescue efforts and loss of SCC individuals.

Management Measures

- Habitat Diversity Management
- AIP Management</td><td></td><td></td></tr>
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List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• Edge Effect Management • Faunal SCC Management • Rehabilitation **Specialist Opinion** It is the opinion of the ecologists that this study provides the relevant information required to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the project area will be made in support of the principle of sustainable development.		
Freshwater Ecosystems	**General Description** According to the screening tool the overall aquatic sensitivity of the Beeshoek Mine and surrounds is very high due to the area being classified as a FEPA catchment, the presence of wetlands and the Beeshoek Mine falling within a strategic water source area. The FEPA catchment and numerous wetlands corresponds with the NFEPA Database (2011) and the NBA 2018 Dataset. According to the Strategic Water Source Areas (SWSA) Database (2017) the south eastern portion of the Beeshoek Mine Boundary is located within the Southern Ghaap Plateau groundwater SWSA. Numerous (over 50) potential areas of increased wet response were identified in the study area. Twenty-one of these possessed unique characteristics not observed in other features, including floral species and aquatic macroinvertebrates which led to their characterisation as “cryptic wetlands” (as defined by Day et al, 2010), whilst one was characterised as an episodic drainage line with a weakly defined riparian zone. Both the cryptic wetlands and the episodic drainage line were classified as watercourses from an ecological perspective and thus assessed as such. The remaining features were characterised as seasonal depressions, preferential flow paths and a “recharge zone” associated with a small unnamed tributary of the Groenwaterspruit, none of which were classified as watercourses. These were excluded from further assessment. The 21 cryptic wetlands identified within the proposed mine expansion footprint were found to be of increased ecological integrity, and of moderate ecological importance and sensitivity (EIS). Although true hydrophytic vegetation was absent from all but one of these cryptic wetlands, additional biotic and abiotic factors were used to define, delineate and characterise these features, including the presence of macroinvertebrate communities within two of the features. It is likely that all identified cryptic wetlands are primarily important in terms of biodiversity maintenance and habitat provision for threatened or protected species. No watercourses, as defined by the National Water Act, 1998 (Act No. 36 of 1998) were identified within 500 m of the proposed railway line. Due to the nature of the proposed development and the location thereof in relation to any identifiable drainage systems (in excess of 1 km from the proposed railway line), the development of the railway is considered to pose little to no risk to any freshwater ecosystems in the region. Therefore, it is the opinion of the specialist that there is no reason, from a freshwater resource management point of view, for the development to not be authorised. **Impact Statement** Based on the layout provided to the specialist in July 2021, two of the 21 cryptic wetlands will be irreversibly lost should the proposed expansion of the Village Pit and future opencast areas proceed. Whilst the results of the risk assessment indicate that the associated risk significance is ‘medium’ it is the specialist’s opinion that this is understated due to the impact only occurring once, and therefore the score is ‘1’; thus a more accurate representation of the risk significance is ‘high’. Restoration of the affected cryptic wetlands will not be practical nor viable, therefore the proponent must engage with the relevant authorities to	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.6 for the Freshwater Ecological Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 8: Freshwater Ecosystems

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	implement appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent with regards to the outright loss of the affected CWs. The expansion of the existing Waste Rock Dumps and detrital area, and proposed activities within already disturbed areas are anticipated to have a 'low' or even negligible risk significance, provided that strict enforcement of mitigation measures takes place. Therefore, those activities may be considered acceptable from a freshwater ecological management perspective. The cryptic wetlands and episodic drainage line identified in the Beeshoek Mine boundary are deemed to be in a natural to largely natural condition, since few discernible impacts have occurred. Although not necessarily important for the provision of ecological services such as flood attenuation, these systems are deemed important for biodiversity maintenance, and may potentially provide important breeding and foraging habitat for various fauna, particularly since the presence of macroinvertebrates was confirmed at two cryptic wetlands. These cryptic wetlands may provide habitat for floral SCC. Responsible implementation of the mitigation hierarchy as well as strict adherence to cogent, well-developed mitigation measures must take place throughout all phases of the proposed mining expansion to minimise the significance of impacts to the receiving freshwater environment. This is particularly important in a semi-arid region to protect the scarce water resources of the region. Should the proponent commit to such adherence to the mitigation hierarchy and mitigation measures, the significance of potential impacts arising from some of the proposed mining activities can be reduced although the direct impact to those cryptic wetlands which will be mined through is irreversible. Restoration of the affected cryptic wetlands will not be practical nor viable, therefore the proponent must engage with the relevant authorities to implement appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent with regards to the outright loss of the affected CWs. **Management Measures** The catchments of all identified watercourses must be determined by a suitably qualified specialist, and as far as feasible, no activities must be permitted within the delineated catchments. Retain as much indigenous vegetation as possible. The watercourse areas and their associated catchments beyond the proposed footprint of expansion should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas. It is strongly recommended that sampling of the cryptic wetlands to determine the presence (or absence) of macroinvertebrates be undertaken. Sampling under dry conditions can be achieved by obtaining soil samples from the top layer (0-50 mm) of soil within each CW, which would hold the egg banks of any invertebrates present. These soils samples are then processed under laboratory conditions to hatch out and enumerate the invertebrate taxa present. Should invertebrate taxa be present, a detailed rescue and relocation plan should be developed by a suitably qualified specialist, to relocate egg banks, either to cryptic wetlands that will be undisturbed, or to recreated wetlands. Such a rescue and relocation plan could potentially form part of and offset initiative, should it be required by the relevant authority. It is worth nothing that should the exploration drilling within the Future Strategic Exploration Block latterly translate to open cast mining, CW14 could, potentially, be mined out. Due consideration must be given to this possibility during future planning phases to ensure that engagement with the relevant authorities takes place to ensure that appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent can be planned for and implemented appropriately. Management measure to be discussed with authorities in the event that the mine proceed with future mining activities in this area could include that cryptic wetlands will be undisturbed, or to recreated wetlands.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Activities associated with Projects 1, 2, 3, 4 and 5 will pose a negligible risk to CW19, as none of the proposed activities will occur within proximity to the CW, although the general increase in mining activity is likely to result in increased dust generation, potentially posing a moderate to high risk significance to the wetland. Therefore, dust suppression must be implemented throughout the life of mine to minimise the risk of wind-borne sediment reaching this, and other, cryptic wetlands. **Specialist Opinion** Due to the outright loss of two cryptic wetlands, it is the specialist's opinion that the proposed mining expansion has the potential to result in impacts of very high significance on the receiving freshwater environment, particularly of a wetland type which is under-researched and of scientific interest. It is however noted that, based on the layout provided at the time of preparing this report, the extent of direct impact will be contained to the local area and will equate to less than 3 ha of wetland habitat. Thus, consideration of the value of this landscape must be considered from a freshwater and terrestrial biodiversity resource management point of view and juxtaposed with the responsibility to comply with Regulation 23 of the Mining and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) MPRDA pertaining to the optimisation of the Mining Right as well as the socio-economic and socio-cultural impact the project will have and the decision should be made and aligned with the principles of sustainable development and Integrated Environmental Management. The expansion of the existing Waste Rock Dumps and detrital area, proposed exploration drilling and proposed activities within already disturbed areas are anticipated to have a 'low' or even negligible risk significance, provided that strict enforcement of mitigation measures takes place. Therefore, those activities may be considered acceptable from a freshwater ecology management perspective.		
Hydrology	**General Description** The climate of Beeshoek can be described as semi-arid to arid, with evaporation far exceeding rainfall. The Mine is located in an endoreic catchment, and therefore, surface water runoff is limited. The general topography of the MRA is flat and the soils consist mostly of semi-permeable to permeable soils. Shallow ephemeral drainage lines occur in the south-east of the MRA and drain towards the Groenwaterspruit. A number of pan like features occur in the west and south of the MRA and have been classified as Cryptic wetlands and seasonal depressions in the Freshwater Ecological Assessment (SAS, 2021). Beeshoek is located in quaternary catchment D73A within the Vaal Water Management Area. According to the Water Resources of South Africa Study 2012 (WR 2012), quaternary catchment D73A is endoreic, meaning that surface water runoff does not flow out of the catchment, and that water is lost to evaporation and infiltration. This is mostly due to the low rainfall and high evaporation of the area. Surface water quality is monitored at the dams/tanks, pits and pipelines. According to Aquatico (2021), the general surface water quality during the 2020 period was classified as being neutral, saline and very hard. Low salt concentrations, metal concentrations and nutrient concentrations were detected at all of the sampling localities. Elevated bacteriological counts occurred at some of the sampling locations. According to GPT (2021), groundwater levels range between 5 metres below ground level (mbgl) in the unaffected mining areas, to 180 - 200 mbgl in the dewatered areas due to groundwater abstraction for dewatering and water supply. The effect of dewatering is more pronounced to the south of the mine. The direction of groundwater flow is south to south easterly from the mining area. A cone of depression has developed within the active mining area with flow directed towards the mining excavation due to the active mining areas. The general groundwater quality is good; however, elevated nitrate does occur at some of the sampling boreholes due to expected mining related impacts (Aquatico, 2021). The only natural defined drainage channel occurs in the south-east of the MRA. A 1:50 and 1:100 year floodline determination was undertaken on this drainage line, as according to Regulation 4 (b) of GN704, prospecting should not take place within the 1:50 year floodline unless exemption is obtained from the DWS. The proposed activities will not be undertaken within this area.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.7 for the Hydrological Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 9: Hydrology

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	No watercourses were identified in the vicinity of the railway line project. **Impact Statement** The impact assessment indicated that all identified impacts would have a medium significance pre-mitigation, and that these impacts can be mitigated to a low significance should mitigation measures be adhered to. Typical impacts identified include: - Erosion of exposed soils leading to siltation and sedimentation of downslope drainage channels. - Potential hydrocarbon spillages washed into downslope drainage channels. - Alteration in natural drainage patterns leading to erosion and siltation. - Loss of hydrological connection and water quantity. - Loss of natural seasonal storage areas. - Loss of water quantity to downstream users. Due to the arid climate this is likely to be a very small to negligible impact. Management Measures The determined floodline is connected to what has been delineated as a recharge zone in the Freshwater Ecological Assessment (SAS, 2021). It is recommended that future prospecting activities do not take place within the 1:50 year floodline as required by GN704 Regulations. It is further recommended that future prospecting activities remain outside of the recharge zone pending further investigation and understanding of this area. The following are proposed stormwater measures: - Berms should be placed around the proposed ROM Stockpile consolidation area, as is the case with other ROM Stockpiles onsite. Waste rock can be used to construct the berms, as it has been authorised for such purposes in the Mines amended WUL. This will ensure that any clean water runoff is diverted away. - No stormwater measures to contain runoff were recommended around the existing WRDs due to the low rainfall, high evaporation and waste classification which indicated non-hazardous material (SWS, 2016). Furthermore, waste rock has been exempted from regulation 5 of GN704 (which pertains to “Restrictions on the use of material”) for the construction of berms and haul roads. Based on the above, it is not foreseen that runoff from the WRD expansion areas would need to be contained. However, WRDs close to sensitive areas such as wetlands and depressions should be contained. - Berms should be placed around the proposed pits and Detrital mining areas, as is the case with the other existing pits, to ensure that no clean water flows into the voids. Seepage and dirty water runoff collected within the voids should be managed by recycling and reusing dirty water as far as practicably possible. - The WHIMS and Jig Plants should be operated as dirty areas. Dirty water runoff from the WHIMS and Jig Plants should be directed via lined channels to lined sumps or Pollution Control Dams (PCDs). The water collected within the sumps/PCDs should be recycled and reused as process water. Both the WHIMS and Jig Plants will be located on topographically elevated areas surrounded by disturbed areas, and therefore, the diversion of clean runoff around these areas is not foreseen. - Water levels and sufficient freeboard within the proposed dirty water dams/tanks, should be monitored and reported on. Dirty water storage facilities must be sufficiently lined with adequate capacity, in accordance with GN704 regulations. - Monitoring plans have been proposed under section 2.h of this EMPr (Part B) report.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Specialist Opinion Based on the findings and outcomes of this study, it is the opinion of the specialist that from a surface water perspective, the proposed projects and activities can commence, provided that the recommendations and mitigation measures provided in this report are adhered to. It is important that future prospecting activities in the southern and western extent of the MRA should avoid the wetlands, depressions, recharge zone and drainage lines.		
Hydrogeology	**General Discussion** The hydrogeology in the Postmasburg/Beeshoek area is extremely heterogeneous due to the complex geology of the area. Karoo Supergroup sediments, volcanics and karstic (dolomitic) formations are the main components of the groundwater regime in the area. Hydraulic conductivity varies spatially and vertically, and the modelled conductivities vary by at least six orders of magnitude, from 10^{-3} m/d to 10^{+2} m/d (0.001m/d to 100m/d). Groundwater levels range between 5mbgl in unaffected areas to 180 - 200mbgl in dewatered areas due to groundwater abstraction for dewatering and water supply. The effect of dewatering is more pronounced to the south of the mine (south of Olynfontein). The direction of groundwater flow is south to south easterly from the mining area. A cone of depression has developed within the active mining area with flow directed towards the mining excavation due to the active mining areas. The leachable concentrations of solid waste were compared to the leachable concentration threshold (LCT) limits to determine the leachability of the different waste types at the mine. Solid waste types were described as either “type 4” or “type 3” waste types which are low hazard waste types with regards to the likelihood to release contaminants in dissolved phase. Generally, the groundwater resources at all the sampling localities are described as being neutral to alkaline (pH levels between 7.8 and 8.0), non-saline to saline (TDS between 445.5mg/l and 563.8mg/l), and the hardness can be classified as very hard (> 300mg $CaCO_3$/l). Water hardness at Beeshoek mine is not unlike most other boreholes in the area, resulting from the calcareous/dolomitic underlying geology characteristic of many parts of the Northern Cape. Metal concentrations were below detection limit or low at all the monitoring boreholes. Nitrate as N and combined nitrate and nitrite exceed the drinking water limit in the majority of external user boreholes regardless of location. The WUL identified nitrates as a contaminant of concern in relation to mining activity due to the use of N-based emulsions for blasting. Through the analysis of N-isotopes from nitrates, a contamination assessment was conducted in 2019 and it was concluded that mine’s contribution to nitrate levels in and around the mine was minimal (<1%). The aquifer can be classified as a minor aquifer system, with medium level protection required. **Impact Statement** The potential influences on groundwater quality were identified as opencast mining, fuel storage and handling, sewage management, solid and liquid mining-related waste management at the mine (i.e. ore discards and impounded mine water). The construction phase is not expected to influence the groundwater levels. With the exception of minor oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.8 for the Groundwater Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 10: Hydrogeology

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	During the operational phase, it is expected that the main impact on the groundwater environment will be dewatering of the surrounding aquifer. Water entering the mining areas will have to be pumped out to enable mining activities. This will cause a lowering in the groundwater table in- and adjacent to the mine. Mining in this area has been ongoing for many decades, and there are historical impacts on the surrounding aquifer which are impractical to simulate in a numerical model. Thus, current groundwater levels (obtained from various sources) have been used as baseline for this impact assessment, and all dewatering impacts related to the current water levels as a starting point. Considering the impact associated with each mining pit, the following observations were made: - The area to the south of the mining rights area is characterised by deep groundwater levels (>100 m) associated with large-scale dewatering at the neighbouring Kolomela Mine. - No drawdown is expected for further mining at East Pit as the declining groundwater levels is predicted to be below the bottom of mining. - Drawdown at Village pit is predicted to extent to up to 2km from the pit in a mostly westerly direction, for an insignificant drawdown of 5 – 10 metres. Areas of significant drawdown is expected only in in the immediate vicinity of the pit, which could even decline with time as Leeuwfontein mining impacts northward into this area. - HF Pit is predicted to have a minor impact limited to the immediate surroundings of the pit itself. - The BN Pit is predicted to have the largest area of impact due to substantial increase in mining depth. Drawdown of groundwater levels will be up to about 100 m but limited to an area of about 1 km around the pit. This is mainly due to different hydraulic characteristics in the area around the pit. - No groundwater-related impacts are expected on surface water resources. After closure and cessation of dewatering/groundwater abstraction, the water table will rise in the mine to reinstate equilibrium with the surrounding groundwater systems. The rebound period also depends on regional activity as large-scale dewatering is occurring at the neighbouring mines as well. Following the closure of the opencasts and the cessation of the dewatering it is assumed to lead to groundwater rebound and potential decanting. However, due to naturally deep-lying groundwater levels, no decant is predicted. The rise of solute concentrations in groundwater is expected to occur slowly in a south to south-westerly direction, at about 100 metres per year. No adverse effects are predicted on receptor boreholes with regards to increasing solute concentrations in groundwater. **Management Measures** The Mine was awarded a WUL on 21 August 2018, licence number 10/D73A/ABGJ/2592 (read with update 2019). The WUL covers Section 21(a), 21(b), 21(g) and 21(j) of the NWA. The conditions as set out in the WUL serve as the guidelines for monitoring data interpretation and reporting for authorised activities. A monitoring programme is in place which entails quarterly water quality monitoring and monthly manual water level and daily telemetric/auto-level water level monitoring at select locations. The current water quality and water level monitoring network is considered adequate to detect and quantify the presence and migration of any contaminants in groundwater and measure the effects of large-scale groundwater abstraction for mining purposes on groundwater levels. A groundwater monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. The boreholes can be grouped or classified according to the following purposes: - Source monitoring: Monitoring boreholes are placed close to or in the source of contamination to evaluate the impact thereof on the groundwater chemistry. Monitoring boreholes within the mining area satisfy this condition.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	- Pathway monitoring: Monitoring boreholes are placed in the primary groundwater migration pathways to evaluate the migration rates and chemical changes along the pathway. Monitoring boreholes located along groundwater flow paths satisfy this condition. - Impact monitoring: Monitoring of possible impacts of contaminated groundwater on sensitive ecosystems or other receptors. These monitoring points are also installed as early warning systems for contamination break-through at areas of concern. External user boreholes and monitoring placed in positions to detect and monitor impacts on groundwater availability and quality satisfy this condition. - Background monitoring: Background groundwater quality is essential to evaluate the impact of a specific action/pollution source on the groundwater chemistry. Monitoring boreholes located up-gradient/upstream of the mining area satisfy this condition. - Dewatering is primarily achieved through wellfields of abstraction boreholes and in pit dewatering points, and the combination thereof functions with the purpose of keeping the pit floor dry by creating a cone of depression around the excavation. The pit floor was thus modelled as a drain, which in MODFLOW uses the bottom elevation of the drain as the hydraulic head that controls flow into the drain. In this way the individual position of dewatering boreholes has no effect on the extent of the cone of depression or groundwater level lowering. Dewatering borehole positions may be changed without notice as objectively they will be placed as close as possible to the excavation to maintain a dry pit floor. **Specialist Opinion** Beeshoek is currently operating in a dynamic mining environment. Water levels are also impacted by various external sources, which directly impacts the water levels at Beeshoek. Currently, no additional groundwater is to be abstracted from the catchment as part of this project expansion. However, due to the nature of the environment in which the mine is operating, regular numerical model updates must be undertaken to determine whether the volumes for dewatering will still be sufficient to also supply the mine with the required volumes as approved in the Section 21a water uses.		
Air Quality	**General Discussion** In 2020, 76% of all winds were either calm or light with and 76% of all winds were less than 3.6 m/s, i.e. (6 658 hours of the possible 8 760 hours in a year). 24% of winds exceeded 3.6 m/s with just 0.1% of winds reaching more than 8.8 m/s, i.e. for just longer than 8 hours. The predominant wind direction in 2020 was from the sector east-northeast (ENE) to easterly (E), accounting for approximately 36% of all winds. The predominant wind direction is northwest to north-northeast with winds from other sectors less frequent. Winds are generally light with most of hourly winds less than 3.4 m/s. Stronger winds reaching more than 8 m/s are occur occasionally from the west-northwest to north-northwest sector. Beeshoek Mine has been measuring dust fallout since 2005. Monitoring is currently done at nine sites using the SANS 1929:2005 and ASTM Standard, D1739-98: Standard Test Method for the Collection and Measurement of Dust fall (Settleable Particulate Matter). The measured dust fallout is generally low compared with the limit value of the dust fallout standard of 1200 $mg/m^2/day$. The total estimate emission of total suspended particulates (TSP) from Beeshoek Mine activities in 2019 was 5 224 tons. The estimate emission from PM10 was 1 545 tons in 2019 and for PM2.5 was 172 tons per annum. The largest source of particulates is vehicle entrainment from the mine roads. Assuming that mine roads are watered twice daily, approximately 90% of all TSP and PM10 emissions are attributed to the entrainment of dust by vehicles, and 80% of the PM2.5 emission. Crushing and screening is the second largest source of particulate emissions at Beeshoek, but it is relatively small and accounts for only 5.4% of the total TSP and PM10 emission. The total emission of particulates increases with the implementation of the optimisation projects.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.9 for the Air Quality Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 11: Air Quality

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.

Particulate emissions in tonnes per annum for the current year of assessment in 2019

Mining activity	TSP	PM10	PM2.5
2019 Emissions	**5 224**	**1 545**	**172**
Emissions post optimisation projects	**7 039**	**2 118**	**230**

The US-EPA approved and DFEE recommended CALPUFF dispersion model was used to predict the ambient particulate concentrations and dust fallout rates from the four optimisation projects and from the Beeshoek Mine after their implementation.

The maximum predicted ambient PM10 and PM2.5 concentrations and TSP deposition for the optimisation projects and for Beeshoek Mine following their implementation are presented in the following table. In all cases the predicted maximum occurs close to the respective project site on the mine property. Exceedance of the NAAQS (shown in bold) are predicted for Project 3: Opencast Pits and result from haul road emissions. This contribution implies that the predicted ambient concentrations for Beeshoek Mine following the implementation of the projects are also exceeded at the point of maximum.

Maximum predicted annual average and 99th percentile of 24-hour PM10 and PM2.5 concentrations in µg/m3 and maximum dust fallout in mg/m2/day

	Annual PM10	24-hour PM10	Annual PM2.5	24-hour PM2.5	Dust fallout
Project 1: Consolidation of ROM stockpiles	7.2	30	2.8	11.6	16.3
Project 2: Amendments to WRDs	1.4	4.4	0.2	0.7	2.8
Project 3: Opencast footprints	**439**	**1 239**	**45**	**127**	1 175
Project 4: Beneficiation plant upgrade	33	271	6.5	21	509
Beeshoek Mine post improvements	**793**	**2 617**	**80**	**263**	2 457

Impact Statement

The predicted maximum ambient concentration at identified sensitive receptors are shown in the following table and compared with the NAAQS. Noteworthy is that in all case they are well below the respective NAAQS at all sensitive receptors.

Predicted annual average and 99th percentile of 24-hour PM10 and PM2.5 concentrations in µg/m3 and dust fallout in mg/m2/day at sensitive receptors.

Receptor	Annual PM10	24-hour PM10	Annual PM2.5	24-hour PM2.5	Dust fallout
Aucampsrus	8.0	65.0	0.8	7.0	75
Boichoko	2.1	21.1	0.2	2.0	22
Maranteng	1.1	12.3	0.1	1.3	12
Newtown	1.4	14.7	0.2	1.5	15
Postdene	0.9	10.1	0.1	0.9	12
Postmasburg-North	1.1	13.0	0.1	1.3	13
Postmasburg-South	1.2	13.2	0.1	1.4	14
NAAQS	40	75	20	40	600

The following points on the predicted ambient PM10 concentrations are noteworthy:

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• The predicted annual PM10 concentrations from Project 1 (ROM consolidation), Project 2 (WRD amendments) and Project 4 (beneficiation plants) are low and below the NAAQS. The highest concentrations for each of these source projects occur in the immediately vicinity of these individual sources. The predicted annual PM10 concentrations for Project 3 (pit expansion) exceed the NAAQS. The exceedances are predicted in the vicinity of the Village Pit and occur within the mine boundary. The relatively high predicted concentrations are a result of dust generated on the haul roads. • The predicted annual PM10 concentrations resulting from emissions from all sources at the Beeshoek Mine following implementation of the optimisation projects exceed the NAAQS over most of the mine and extend a little beyond the southern and eastern boundary of the mine. The exceedances do not extend into any commercial or residential areas. The following points on the predicted ambient PM2.5 concentrations are noteworthy: • The predicted annual PM2.5 concentrations from Project 1 (ROM consolidation), Project 2 (WRD amendments) and Project 4 (beneficiation plants) are low and below the NAAQS. The highest concentrations for each of these source projects occur in the immediately vicinity of these individual sources. • The predicted annual PM10 concentrations for Project 3 (pit expansion) exceed the NAAQS at the Village Pit. The relatively high predicted concentrations here are a result of dust generated on the haul roads. • The predicted annual PM10 concentrations resulting from emissions from all sources at the Beeshoek Mine following implementation of the optimisation projects exceed the NAAQS over the Village Pit and the East Pit. The predicted exceedances occur within the mine boundary. The following points on the predicted dust fallout rates are noteworthy: • The predicted dust fallout resulting from Project 1 (ROM consolidation) and Project 2 (WRD amendments) and Project 4 (beneficiation plants) is low relative to standards and highest fallout rates occur in the immediately vicinity of these individual sources. • The predicted dust fallout for Project 3 (pit expansion) is low relative to the national standard for non-residential areas. The highest fallout rates compare with the residential standard and occur in the immediate vicinity of the Village Pit where the non-residential standard is shown by the red line. • The predicted dust fallout resulting from emissions from all sources at the Beeshoek Mine following implementation of the optimisation projects are relatively low and comply with the standard for residential areas. The only predicted exceedance of the non-residential standard occurs within the mine perimeter and over the Village Pit where the residential standard is also predicted to be exceeded. The dust fallout standard for residential areas is also predicted to be exceeded over the East Pit. The significance of air quality impacts associated with the optimisation projects and for Beeshoek after the optimisation were assessed using the predicted ambient concentrations. **Management Measures** The development and implementation of a fugitive dust management plan (FDMP) is recommended. The FDMP must define the responsible persons and should include, but not be limited to the following. • Strict enforce speed limits on all mine roads.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	- Limiting site clearance to design areas. - Rehabilitation of all areas on completion of construction activities. - Routine damping of denuded areas during construction, particularly when strong winds are forecast. - Monitoring of activities causing high dust fallout and manage these specific activities accordingly by actively using the existing dust fallout network. - Implementation of dust control measures in the form of slope stability and a vegetation program. - Installation, operation and maintenance of dust extraction systems at the secondary and tertiary crushing and screening plants. For crushing and screening operations at mineral processing plants, fugitive dust can be controlled with dust extraction systems and water sprayers. - The application of chemical dust suppression systems at the primary crushing and screening plants. - Covering all product transported by vehicles using tarpaulins. **Specialist Opinion** From an air quality perspective, it is the reasonable opinion that the Beeshoek Mine optimisation project should be authorised considering the findings of this assessment.		
Heritage and Palaeontology	**General Description** A Heritage Impact Assessment (HIA) was conducted for the project and the study area was assessed on desktop level and by a non-intrusive pedestrian field survey. Key findings of the assessment include: <u>Mine Optimisation Project Area</u> - Large sections of the study area are disturbed by existing mining activities; - Archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for Stone Age sites/finds. This pattern was corroborated during the survey where isolated artefacts were recorded (in undisturbed areas) with a higher frequency of background scatter of artefacts in the southern section (Strategic exploration area) where several pans dot the area; - Dense vegetation after exceptionally high rainfall limited archaeological visibility, this limitation can be successfully mitigated as outlined under the recommendations; - The heritage survey recorded a range of heritage features including Stone Age artefacts, Ruins, Stone cairns and cemeteries; - Two cemeteries were recorded located outside of the mining footprints in addition to stone cairns of unknown purpose within the mining footprint. The stone cairns are most probably the result of clearing or construction activities and although unlikely these can represent graves. Graves and cemeteries are of high social significance and should be avoided and retained in situ. - In terms of the palaeontological component, the area is of high paleontological sensitivity and a separate study was conducted for this aspect (Bamford 2019 & 2021). This study concluded that it is extremely unlikely that any fossils would be preserved in the Campbell Rand Subgroup stromatolites or in the loose sands of the Quaternary. There is however a very small chance that fossil may occur in palaeopans in the ancient rocks. <u>Railway Line Area</u>	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.11 for the Cultural, Heritage, and Paleontological Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 12: Heritage and Palaeontological Study

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	- The surrounding area has been disturbed by mining activities, Tommy's airfield, road and railway developments; - Stone Age material is on record in the general area where archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for archaeological finds and specifically Stone Age sites, as these areas were utilized for settlement of base camps close to water and hunting ranges; - None of the above-mentioned focal points occur in the study area although the heritage survey recorded two observation points, the first is an isolated find dating to the Earlier Stone Age and the second is a low-density scatter of lithics possibly dating to the Middle and Later Stone Age. The lithics that are in a deflated context, impacted on by the surrounding developments and found in low densities, forming part of the archaeological background scatter (Orton 2016) and are of low significance apart from providing evidence of use of the wider landscape from as early as >200 ka. No other heritage sites of significance were recorded within the proposed impact areas; - In terms of the palaeontological component, the area is of moderate paleontological sensitivity and a separate study was conducted for this aspect (Bamford 2021). This study concluded that it is extremely unlikely that any fossils would be preserved in the Campbell Rand Subgroup stromatolites or in the loose sands of the Quaternary. There is however a very small chance that fossil may occur in palaeopans in the ancient rocks; The project is in line with surrounding land use and the impact to heritage resources can be mitigated to an acceptable level. The project can commence provided that the recommendations in this report are adhered to and based on the South African Heritage Resource Authority (SAHRA) 's approval. **Impact Statement** Loss of resources in the case of a chance find. **Management Measures** - Implementation of a chance find procedure (heritage and palaeontology) for the project; - It is recommended that the Strategic exploration area should be subjected to a heritage walk through prior to development; - Graves and cemeteries (BH26 and BH27) should be retained in situ with access for family members and a sufficient buffer zone; - Although unlikely, the recorded stone cairns (BH12 and BH24) could represent graves and should be confirmed during the social consultation process. **Specialist Opinion** The project is in line with surrounding land use and the impact to heritage resources can be mitigated to an acceptable level. The project can commence provided that the recommendations in this report are adhered to and based on the SAHRA's approval.		
Visual	**General Description** Beeshoek is located approximately 7 kilometres (km) west of the town of Postmasburg in the Northern Cape. The Mine is divided into two areas that are separated by the R385 regional road that runs in a north-westerly direction between the towns of Postmasburg and Olifantshoek. The North Mine is located to the north of the R385, whilst the South Mine is located to the south.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.12 for the Visual Description

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Due to the flat topography and short shrubby vegetation of the region, the study area for this assessment was defined as a 10 km radius around the Mine dumps that are proposed to be raised. The main features within a 10 km radius of Beeshoek include the town of Postmasburg to the east, Kolomela Mine to the south, a number of smaller mines to the west and north, and scattered farmhouses. **Impact Statement** The following were the main findings of the study: - The proposed infrastructure will be located within the existing Beeshoek MRA; - Mining activities, primarily from two large iron ore mines in the area, namely, Beeshoek and Kolomela Mine, largely characterise the landscape to the west and south-west of Postmasburg. Their large mine dumps have been constructed in a region that has flat topography, surrounded by short vegetation. Mining dominates the landscape of these areas, and the sense of place has been altered from a natural open landscape, to one associated with mine dumps and bare areas. - Due to the general flat topography and short vegetation of the area, the proposed raised Mine dumps will be visible over a large area. - The visual quality was determined to be medium in the flat natural areas away from the mining areas, and high in the natural mountainous areas particularly to the north-west of the study area. The town of Postmasburg has a medium scenic quality, whilst the immediate outer lying areas have a low scenic quality, due to the dusty nature and large amount of litter noted as well as informal settlements that characterise the area. The mining areas, particularly to the centre and south of the study area were assigned a low scenic quality. - The Visual Absorption Capacity (VAC) in general was determined to be low, particularly to the west of Beeshoek. The north – south ridge located to the east of Beeshoek, has a high VAC in concealing and blending the proposed increase in the mine dumps into the landscape. The trees and buildings within Postmasburg will have a high VAC in concealing any views of the dumps. - The visual intrusion of the proposed project was determined to be low, due to mine dumps and mining activities already taking place at Beeshoek as well as in the surrounding area. The proposed Project is in line with the current land use of the area. - Visual receptors include houses and farmsteads in the rural areas, residents of Postmasburg, motorists on the roads surrounding Beeshoek, and an aerodrome. The viewer sensitivity of the farmsteads and rural houses was determined to be moderate, and low for the remaining visual receptors due to the already existing mine infrastructure in the area. - The impact assessment indicated that all impacts would have a medium significance pre-mitigation, with most achieving a low significance post-mitigation. **Management Measures** - Vegetation clearance should be kept to an absolute minimum. Exposed areas should be vegetated as soon as possible. Dust suppression measures should be implemented to limit the generation of dust. - Machinery, trucks and vehicles are already present on the Mine site and are unlikely create any additional significant presence. - The pits should be backfilled where possible. The WRDs should be vegetated as soon as practicably possible. Dust suppression measures should be implemented to limit the generation of dust.		Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 13: Visual

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	- The natural landscape of the area has already been altered by mining. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed infrastructure. However, it is recommended that should the plant and other proposed infrastructure be painted, that earthy colours are used to blend in with the surrounding landscape. It is further recommended that the pits are backfilled where possible and that the WRDs are vegetated upon rehabilitation. - Down lighting and lighting shields should be used as far as possible. - The removal of Mine infrastructure should be undertaken. The pits should be backfilled where possible. The WRDs should be vegetated. **Specialist Opinion** In conclusion, the natural landscape of the area has already been altered by mining activities. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed infrastructure. It is therefore the opinion of the specialist that the project can commence, provided that the recommendations and mitigation measures.		
Socio Economic	**General Description** The study area falls within the boundaries of the ZF Mgcawu District Municipality and under the jurisdiction of the Tsantsabane Local Municipality. The municipality is divided into seven wards, with the study area falling within Ward 6 and a section of Ward 7 with Wards 1, 2, 3, 4 and 5 in very close proximity. The key Municipal priorities as set out in the TLM's IDP include: - Bulk Infrastructure services; - Revenue Collection and Enhancement; - Provision of Sustainable Basic Services (Water, Electricity & Sanitation); - Local Economic Development and Job Creation; - Education: access to land for educational purposes; - Access to land for residential and business erven; - Library services for rural areas; - Refurbishment of community halls; and - Access to health services. The TLM's population indicates a predominantly young age structure with 34% of the population under 18 years and 62% between 18 and 64 years. The median age is 26 years with the highest percentage (23%) of people falling between 20 and 29 years of age. The proportion of the adult population within the Tsantsabane Local Municipal area with no schooling amounts to 7%, with only 2% having obtained a tertiary level of education. Approximately 36%, however has a matric certificate, which is about 20% higher than the rate in the district and 10% higher than the provincial rate. With the low number of the population having a tertiary qualification or having completed Grade 12, it can be assumed that the skills levels are also low. This results in a very low probability for employment. Unemployment and low skills remain a major concern within the TLM area.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.13 for the Socio-Economic Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 14: Socio-Economic

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th><th>Specialist recommendations that have been included in the EIA report</th><th>Reference to applicable section of report where specialist recommendations have been included.</th></tr>
<tr><td></td><td>The mining sector, followed by the agricultural sector, is the main employment sectors within the local study area. The mining industry's contribution to the GDP of TLM increased from R1,5bn in 2002 to R3,9bn in 2012. During 2012 the mining industry employed 54.5% (6 648 persons) of the employed population.

Impact Statement

Based on the social assessment, the following concluding remarks should be noted:

• In view of the fact that mining activities are already undertaken in the area and that the Beeshoek Optimisation Project would be situated within the mining rights area, the proposed mining activities do not constitute a separate activity. It would rather be perceived as development associated with an existing activity.
• The mining activities and associated infrastructure by itself will thus not introduce new social risks and hazards, but only increase the probability and scale of those already associated with the existing mining activities.
• Limited direct negative impacts on the social environment are, at this stage, anticipated.
• No negative social impacts that could be classified as fatal have been identified and there are also no impacts of such a high significance that they could prevent the project from continuing. It is thus concluded that the proposed project is acceptable from a social point of view, provided that mitigation measures are implemented.

Management Measures

• Mitigation and enhancement measures proposed should be noted as recommendation measures and should be included as part of the EMPr.
• The use of local labour, if any additional labour would be required, should be maximised as it could assist in mitigating various other social impacts, but would also enhance the potential benefits of the proposed project to the local community members.
• Local procurement, especially during the operational phase, would have various trickle down positive socio-economic impacts on the beneficiary communities and local businesses. This aspect should thus be pursued as far as possible.
• Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other similar environments.
• The mine should engage the TLM to develop a culture of cooperative support and accountability in order to continue to facilitate and support a variety of socio-economic needs in the area.
• Local residents, with the focus on the surrounding landowners and communities, should receive accurate information with regards to the project status, timeframes for construction and other relevant information about issues that could influence their daily living and movement patterns.
• Socio-economic issues and concerns could arise during the implementation of the project. These should be thoroughly dealt with taking the sensitivities into consideration.

Specialist Opinion

Should the proposed project not proceed, the status quo in terms of the existing social impacts in the area would therefore remain. The Life of Mine would then not be extended and the mine would cease to operate over a shorter period of time.</td><td></td><td></td></tr>
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List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region. As the Beeshoek mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact. The 'no-go alternative' should thus not be considered from a social point of view as the negative social impacts anticipated with the Beeshoek optimisation project are deemed low. The negative impacts would further respond to mitigation as proposed. The proposed activities further fall within the mining rights area and the area is already characterised by and surrounded by various mining infrastructure. From a social perspective it can be concluded that the socio-economic benefits associated with the project outweigh the negative social impacts. The Beeshoek Optimisation project is anticipated to facilitate the continuation of economic benefits to the local area, currently faced with high rates of unemployment and poverty.		

EAP Opinion

It is the opinion of the EAP that this EIA and EMPr provides the necessary and relevant information required in order to implement the principles of Integrated Environmental Management so as to ensure that the best long-term use of the soil, ecological and aquatic resources in the project area will be made in support of the principle of sustainable development.

No fatal flaws or residual impacts have been identified by the specialist or the EAP.

The project will not result in a new Greenfields mining activity, but rather utilising and optimising the infrastructure and resources available to prolong the life of mine. This in itself will have a significant benefit economically and socially within the Local Municipality.

When considering the no-go alternative option it is evident that this project could result in various positive impacts on the environment.

Recommendations of the EAP and specialists have been considered favourably by the applicant and the final project plan has incorporated these recommendations. If the proposed management and mitigation measures are not properly applied or if the applicant intentionally disregards any of these measures, it will negatively affect the environment and have potential consequences and for this reason it is important that the recommendations for conditions for inclusion as presented in Section 2.l be included should the Environmental Authorisation be considered favourably by the Competent Authority.

It is recommended that, the proposed development be considered **favourably** provided that the recommended management measures for the identified impacts, monitoring requirements and auditing protocols are adhered to, and that construction within the no-go zones is avoided. Where this is not possible, such as avoiding the 500m buffer around wetlands systems, such construction is to be kept to an absolute minimum and only undertaken with the necessary approval of the DMR and DWS.

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mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

PART A

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

DMR REFERENCE NUMBER MP: LP 30//2/3/2/1(179) EM

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

NAME OF APPLICANT: **Assmang (Pty) Ltd: Beeshoek Iron Ore Mine**

TEL NO: **+27(0) 53 311 6666**

EMAIL: **Msimelelo.Silomntu@assmang.co.za**

POSTAL ADDRESS: **Private Bag X3002, Postmasburg, 8420, Northern Cape**

PHYSICAL ADDRESS: **Beeshoek Iron Ore Mine, R385, 10km outside Postmasburg**
(Beeshoek Iron Ore Mine is situated on the farms Beesthoek and Olynfontein in the Kuruman Registration Division (RD). The specific farm portions on which the Mine is located are Portion 0 of the farm Beesthoek 448; Portion 1 of the farm Beesthoek 448; and Portion 4 of the farm Olynfontein 475)

FILE REFERENCE NUMBER SAMRAD: **Mining Right Reference Number: NC30/5/1/2/3/2/1/223**

IMPORTANT NOTICE

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

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

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

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

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

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

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

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

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

(d) Determine the—-

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

(ii) Degree to which these impacts—

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated;

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

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

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

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

(i) identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored. _________

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

EnviroGistics (Pty) Ltd (EnviroGistics) was appointed as the Environmental Assessment Practitioner (EAP) by the Proponent (Assmang (Pty) Ltd: Beeshoek Iron Ore Mine; hereafter referred to as 'Beeshoek' or 'the Mine') to undertake the required Environmental Authorisation Process for the proposed Beeshoek Mine Optimisation and Railway Line Project.

This application is for the purposes of an Environmental Impact Assessment (EIA) Process in terms of the 2014 National Environmental Management Act, Act No. 109 of 1998 (NEMA) EIA Regulations (Regulation 982, together with Regulation 983, Regulation 984 and Regulation 985) as amended in 2017 and 2021; as well as the National Environmental Management: Waste Act, Act No. 59 of 2008 (NEMWA) Regulation 921 of 2013 (as amended).

The application for the Environmental Authorisation Process was submitted to the Department of Mineral Resources and Energy (DMRE), the Competent Authority for this project, on 12 February 2021. A letter of acknowledgement from the DMRE has to date not been received, however a screenshot that the application has been uploaded onto the South African Mineral Resources Administration System (SAMRAD) system was provided indicating the date of 25 February 2021. A Section 102 Environmental Management Programme (EMPr) Amendment Application was submitted to the DMRE with the Integrated EIA application.

A meeting was held with the DMRE on 19 March 2021, during which time the DMRE indicated that the proposed railway line project be included into an Addendum Application and that the draft Scoping Report must be updated to include this project (Project 6) and be resubmitted to the stakeholders for comment. The draft Addendum Scoping Report was submitted to all registered stakeholders on 29 March 2021 with the final Scoping Report submitted to the DMRE on 3 May 2021. To date no comments have been received from the DMRE. The application was acknowledged by the DMRE on 4 August 2021.

Please refer to Annexure 1 for the proof of submissions.

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.a Contact Person and Correspondence Address

1.b Details

1.b.i Details of the Environmental Assessment Practitioner (EAP)

EnviroGistics, established in 2015, provides independent environmental planning, permitting and consulting services to a vast array of clients throughout the mining, construction and development industry. EnviroGistics' independence is ensured with Ms Tanja Bekker being registered with both the South African Council for Natural Scientific Professions (SACNASP), and the Environmental Assessment Practitioners Association of South Africa (EAPASA) and complies with all the requirements of the South African Environmental Legislation. EnviroGistics further holds no equity in this or any other project. EnviroGistics operates with the goal of fulfilling its vision and mission, breaking away from a general consulting mould, and striving to form an integral part of a project team. For this reason, clients will be provided with experienced, practical, technically sound, independent, objective and value adding advice and ensures support on environmental planning, permitting and compliance matters.

EnviroGistics is an independent company and has no vested interest in the outcome of the environmental assessment.

Table 1: Details of EAP

Name	Tanja Bekker
Designation	Environmental Assessment Practitioner
Postal Address	PO Box 22014, Helderkruin, 1733
Physical Address	21 Gladiolus Street, Roodekrans, 1724
Telephone Number	+27 (0) 82 412 1799
Cell Phone Number	+27 (0) 82 412 1799

Fax Number:	+ 27 (0) 86 551 5233
Email Address	tanja@envirogistics.co.za

1.b.ii Expertise of the EAP

The following table presents a summary of the EAP's experience:

Table 2: Experience of EAP

Name	Position	Qualification	Professional Registrations	Experience
Tanja Bekker	Environmental Assessment Practitioner	M.Sc. Environmental Management (RAU; now University of Johannesburg)	Registered with the Environmental Assessment Practitioners Association of South Africa (EAPASA; Reg No. 2019/306). Professional Natural Scientist (Pr.Sci.Nat) in the field of Environmental Science with the South African Council for Natural Scientific Professions (SACNASP; Reg No. 400198/09) Member of the South African branch of the International Impact Assessment Association (IAIAsa) Member of the South African branch of the Environmental Law Association (ELA)	19 Years

The EAP's Curriculum Vitae was submitted along with the application form. This can be provided upon request should it be required as part of the draft EIA.

<u>Education</u>

MSc. Environmental Management - RAU (University of Johannesburg)
BSc. Geography Honours (Cum Laude) - RAU (University of Johannesburg)
BSc. Earth Sciences (Geography & Geology) - RAU (University of Johannesburg)

<u>Career Enhancing Courses</u>

ISO 14000 Lead Auditors Course (WTH Management)
Certificate in Project Management (Pretoria University)
Management Advance Programme (MAP 81) (Wits Business School)

<u>Professional Affiliations</u>

Registered member of EAPASA
Certified ISO 14001 Environmental Management System Auditor
Registered as a Professional Natural Scientist with SACNASP
Member of the South African affiliate of the IAIA
Member of the ELA of South Africa

<u>Summary of the EAP's past experience</u>

Ms. Bekker is registered as a Professional Natural Scientist in the field of Environmental Science with SACNASP and is also a Registered EAP with EAPASA, a legal requirement stipulated by NEMA. She is further certified as an ISO 14001 Lead Auditor. Her qualifications include BSc. Earth Sciences (Geology and Geography), BSc. Hons. Geography, and MSc. Environmental Management. In addition to these tertiary qualifications, she obtained a Certificate in Project Management, and completed the Management Advancement Programme at Wits Business School.

With more than 19 years' working experience in environmental management and the consulting industry and managing various Large Account Clients, she understands the South African Regulatory System, and can advise clients with due diligence on their environmental regulatory requirements and offer a solution driven service to their project life cycle. She is equipped with exceptional project management and coordination skills, which especially enhances the service she offers clients within the environmental permitting system.

Her key focus is environmental management and compliance with extensive experience in the mining industry. Project Management and Coordination of projects form a critical component of her duties, which include project planning, initiation of projects, client, authority and stakeholder consultation, specialist coordination, budget control, process control, quality control and timeframe management. Her interest lies in a client advisory capacity, being involved during due diligence investigations, pre-project development and assisting the client and engineering team in adding value to develop the project in an environmentally sustainable manner, considering client costs and liabilities, as well as considering the implication of environmental authorisation conditions and requirements on project deliverables. Her involvement in projects has spanned over the project life cycle from Due Diligence Investigations, Pre-Feasibility Investigations, Prospecting Right Applications, Mining

Right Applications, Environmental Reporting and implementation and auditing of Environmental Management Plans and Authorisations.

1.b.iii Details of the Applicant

Beeshoek is situated in the Tsantsabane Local Municipality, with neighbouring towns being Postmasburg, located 7km east of the Mine and Kathu located 70km north of the Mine.

Mining at Beeshoek was established in 1964 with a basic hand sorting operation. In 1975 a full Washing and Screening Plant was installed. Because of increased production, Beeshoek South, a southern extension of the Beeshoek Mine, was commissioned during 1999 on the farms Beesthoek and Olynfontein.

Assmang (Pty) Ltd is the holder of the new order rights in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) in respect of high-grade hematite iron ore deposits at Beeshoek on the farms Beesthoek and Olynfontein. The mining method currently entails an opencast mining operation, which consists of five (5) active opencast pits (Village Pit, HF Pit, BF Pit, East Pit, and BN Pit). Although other opencast pits are dormant at this time, these are continuously assessed in terms of their economic value. The current resources of the Mine are approximately 97.17 million tonnes with a reserve of about 26.18 million tonnes.

Beeshoek can be broadly categorised as follows:

- Northern mining area (North Mine): This area comprises active as well as historical mining areas. A number of small quarries and mine residue dumps of various categories are located within this area. North Mine also includes the existing Iron Ore Beneficiation Plant, Tailings Storage Facility/ slimes dam (TSF), as well as the North Opencast Pits;
- Main Offices, village (since demolished) and recreational area; and
- Southern mining area (South Mine): This area comprises large opencast pits and associated Waste Rock Dumps (WRDs). The Village Pit and associated WRD are the main activities in this area. This area also includes a crushing and screening area as pre-preparation of the Run of Mine (ROM) iron ore before being routed by overland conveyor to the Iron Ore Beneficiation Plant located at North Mine.

Table 3: Details of Applicant

Applicant	Beeshoek Iron Ore Mine
Postal Address	Private Bag X3002 Postmasburg 8420
Technical Manager (SHERQ)	Ms. Dorianne Odendaal Tel: +27 (0) 53 311 6666 E-mail: dorianne.odendaal@assmang.co.za
Environmental Superintendent	Mr. Msimelelo Silomntu Tel: +27 (0) 53 311 6666 Cell: +27 (0) 63 520 9191 E-mail: msimelelo.silomntu@assmang.co.za
Senior General Manager	Ms. Maryke Burger Telephone No: +27 (0) 53 311 6666 Email: Maryke.Burger@assmang.co.za
Mining Rights Holder	Assmang (Pty) Ltd Private Bag X3002 Northlands 2116 South Africa Contact: Andre Joubert Telephone: +27 (0) 11 770 6800 Facsimile: +27 (0) 11 268 6440 Email: andre.joubert@arm.co.za
Surface Rights Holder	Assmang Limited Private Bag X3002 Northlands 2116 South Africa
Mining Right Ref. No.	(NC) 223MRC

1.b.iv Environmental Authorisations

In terms of the Minerals Act, 1991, an Old Order Mining Right was obtained for all mining activities on Portions 0 (RE) and Portion 1 of the farm Beesthoek and Portion 4 of the farm Olynfontein under reference number NC 5/2/2/150, dated 1 December 1993.

Because of increased production, the applicant applied for an addendum for the “Mid-South” Section on the Farm Olynfontein, which was approved by the Department of Mineral Resources (DMR; now the Department of Mineral Resources and Energy (DMRE)) on 7 November 1997, with reference number NC 6/2/2/15. Beeshoek South (South Mine), a southern extension of the Beeshoek Mine, was commissioned during 1999 on the farms Beesthoek and Olynfontein. This mining right made provision for six opencast pits at estimated iron ore reserves of 160 million tonnes for export. The mining method currently entails an opencast mining operation, which consists of five (5) active opencast pits (Village Pit, HF Pit, BF Pit, East Pit, and BN Pit). The current resources of the mine are 98 million tonnes with a reserve of 46 million tonnes.

A revision to the Environmental Management Plan (EMP) was submitted to the DMRE in August 2004. The purpose of the EMP Update was:

- To enhance the format and content of the EMP in order to be better aligned to the current standard of EMPs;
- To reflect the latest environmental related monitoring and work conducted by the Mine;
- To provide better focus on closure of the Mine. This specifically addresses the rehabilitation of opencast pits and mine residue dumps; and
- To outline the process to be followed to contribute to the maintenance of quality of life during the post-closure period.

The key infrastructure associated with the 2004 EMP Update were:

- Six million tonnes per year opencast mining activity, producing iron ore for the local and export markets;
- A number of opencast pits located within distinct northern and southern mining areas (North and South Mines);
    - The northern mining area comprised primarily the historical mining activity, with, at that time, the new BN Opencast Pit; and
    - The southern mining area included the new and larger opencast pits and the dominant mining was conducted within this area.

The Old Order Mining Right was converted to a New Order Mining Right on 16 March 2012 (Ref: NC30/5/1/3/2/1/223EM) and an EMP Alignment Report, 2009 was approved by the DMRE on 7 June 2010. The EMP Alignment Report made provision for the current Village Pit Mining Operation and the demolition of the Beeshoek Village.

Subsequent to the EMP Alignment Report, various individual Environmental Authorisations were undertaken:

2010 EMP, for the R385 Regional Road Deviation (approved 3 May 2011). The Road Deviation was required as part of the Village Pit. The road realignment (associated with the proposed mine expansion) also required that:

- Inhabitants of Beeshoek Mine Village be moved to Postmasburg;
- Several Assmang power lines not exceeding a capacity of 22 kilovolts be relocated, one of which was located along the existing R385 Road;
- The relocation of the telephone lines along the R385 Road, which impacted on the sociable weaver nesting site on a telephone pole, take place (these have been safely relocated);
- Telephone lines and optic fiber lines will have to be relocated;
- The mine offices be moved to North Mine; and
- A communication tower alongside the current road in Beeshoek be relocated.

2013 Basic Assessment Application (approved 14 March 2014): This application was for the expansion of the BF WRD (now the Village WRD).

2014 Basic Assessment Application (approved 19 June 2015): The project entailed the development of a 35m wide and 1.45km long haul road from the Beeshoek Village Pit to the ROM Stockpile. The haul road also formed part of the associated infrastructure for the Village WRD and was depicted on plans submitted with the 2013 Basic Assessment Application.

2015 Basic Assessment Application (approved 10 March 2017): The project entails the construction of the Storm Water Dam North, which has been finalised with the Storm Water Dam North now operational.

In summary of the above, the Mine is currently operational with all required environmental authorisations in terms of the following in place:

- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) [also the original approval in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989) (ECA)];
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA);
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA); and
- National Water Act, 1998 (Act No. 36 of 1998) (NWA).
    - The aforementioned Act makes provision for a Water Use Licence (WUL), which was obtained during 21 August 2018 and amended on 19 November 2019 to correct certain administrative errors.

Copies of the Environmental Authorisations are available from the Mine.

Table 4: List of Environmental Authorisations

#	Legislation	Licence	Reference	Date
1	Minerals Act, 1991	EMPr Addendum, for the “Mid-South” Section	NC 6/2/2/15	7 November 1997
2	Environmental Conservation Act, 1989	Section 20 Permit for Domestic Landfill Site	12/9/11	30 October 2008
3	Minerals and Petroleum Resources Development Act, 2002	EIA and EMPr Alignment Report	IVU.07.160	July 2009, Approved 7 July 2010
4	Minerals and Petroleum Resources Development Act, 2002	Old Order Mining Right was converted to a New Order Mining Right	NC30/5/1/2/3/2/1/223EM	16 March 2012
5	National Environmental Management Act, 1998	EMPr for the R385 Regional Road Deviation	17/2011	3 May 2011
6	National Environmental Management Act, 1998	BF WRD (now the Village WRD) EMPr	12/2014	14 March 2014
7	National Water Act, 1998	Water Use Licence	10/D73A/ABGJ/2592	1 December 2014
8	National Environmental Management Act, 1998	BF WRD (now the Village WRD) Haul Road EMPr	20/2015	19 June 2015
9	National Environmental Management Act, 1998	Storm Water Dam North	NC30/5/1/2/3/2/1/223EM	10 March 2017
10	National Water Act, 1998	Water Use Licence	10/D73A/ABGJ/2592	21 August 2018; amendment 19 November 2019

1.c Description of the Property

1.c.i Location of the Mine and Land Ownership

Beeshoek is located in the Northern Cape Province, approximately 7km west of the town of Postmasburg. The Mine is situated under the jurisdiction of the Tsantsabane Local Municipality, which is an administrative area in the ZF Mgcawu District Municipality. The mining area is situated on the farms Beesthoek and Olynfontein in the Hay Registration Division (RD). Please refer to Figure 1 and Figure 2 presenting the local and cadastral setting of the Mine, respectively.

The R385 roadway, as well as the Ore Export (OREX) Railway Line traverse the site. The overall area is characterised by intensive mining development. Various servitudes traverse the site, which include roads, telephone lines, and electricity lines.

Beeshoek falls in Quaternary Catchment D73A in the Lower Vaal Water Management Area (WMA) which has a catchment area size of 51 543km^2. The nearest watercourse to the Beeshoek mining area is the Groenwater Spruit, located approximately 5km to the southwest of the mining operations.

Please refer to the following table for the registered name, administrative jurisdiction and summary of location of the land.

Table 5: Property Information

<table>
<tr><td>Farm Name:</td><td>Beeshoek Mine Mining Rights area is located on:
- Beesthoek 448, Portion 0 (RE),
- Beesthoek 448, Portion 1 and
- Olynfontein 475, Portions 2, 3, 4 and 6

The surface rights and also the areas on which the proposed projects are located include:
- Beesthoek 448, Portion 0 (RE),
- Beesthoek 448, Portion 1 and
- Olynfontein 475, Portion 4.</td></tr>
<tr><td>Magisterial district:</td><td>Hay Registration Division (RD)</td></tr>
<tr><td>Distance and direction from nearest town.</td><td>Beeshoek is located in the Northern Cape Province, approximately 7km west of the town of Postmasburg. The mine traversed by the regional road R385, as well as the OREX Railway Line.</td></tr>
<tr><td>21-digit Surveyor General Code for each farm portion applicable to this application.</td><td><table>
<tr><th>Farm Name</th><th>Registration Division</th><th>Portion</th><th>Ownership</th><th>Title Deed</th><th>SG Code</th></tr>
<tr><td>Beesthoek 448</td><td>Hay RD</td><td>0 (RE)</td><td>Assmang Ltd</td><td>T659/1965</td><td>C03100000000044800000</td></tr>
<tr><td>Beesthoek 448</td><td>Hay RD</td><td>1</td><td>Assmang Ltd</td><td>T245/1954</td><td>C03100000000044800001</td></tr>
<tr><td>Olynfontein 475</td><td>Hay RD</td><td>4</td><td>Assmang Ltd</td><td>T4859/1998</td><td>C03100000000047500004</td></tr>
</table></td></tr>
</table>

The following table presents the details of the surrounding farm portions.

Table 6: Adjacent Land Ownership

Farm Name	Portion	Ownership
Doornfontein 446	1	Sishen Iron Ore Co Pty Ltd
Doornfontein 446	2	Adam Johannes Wahl
Doornfontein 446	RE	Assmang Ltd (Project Applicant)
Pensfontein 449	RE	Rahida Inv Pty Ltd
Postmasburg Erven	RE/1	Tsantsabane Municipality
Kalkfontein 475	RE	Charl Francois Viljoen
Olynfontein 475	2	Charl Francois Viljoen (mine Mining Rights Area)
Olynfontein 475	6	Tsantsabane Municipality (mine Mining Rights Area)
Ploegfontein 487	-	Sishen Iron Ore Co Pty Ltd
Soetfontein 606	-	Viljoen Familie Trust
476	-	Sishen Iron Ore Co Pty Ltd
447	-	Sishen Iron Ore Co Pty Ltd

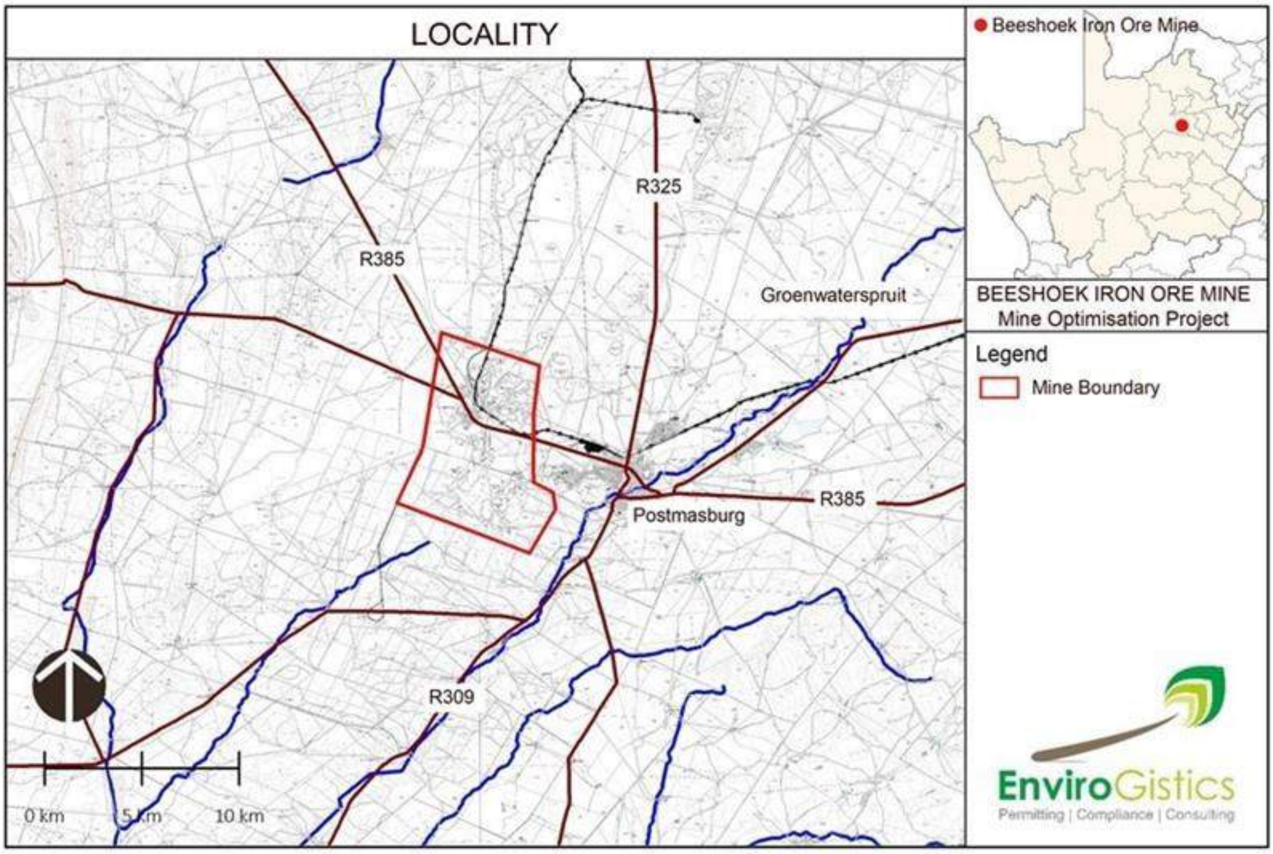

Figure 1: Local and Regional Setting of the surface operations

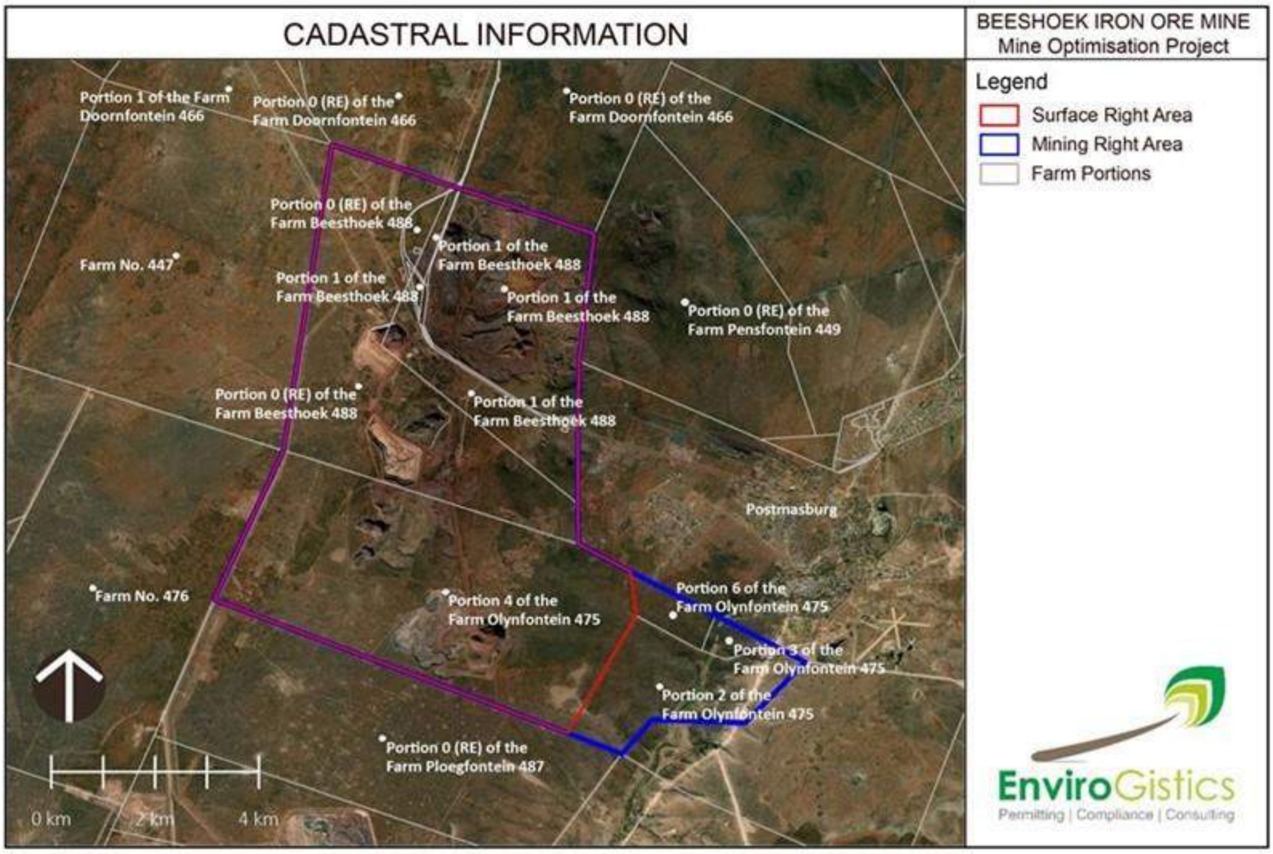

Figure 2: Cadastral Information

1.d Locality Map

Beeshoek Mine has actively investigating opportunities for the continued and sustainable mining of iron ore reserves within the approved Mining Rights Area. This application for Environmental Authorisation specifically gives effect to that and includes the following projects:

1. Specific Demarcation of Run of Mine (ROM) Stockpiles on South Mine;
2. Amendments to the design of existing WRDs in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints;
3. Increase of Opencast Pit footprint areas, as well as the undertaking of detrital mining;
4. Beneficiation Optimisation Project:
    - Development of a Jig Plant (this area will be located in the vicinity of the current plant) for the beneficiation of discard and low-grade Iron Ore;
    - Development of a Wet High Intensity Magnetic Separation (WHIMS) Plant for the beneficiation of slimes;
    - Development of a new surface water dam for the purposes of the Beneficiation Optimisation Projects (Jig and WHIMS Plants);
5. Development of supporting infrastructure such as power lines, roads, pipelines and improvements to storm water management systems where applicable;
6. Development of a 2.8km railway line link between the existing Beeshoek Siding and the Transnet Freight Rail (TFR) siding.
    - It is important to note that various discussions are being undertaken between Transnet and the Applicant. These discussions would define the direction the project moves in, i.e. immediate commissioning upon authorisation, potential delay in commissioning, or not commissioning the project. However, for the purposes of this EIA report, the assumption is made that this project will proceed, and for this reason should the project proceed the following is considered:
        - Construction of a rail way link line to connect the Kolomela direct link line (connecting to the Orex Line) and the Sishen/Postmasburg rail way line at Beeshoek Iron Ore Mine – Beeshoek Siding.
        - Construction of the northern link to allow train movement from the Sishen/Postmasburg rail way line directly onto the abovementioned link line.
        - The project will further include a new access road to the Tommy's Field Airport. This access road to Tommy's Field airport will either be through level crossings over the rail line or a bridge through the formation beneath the rail line.
        - Borrow pits and laydown areas will be established temporarily for the purposes of the construction phase.

The following figure provides the location of the activities in question.

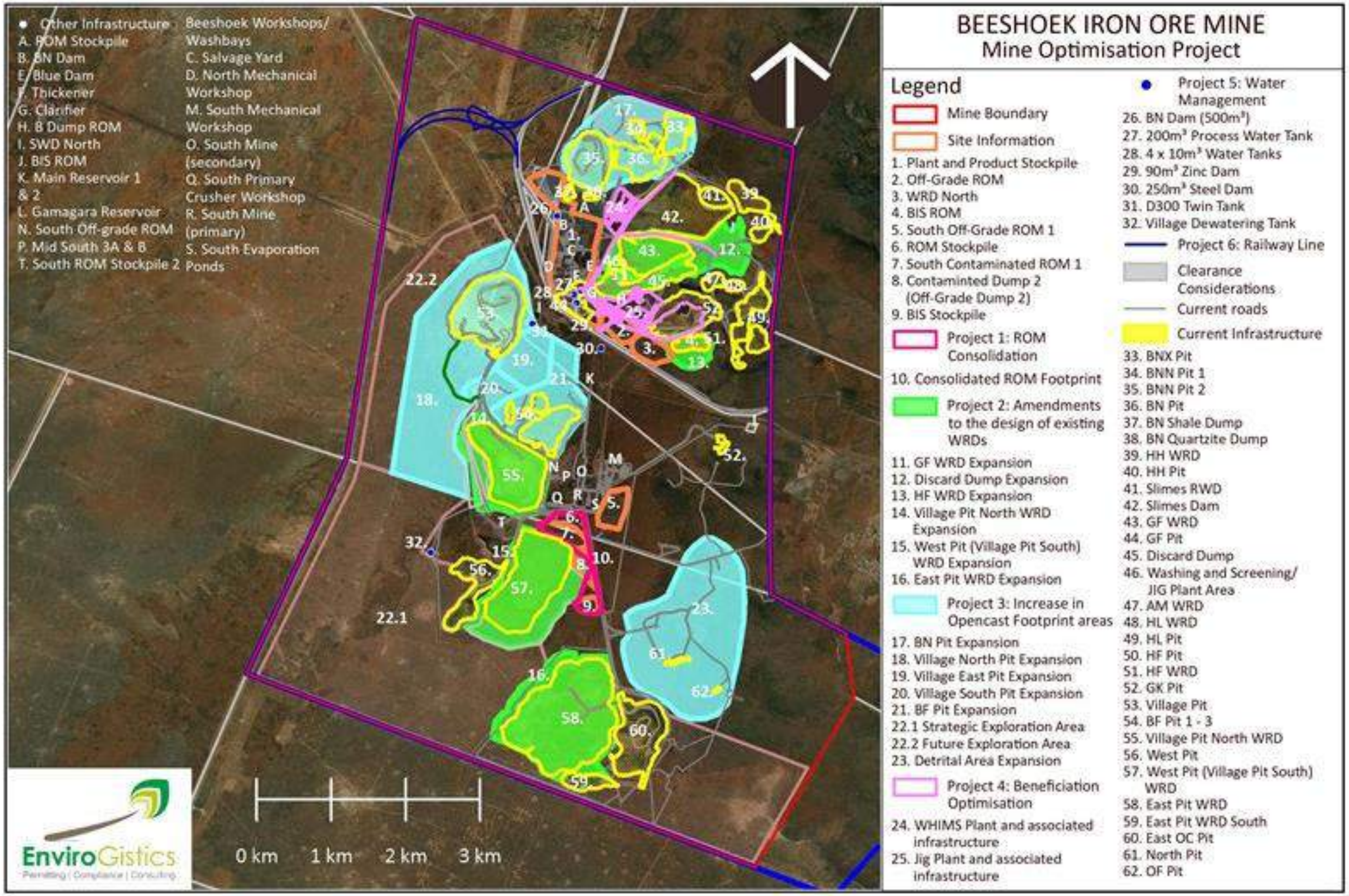

Figure 3: Overall Project Layout

2 DESCRIPTION OF THE SCOPE OF THE PROPOSED ACTIVITY

Section 23(1)(a) of the MPRDA states in Section 1(a), that subject to subsection 4, the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. The Mine has been awarded a Mining Right by the Department of Mineral Resources (DMR; now DMRE) and therefore has an obligation to give effect to the following:

- The ongoing development and improvement of the Mining Work Programme which details the planned mining activities to be followed in order to mine the mineral resource optimally; and
- Optimal mining of minerals must be undertaken, as the Minerals and Petroleum Board may recommend to the Minister to direct the holder of a mining right to take corrective measures if the Board establishes that the minerals are not being mined optimally in accordance with the Mining Work Programme. The Minister may, on the recommendation of the Board, suspend or cancel a mining right if the Minister is convinced that any act or omission by the holder justifies the suspension or cancellation of the right.

Beeshoek Mine has actively investigating opportunities for the continued and sustainable mining of iron ore reserves within the approved Mining Rights Area. This application for Environmental Authorisation specifically gives effect to that and includes the following projects:

1. Specific Demarcation of ROM Stockpiles on South Mine;
2. Amendments to the design of existing WRDs in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints;
3. Increase of Opencast Pit footprint areas, as well as the undertaking of detrital mining;
4. Beneficiation Optimisation Project:
    - Development of a Jig Plant (this area will be located in the vicinity of the current plant) for the beneficiation of discard and low-grade Iron Ore;
    - Development of a WHIMS Plant for the beneficiation of slimes;
    - Development of a new surface water dam for the purposes of the Beneficiation Optimisation Projects (Jig and WHIMS Plants);
5. Development of supporting infrastructure such as power lines, roads, pipelines and improvements to storm water management systems where applicable;
6. Development of a 2.8km railway line link between the existing Beeshoek Siding and the TFR siding.
    - It is important to note that various discussions are being undertaken between Transnet and the Applicant. These discussions would define the direction the project moves in, i.e. immediate commissioning upon authorisation, potential delay in commissioning, or not commissioning the project. However, for the purposes of this EIA report, the assumption is made that this project will proceed, and for this reason should the project proceed the following is considered:
        - Construction of a 1.3km northern link line to tie the Beeshoek line with the Orex line from the north (from Khumani Iron Ore Mine).
        - The initial plan to cross under the current R385 has been revisited by the engineering team. The crossing of the R385 will be a design of a road bridge over the proposed railway link line.
        - The project will further include a new access road to the Tommy's Field Airport. This access road to Tommy's Field airport will either be through level crossings over the rail line or a bridge through a culvert beneath the rail line.
        - Borrow pits and laydown areas will be established temporarily for the purposes of the construction phase.

2.a Policy and Legislative Context

South Africa has a comprehensive environmental governance framework underpinned by an extensive array of environmental laws. The past years have evidenced the wholesale reform of South Africa's environmental legal framework under the guidance of the Constitution.

Historically, the mining industry in South Africa has not been subjected to comprehensive environmental regulation. However, in recent years, this has changed significantly and the industry is now required to comply with a multifaceted network of mining and environmental legislation. There are no shortages of policy and legal frameworks to ensure “responsible” mining in South Africa. The Minerals and Mining Policy for South Africa, 1998 affirmed that the State, as custodian of the nation’s natural resources, will support mining development while maintaining and enhancing environmental awareness of the mining industry in accordance with national environmental policy, norms and standards.

The following table presents the key policy and legislative considerations as part of this application.

Table 7: Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT
1. <u>Constitution of the Republic of South Africa (Act No. 108 of 1996)</u> Environmental legislation is shaped by the Bill of Rights of the Constitution of the Republic of South Africa ("**Constitution**"). Section 24 of the Constitution, known as the '**Environmental Right**', guarantees every person the right to an environment that is not harmful to their health or well-being; provides for the protection of the environment against pollution; and degradation and centres sustainable development as the cornerstone of South Africa's environmental law regime. This right is binding on the State and people, both natural and juristic. In fulfilment of its constitutional mandate to take reasonable legislative measures that gives effect to Section 24 of the Constitution, the government has promulgated several environmental laws. These laws provide a legal framework that embodies internationally recognised legal principles. The principal act governing activities that affect the environment is NEMA. ***Applicability to the EIA Process*** The proposed project will allow for the optimisation of the mining activities and associated provision of economic injections into the local economic in terms of the multiplier effect, and job creation. However, with the optimisation of mining activities comes the obligation by the Licence Holder to ensure that it will not result in pollution and/or ecological degradation, and the activity is ecologically sustainable while promoting justifiable economic and social development. In this regard the optimal use of mineral resources, reworking of mine residue deposits and the improvement of water conservation and demand management within the mining plan is of key importance. The benefit specifically to the Local Municipality and community in terms of this project, is the fact that Beeshoek Mine's Life of Mine will increase from the current disclosed 5 years to a possibility of 15-20 years. This will ensure the continuation of the existing commitments made in the Social and Labour Plan (SLP). Should this project be successful it will further continue in the revision of the SLP once the current 5 year period has passed, allowing for a continuation of Beeshoek's involvement in the Socio-Economic Development of the Tsantsabane Local Municipality.
2. <u>National Environmental Management Act (Act No. 107 of 1998) (NEMA)</u> In terms of sections 24(2) and 24D of NEMA the Minister of Environmental Affairs (now the Department of Forestry, Fisheries and Environment (DFFE)) promulgated certain activities that may not commence without an Environmental Authorisation. Activities promulgated in terms of GN 983 and GN 985 require a Basic Assessment process, while activities promulgated in terms of GN 984 require that a full Scoping and EIA process be conducted [GN 983, 984 and 985 promulgated under NEMA in Government Gazette (GG) 38282 of 4 December 2014 (as amended in 2017 and 2021). The requirements for an EIA and EMPr are specified in Appendix 3 and Appendix 4 of GN 982 promulgated under NEMA in GG 38282 of 4 December 2014 (as amended in 2017 and 2021) ("**2014 EIA Regulations**")]. Section 24C(2A) of NEMA indicates that where listed activities are directly related to the extraction and primary processing of a mineral or petroleum resource the Minister of Mineral Resources (now DMRE) is the Competent Authority or officials at the DMRE to whom he has delegated his authority, being the Regional Managers. ***Applicability to the EIA Process*** Various listed activities are triggered by the optimisation of the mining infrastructure and mining process planned as part of this project. For this reason, an Environmental Authorisation in terms of the NEMA is required. A financial provision plan is also developed as part of this EIA process and included with the EIA report and EMPr. Section 28 of the NEMA places a duty of care on all persons to prevent, limit or remediate any pollution or degradation of the environment. This duty of care should be adhered to at all times during construction, operation and decommissioning of a project. Section 28 applies to all activities taking place, and is not solely focused on the listed activities being applied for.
3. <u>EIA Regulations (2014 EIA Regulations)</u> Chapter 6 of the 2014 EIA Regulations provides for the requirements for Public Participation Processes (PPP), which must be carried out as part of the DMRE Environmental Authorisation application process. In terms of Regulations 21 and 23, the outcome of the PPP must be reported in this report submitted to the Competent Authorities. The PPP "*must give all potential or registered interested and affected parties, including the competent*

authority a period of at least 30 days to submit comments on each of the EMPr, scoping report and environmental impact assessment report, and where applicable the closure plan, as well as the report contemplated in regulation 32, if such reports or plans are submitted at different times" (Regulation 40 (1)).

The PPP must also:

- provide access to all information that reasonably has or may have the potential to influence any decision regarding an application;
- involve consultation with the Competent Authorities, every state department that administers a law relating to the environment relevant to the application, all relevant organs of state and all potential, or where relevant, and registered Interested & Affected Parties (I&APs); and
- provide opportunity for I&APs to comment on reports and plans prior to submission of an application but must be provided with an opportunity to comment on such reports once an application has been submitted to the Competent Authorities.

The process must include the following:

"*(1) If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.*

(2) Sub regulation (1) does not apply in respect of—

(a) linear activities;

(b) activities constituting, or activities directly related to prospecting or exploration of a mineral and petroleum resource or extraction and primary processing of a mineral or petroleum resource; and

(c) strategic integrated projects as contemplated in the Infrastructure Development Act, 2014.”

Applicability to the EIA Process

An integrated PPP has been undertaken for this process and will continue throughout the EIA and EMPr review process.

4. NEMA Listed Activities (GN 983 and GN 984) 2014 as amended 2017 (note GN985 is not applicable to the environmental setting in which the mine is located)

Regulation 54 (2) of the NEMA provides that “An application submitted after the commencement of these Regulations for an amendment of an Environmental Management Programme, issued in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), must be dealt with in terms of Part 1 or Part 2 of Chapter 5 of these Regulations”.

Applicability to the EIA Process

Various listed activities are triggered by the optimisation of activities planned as part of this project. For this reason, an Environmental Authorisation in terms of the NEMA is required.

A financial provision plan has been developed as part of the EIA process and submitted with this EIA Report and EMPr.

Section 28 of the NEMA places a duty of care on all persons to prevent, limit or remediate any pollution or degradation of the environment. This duty of care should be adhered to at all times during construction, operation and decommissioning of a project. Section 28 applies to all activities taking place.

5. National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEMAQA)

The National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEMAQA) was promulgated to ensure the protection and regulation of air quality and provide measures that will prevent pollution and sustainability. Under NEMAQA, the Minister of Environmental Affairs (now DFFE) must identify substances in ambient air which present a threat to health, well-being or the environment and establish national standards for ambient air quality, including the permissible quantity or concentration of each substance in ambient air.

The following regulations promulgated under NEMAQA were considered for the project:

- Listed Activities and Associated Minimum Emission Standards, published under GN 893 in GG 37054 of 22 November 2013, which lists activities that could result in atmospheric emissions requiring an Atmospheric Emissions Licence (AEL) before being undertaken. Examples of such activities include:
    - the use of combustion installations;
    - storage of petroleum products;
    - slag processes;
    - carbonisation and coal gasification;
    - mineral processing; and
    - disposal of hazardous and general waste by way of incineration.
- National Dust Control Regulations published under GN827 in GG 36974 of 1 November 2013, which provide that an acceptable dust fallout rate for a non-residential area is considered more than 600mg/m^2/day but less than 1,200mg/m^2/day (30-day average), with maximum allowable two exceedances per year, provided these exceedances do not take place in consecutive months. Where the dust fallout rate is exceeded, a dust fall monitoring programme, as prescribed in terms of the Regulations, must include:
    - the establishment of a network of dust monitoring points using method ASTM D1739:1970 (or an equivalent standard), sufficient in number to establish the contribution to dust fallout in residential and non-residential areas near the premises, monitor identified or likely sensitive receptor locations, and establish the baseline dust fall for the district; and
    - a schedule for submitting to the air quality officer dust fallout monitoring reports annually or at more frequent intervals if so, requested by the Air Quality Officer (AQO).

The priority pollutants, as defined by the NEMAQA, are Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), PM10 and PM2.5, Carbon Monoxide (CO), Benzene (C_6H_6), Lead (Pb) and Ozone (O_3). The NEMAQA National Dust Control Regulations are based on the SANS guidelines and present acceptable/allowable dust fallout rates for both residential and non-residential areas. Within the National Dust Control Regulations, conditions are provided for Dust Management Plans as follows:

- Any person who has exceeded the standards must, within 3 months after submission of the monitoring report, develop and submit a Dust Management Plan, as contemplated in the National Dust Control regulations, to the AQO for approval;
- The Dust Management Plan must be implemented within a month of the date of approval; and
- An implementation progress report must be submitted to the AQO at agreed time intervals.

The National Dust Control Regulations further stipulate that the latest ASTM method (2010) must be applied to dust fallout monitoring in South Africa. This requirement has a number of implications, with key items including:

- Permission to exclude exceedances caused by non-anthropogenic sources;
- The latest ASTM requires samplers be installed with a wind shield, which has been proven to increase the accuracy of capturing dust fallout;
- <u>All mining operations must implement a Dust Fallout (DFO) programme</u>;
- Sample analysis must now also include soluble content of samples, no longer only limited to the insoluble content of samples, as is the case with the current regulations;
- Submission of dust fallout monitoring reports on a monthly basis to the relevant AQO;
- Current fallout levels compared to historic results for at least the previous four years (where available);
- All mining operations must implement a dust management plan; and
- Provide proof of the implementation of the dust management plan in the monthly monitoring reports.

Applicability to the EIA Process

Beeshoek Mine has a Dust Fallout Monitoring Programme in place measuring dust fall out, PM10 and PM2.5. According to the current Air Quality Study, no elevations of dust fall out, PM10 or PM2.5 is expected beyond the mining boundary. These values are all within the National Ambient Air Quality Standards (NAAQS), with dust fall out within the standards for residential areas (below 600mg/m^2/day), and PM10 and PM2.5 (the general health triggers) also well within the boundaries of the NAAQS limits. Within the mining boundary, especially at the Opencast Pit footprints there will be elevated dust, PM10 and PM2.5 fall out, this is however expected and managed through the strick wearing of the necessary Personal Protective Equipment (PPE), such as dust masks, in these areas.

- **<u>National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA) and related Legislation</u>**

In line with the Convention on Biological Diversity, the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA) aims to legally provide for biodiversity conservation, sustainable use and equitable access and benefit sharing. NEMBA creates a basic legal framework for the formation of a national biodiversity strategy and action plan and identification of biodiversity hotspots and bioregions, which may then be given legal recognition. It imposes obligations on landowners (state or private) regarding alien invasive species. It requires that provision is made by a site developer to remove any aliens which have been introduced to the site or are present on the site.

The NEMBA also provides for listing of threatened or protected ecosystems, in one of four categories: 'Critically Endangered (CR)', 'Endangered (EN)', 'Vulnerable (VU)' and 'Protected'. Threatened ecosystems are listed to reduce the rate of ecosystem and species extinction, by preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value.

<u>National List of Ecosystems that are Threatened and in need of Protection (2011)</u>

The NEMBA provides for the listing of threatened or protected ecosystems in one of four categories: 'Critically Endangered (CR)', 'Endangered (EN)', 'Vulnerable (VU)' and 'Protected'. Threatened ecosystems are listed in order to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems.

According to the National List of Threatened Terrestrial Ecosystems database (2011), the project area is <u>not</u> situated within any listed Threatened Ecosystems.

<u>Threatened or Protected Species Regulations (2007)</u>

The NEMBA provides for listing of Threatened or Protected Species (ToPS). If a species is listed as threatened, it must be further classified as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). In addition to these categories, protected species are defined as "any species which is of such high conservation value or national importance that it requires national protection". Species listed in this category may include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). It should be noted that currently the 2007 Regulations are still in effect. The 2016 Regulations (notice 255 of 2015) have to date not been promulgated. As such, TOPS from both the 2007 (promulgated) and the 2015 (still draft) regulations are listed below.

Applicability to the EIA Process

From a floral perspective there are some species that were either recorded within the Mine boundary or have the potential to occur within the Mine.

From the 2007 ToPS List:

- *Harpagophytum procumbens* – recorded within the Mine boundary
- *Hoodia gordonii* (unlikely but added as a precautionary measure)

Additional species from the 2015 ToPS List:

- *Drimia sanguinea*

From a faunal perspective:

From the 2007 ToPS List:

- *Opistophthalmus* sp. *(*Burrowing Scorpion)
- *Ardeotis kori (*Kori Bustard) (confirmed)
- *Neotis ludwigii* (Ludwig's Bustard)
- *Harpactira* sp. (Common Baboon Spiders)
- *Felis nigripes (*Black-footed Cat),
- *Vulpus chama* (Cape Fox)

Additional species from the 2015 ToPS List:

- *Orycteropus afer* (Aardvark)

- *Otocyon megalotis* (Bat-eared Fox)

The following threatened species, listed by the International Union for the Conservation of Nature (IUCN) as being of conservation concern, also has a high probability of occurrence at Beeshoek Mine:

- *Sagittarius serpentarius* (Secretarybird)
- *Ardeotis kori (*Kori Bustard) (confirmed

Should any TOPS-listed, or floral or faunal threatened species occur within the project areas, the necessary permits will have to be obtained to destroy or relocate these species.

National Forests Act (Act No. 84 of 1998)

An updated list of protected tree species was published under section 12(1) (d) of the National Forests Act (Act No. 84 of 1998) on 1 March 2021. In terms of section 15(1) of this Act, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. No indigenous forests occur within the Mine boundary.

Applicability to the EIA Process

Protected tree species recorded on site are:

- *Boscia albitrunca*
- *Vachellia erioloba*

Should any protected tree species fall within the project development footprint areas, the necessary permits must be obtained from DFFE for the destruction, removal or relocation of such species.

Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA)

This Act provides a list of Specially Protected Species (Schedule 1) (Section 49[1] of the NCNCA) and Protected Species (Schedule 2) (Section 50[1] of the NCNCA) for the Northern Cape Province. Provincially protected species. Numerous provincially protected species, i.e., those listed in Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA), were recorded in the Calcrete Shrubland, with several additional species likely occurring within this habitat unit. Schedule 2 Protected Plants recorded in this habitat unit included the below:

Optimisation Project:

- Species from the *Aizoaceae* family, *Mestoklema tuberosum, Ruschia cf. griquensis* and *Ruschia calcarea*.;
- Species from the protected *Iridaceae* family, namely *Babiana cf. bainesii*;
- Numerous individuals from the protected genus *Boscia*, i.e., *Boscia albitrunca*;
- Species of the protected family *Oleaceae*, namely *Olea europaea subsp. africana*; and
- Species of *Oxalis cf. lawsonii*.

Railway Line:

- Species from the *Aizoaceae family, Mestoklema tuberosum, Ruschia calcarea* and *Ruschia cf. griquensis*;
- Species from the protected *Iridaceae* family, namely *Babiana cf. bainesii* were not present, but are highly likely to be found in the footprint areas;
- Numerous individuals from the protected genus *Boscia*, i.e., *Boscia albitrunca*;
- Species from the protected genus *Euphorbia*, namely *Euphorbia cf. duseimata*;
- Species from the protected family *Amaryllidacae*, namely *Boophone disticha*;
- Species from the protected family *Asphodelaceae*, namely *Aloe claviflora*; and
- Species of the protected family *Apocynaceae*, namely *Orbea* species.

Permits from Northern Cape Department of Environment and Nature Conservation (DENC) should be obtained to remove, cut or destroy the above-mentioned protected species before any vegetation clearing may take place.

The Mine is located within the Griqualand West Centre (GWC) of plant endemism and has high potential to harbour endemic flora.

National Environmental Management: Protected Areas Act (NEMPAA; Act No. 57 of 2003)

The NEMPAA was promulgated in order to provide for (among other things) the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national Register of Protected Areas, and for the management of those areas in accordance with national norms and standards.

South African Protected Areas Database (SAPAD, 2020) and South African Conservation Areas Database (SACAD, 2020)

The primary function of protected areas is to ensure the conservation of habitats, environmental processes and species occurring within these ecosystems. The SAPAD and SACAD are Geographic Information System (GIS) inventories of all Protected and Conservation areas in South Africa. The Protected and Conservation Areas (PACA) database also includes data on privately owned protected areas. This Register comprises of all data required for the Register of Protected Areas (legally declared) as well as data on Conservation Areas (areas responsibly managed for biodiversity conservation but not legally declared as Protected Areas). None of these areas have been identified.

The National Protected Areas Expansion Strategy (NPAES; 2010)

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large, protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy (NPAES, 2008). None of these areas have been identified.

Important Bird and Biodiversity Areas (IBA; 2015)

Various sites within the country have been identified as important for maintaining viable populations of endemic, range restricted and threatened bird species. The primary aim of the IBA programme is to ensure the long-term conservation of important avifaunal habitats. They also provide essential benefits to people, such as food, materials, water, climate regulation and flood attenuation, as well as opportunities for recreation and spiritual fulfilment. According to BirdLife South Africa, one-third of the 112 IBAs located within South Africa are under threat by invasive alien vegetation, habitat modification/ degradation and agricultural expansion (Marnewick et al., 2015). Further to this, 52% of IBAs fall outside formally Protected Areas, further complicating avian habitat conservation.

None of these areas have been identified.

Alien and Invasive Species Regulations (2020)

These regulations only come into force on 1 March 2021 (see GN 1100: National Environmental Management: Biodiversity Act (10/2004): Extension of commencement date of the Alien and Invasive Species Lists, 2020 and the Alien and Invasive Species Regulations, 2020)

The NEMBA Alien and Invasive Species Regulations (2020) aim to:

- Prevent the unauthorised introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur;
- Manage and control alien and invasive species, to prevent or minimise harm to the environment and biodiversity; and
- Eradicate alien and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Alien and invasive species categories according to the Alien and Invasive Species Regulations (2020) are as follows:

- Category 1a: Invasive species requiring compulsory control. Plants are to be removed and destroyed. Any Category 1a listed plants must be combatted or eradicated.
- Category 1b: Invasive species that require control by means of an invasive species management programme.
- Category 2: Invasive species that require a permit to carry out a restricted activity within an area, as specified in the permit. If an invasive species management programme has been developed, a person must control the listed invasive species in accordance with such a programme.
- Category 3: Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purpose of the regulation be considered to be a Category 1b Listed Invasive Species. If an invasive species management programme has been developed, a person must control the listed invasive species in accordance with such a programme.

The NEMBA Alien and Invasive Species Lists (2020) include national lists of invasive species to be read together with the Alien and Invasive Species Regulations (2020)

Applicability to the EIA Process

Several listed and non-listed alien species occur on site. Some noteworthy (Category 1b) aliens include:

- *Pennisetum setaceum*
- *Opuntia ficus-indica*
- *Opuntia imbricata*
- *Argemone ochroleuca* subsp. *ochroleuca*

National Biodiversity Assessment (NBA; 2018)

The most recent National Biodiversity Assessment (NBA), dated 2018, is a collaborative effort to synthesise the best available science on South Africa's biodiversity. The NBA is used to inform policy in the biodiversity sector and other sectors that rely on or impact on natural resources, such as water, agriculture, mining and human settlements. The NBA provides information to help prioritise resources for managing and conserving biodiversity and provides context and information that underpins biodiversity inputs to land use planning processes (Skowno et al., 2019).

The three vegetation types associated with the Beeshoek Mine all have a Least Concern conservation status and are currently Not Protected; however, all three are endemic vegetation types.

- Postmasburg Thornveld
- Kuruman Thornveld
- Kuruman Mountain Bushveld

Mining and Biodiversity Guidelines (2012)

The Mining and Biodiversity Guidelines (2012) enables regulators, industry and practitioners to minimise the impact of mining on biodiversity and ecosystem services by promoting the sustainable development of mineral resources. Biodiversity priority areas (as per the guidelines), are likely to be sensitive to the impacts of mining and as such, should inform and influence spatial land use policies and plans for mining activities (DEA et al., 2013).

No areas of increased biodiversity in term of the Mining Band Biodiversity Guidelines (2012) have been identified within the surface rights area.

Northern Cape Critical Biodiversity Areas (NCDENC, 2016) dataset

The Northern Cape Critical Biodiversity Areas (CBAs) dataset (2016) identifies biodiversity priority areas, namely CBAs and Ecological Support Areas (ESAs), which, together with protected areas, that are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of a landscape as a whole.

CBAs are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan, while ESAs are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs and/or in delivering ecosystem services. The primary purpose of CBA and ESAs maps is to guide decision-making about where best to locate development and to encourage appropriate land uses that are compatible with the desired state of CBAs and ESAs. It should inform land-use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity. It is the biodiversity sector's input into multi-sectoral planning and decision-making processes.

- According to the Northern Cape CBA dataset, the Mine boundary is located within areas classified as ESAs and Other Natural Areas. No CBAs are associated with the Beeshoek Mine area.

6. National Environmental Management: Waste Act (Act No. 59 of 2008) (NEMWA)

The purpose of the NEMWA is to: assist in regulating waste management; ensure the protection of human health; and prevent pollution and environmental degradation through sound waste management principles and guidelines. It furthermore provides for:

- national norms and standards for regulating the management of waste by all spheres of government;
- licensing and control of waste management activities;
- remediation of contaminated land;

- a national waste information system; and
- provision for compliance and enforcement.

The NEMWA broadly defines waste as "*any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be reused, recycled or recovered.*" It also regulates processing of mining residue deposits or stockpiles.

The NEMWA imposes a general duty upon waste holders to take reasonable measures to avoid waste generation and, where this is impossible, to: minimise the toxicity and quantities of waste generated; reuse, reduce, recycle and recover waste; and ensure that it is treated and disposed of in an environmentally-sound way. Failure to do so is a criminal offence, with a maximum fine of R10 million or imprisonment of up to 10 years, or both.

It is necessary to hold a Waste Management Licence (WML) for defined waste management activities.

The Department of Environmental Affairs (DEA, now DFFE) promulgated the 2013 Waste Management Regulations, which provides that a WML is required for undertaking certain waste management activities ("**Waste Listed Activities**"). The Waste Listed Activities are separated into three categories, namely Category A, Category B and Category C. Category A and B Waste Listed Activities require a WML, for which either a Basic Assessment or an EIA process needs to be undertaken that complies with the 2014 EIA Regulations. The procedures for licensing Waste Listed Activities are stipulated in Chapter 5 of NEMWA and are not applicable to this project.

Classification of certain waste streams is required in terms of the Waste Classification and Management Regulations, published in GN 634 of GG 36784 on 23 August 2013, to ensure that the correct waste management standards and disposal methods are implemented.

The National Norms and Standards for the Assessment of Waste for Landfill Disposal and the National Norms and Standards for the Disposal of Waste to Landfill (published under GN 635 and GN 636, respectively in GG 36784 of 23 August 2013) provide the norms and standards for disposal of waste to landfill. This includes liner requirements and design specifications.

In 2014 the National Environmental Management: Waste Amendment Act (Act No 25 of 2014) was promulgated to include residue deposits and residue stockpiles from:

- Mineral excavation;
- Physical and chemical processing of metalliferous minerals;
- Physical and chemical processing of non-metalliferous minerals; and
- Drilling operations.

Residue deposits are defined in the MPRDA as "*any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right*". Residue stockpiles, in turn, are defined in the MPRDA as "*any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, beneficiation plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated for potential re-use, or which is disposed of, by the holder of a mining right, mining permit, production right or an old order right.*"

The Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits ("**Residue Regulations**"), published under GN 632 in GG 39020 of 24 July 2015, provide for the planning, management and reporting of residue stockpiles and residue deposits, which obligations include:

- The assessment of impacts and analyses of risks relating to the management of residue stockpiles;
- Residue deposits; characterisation of residue stockpiles and residue deposits;
- Classification of residue stockpiles and residue deposits;
- Investigation and the selection of site for residue stockpiling;
- Design of the residue stockpiles and residue deposits;
- Impact management;
- Duties of the holder of right or permit;
- Monitoring and reporting systems;
- Dust management and control; and
- Decommissioning, closure and post closure management requirements.

The Residue Regulations provide the tools for and correspond to the statutory provision relating to managing residue stockpiles and residue deposits in the manner prescribed in section 43A of the NEMWA.

Applicability to the EIA Process:

In terms of the existing WRD and reworking activities it should be noted that on 24 July 2015, GN 633 introduced transitional provisions that seek to regulate the transition of waste management at mines from an EMPr approved in terms of the MPRDA to a WML in terms of the NEMWA. In this regard the transitional provisions state that:

"*An environmental management programme or plan approved in terms of the Mineral and Petroleum Resources Development Act, 2002 shall be deemed to have been approved and issued in terms of the NEMWA."* (WML).

"The Minister responsible for mineral resources may direct any holder of a prospecting right, mining permit, mining right, exploration right, or production right, if he or she is of the opinion that the residue stockpile or residue deposit in question is likely to result in significant pollution, degradation or damage to the environment, to take such action to upgrade the environmental management programme or plan to address any deficiency in the environmental management programme or plan.

An environmental management programme or plan submitted in terms of the Mineral and Petroleum Resources Regulations, 2004 and which is pending when the Notice took effect, must despite the repeal of the Mineral and Petroleum Resources Regulations, 2004 be dispensed with in terms of the Mineral and Petroleum Resources Regulations, 2004 as if those regulations were not repealed."

In terms of the transitional arrangement the EMPr issued prior to the notice is deemed as a WML for Residue Stockpile and Deposits. The current reworking and concurrent backfilling, as well as the intended reworking thereof is therefore a lawful activity. The expansion of the various WRDs will necessitate the need for a WML.

The increase in the footprint areas of the WRDs will also trigger the need for a WML.

7. National Heritage Resources Act (Act No. 25 of 1999) (NHRA)

For this project, the following has been considered as part of the specialist studies in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) are triggered when considering:

a) Archaeological artefacts, structures and sites older than 100 years;
b) Ethnographic art objects (e.g. prehistoric rock art) and ethnography;
c) Objects of decorative and visual arts;
d) Military objects, structures and sites older than 75 years;
e) Historical objects, structures and sites older than 60 years;
f) Proclaimed heritage sites;
g) Grave yards and graves older than 60 years;
h) Meteorites and fossils; and
i) Objects, structures and sites or scientific or technological value.

Section 34 of the NHRA deals with structures that are older than 60 years. Section 35(4) of the NHRA deals with archaeology, palaeontology and meteorites. Section 36 of the NHRA, deal with human remains older than 60 years. Unidentified/ unknown graves are also handled as older than 60 years until proven otherwise.

According to Regulation 38 of the NHRA, any development or other activity which will change the character of a site exceeding 5 000m^2 in extent requires notification to the South African Heritage Resources Agency (SAHRA). This process, as well as the outcomes of the heritage and paleontological study will be undertaken as part of the Environmental Authorisation process.

Applicability to the EIA Process:

The project areas are regarded as having a high sensitivity for palaeontological themes and medium sensitivity for archaeological themes. For this reason, specific specialist studies in this regard are conducted. A Heritage Assessment and paleontological study was conducted which found the following:

Key findings of the assessment include:

- The surrounding area has been disturbed by mining activities and road developments;
- Stone Age material is on record around the study area where archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for archaeological finds and specifically Stone Age sites, as these areas were utilised for settlement of base camps close to water and hunting ranges; and

- None of the above-mentioned focal points occur in the project areas and no heritage sites of significance were recorded within the proposed impact areas.

In terms of the palaeontological component, the area is of moderate paleontological sensitivity and a separate study was conducted for this aspect. This study concluded that it is extremely unlikely that any fossils would be preserved in the Campbell Rand Subgroup stromatolites or in the loose sands of the Quaternary. There is however a very small chance that fossils may occur in palaeopans in the ancient rocks.

No SAHRA permits or applications are required. The project is in line with surrounding land use and the impact to heritage resources are low. The project can commence provided that the recommendation of the Implementation of a chance find procedure for the project are adhered to and based on SAHRA's approval.

8. National Water Act (Act No. 36 of 1998) ("NWA")

The National Water Act (Act No. 36 of 1998) (NWA) is the primary regulatory legislation controlling and managing the use of water resources and pollution thereof. It provides for fundamental reformation of legislation relating to water resource use. The preamble to the NWA recognises that the ultimate aim of water resource management is to achieve sustainable use of water for the benefit of all users and that water resources quality protection is necessary to ensure sustainability of the nation's water resources in the interests of all water users. The NWA's purpose is stated in section 2 and enforced by the Department of Water and Sanitation (DWS). Section 2 of the NWA relates to the following:

- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources; and
- Meeting international obligations.

The NWA presents strategies to facilitate sound management of water resources; provides for the protection of water resources; and regulates use of water by means of Catchment Management Agencies (CMAs), Water User Associations (WUAs), Advisory Committees and International Water Management. As the NWA is founded on the principle of trusteeship, the government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and industry (including mines) can only be entitled to use water if the use is permissible under the NWA.

In terms of section 21 of the NWA, certain consumptive and non-consumptive water uses are identified and can only commence once authorised. Where a water use constitutes a Scheduled 1 Use (permissible use without an authorisation requirement); permissible water uses in terms of section 22 of the NWA; or is authorised in terms of a General Authorisation, a Water Use Licence (WUL) is not required.

The NWA further requires that:

- a motivation in terms of Section 27 be submitted as part of a Water Use Licence Application (WULA);
- the necessary water uses application forms be compiled and submitted in support of the WULA;
- the requirements of GN 704 and detail surrounding these activities will be considered in the WULA; and
- an integrated waste and water management plan be submitted in support of the Integrated WULA (IWULA).

Applicability to the EIA Process:

- Various water uses are triggered by this project, resulting from the construction of new Process Water Tanks, Central Dams, expansion of WRDS, potential increase in dewatering from Opencast Pits and taking into consideration the various ephemeral depression wetlands ('pans') present in this area.

<u>GN 704 Exemption:</u>

GN 704 was promulgated in terms of section 26(1) of the NWA and is specifically aimed at the protection of water resources associated with mining related activities. It provides minimum requirements which need to be adhered to for the protection of the water resources on a mine. GN 704 regulates the use of water, management of dirty and clean water infrastructure and related activities at mines. This includes minimum requirements for infrastructure that hold dirty water. A mine can apply for exemptions from these requirements and could be granted approval should sufficient management measures be put in place to ensure the protection of the environment. Regulation 4 of GN 704 places some restrictions in terms of the locality of certain infrastructure which could have an impact on water resources.

In terms of GN 704 exemptions, the GN 704 Regulations relate to both existing and new water use activities and each section should be read and interpreted individually. It is recommended that exemption be applied for in terms of the GN 704 Regulations based on the nature of the activities.

New WULA Requirement:

Various new water uses will be triggered which include:

- Expansion of WRD (Section 21(g));
- Dewatering for safe mining conditions (Section 21(j));
- Use of water on site (Section 21(a));
- Storage of clean water (Section 21(b));
- Storage of dirty water (Section 21(g)); and
- Impact on cryptic wetlands (Section 2 (c)&(i)).

The DWS has informed the applicant in writing during June 2021 that a new WULA must be submitted onto the EWULAAS system and that this application will supersede the current WUL, 2018.

2.b Listed and Specific Activities

2.b.i National Environmental Management Act, 1998 (NEMA)

In terms of the NEMA, there are three (3) listing notices which should be considered for this application. These listing notices were amended during April 2017 and again the Regulations were updated during 2021. This amendment did not repeal the 2014 listed activities, but purely amended certain listings. Listing Notice 1 (Regulation 983) activities require a Basic Assessment Process, whereas Listing Notice 2 (Regulation 984) activities require a full EIA Process. Listing Notice 3 (Regulation 985) activities require a Basic Assessment Process if the area falls within certain geographic zones. Beeshoek is not characterised by gazetted Threatened Ecosystems, Critical Biodiversity Areas (CBAs) or located in proximity to any Protected or Conservation Areas and for this reason Listing Notice 3 is not applicable to the Mine.

2.b.ii National Environmental Management: Waste Act, 2008 (NEMWA)

The NEMWA, Regulation 921, dated 29 November 2013 and as amended, makes provision for lists of waste management activities that have, or are likely to have a detrimental effect on the environment.

The following table presents a detailed presentation of the legal activities triggering various Environmental and Waste Licencing requirements.

Table 8: Applicable Listing Notices

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	EIA LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985*)	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE ACTIVITES Section 21 Water Uses
Project 1: Consolidation of Run of Mine (ROM) Stockpiles on South Mine	The ROM stockpile area on South Mine will be demarcated as a combined ROM stockpile area for both on-grade, off-grade and BIS. Overall Area: 35ha (Note that no clearance of vegetation is required; this area is located on the north-eastern perimeter of the West Pit WRD (now referred to as the Village Pit South WRD) in a legally disturbed area). The current Water Use Licence (WUL) allows for the following ROM deposition on the stockpile in question – note that the deposition of ROM will not increase in annual throughput: - South Contaminated ROM 1: 4 450 000t/a - South Contaminated ROM 2 Off-Grade ROM Stockpile, including BIS: 1 920 000t/a - ROM Stockpile: 720 000t/a	x	Part 1, Regulation 29: "An environmental authorisation may be amended by following the process prescribed in this Part if the amendment; Will not change the scope of a valid environmental authorisation nor increase the level or nature of the impact, which impact was initially assessed and considered when the application was made for an environmental authorisation; or Relates to the change of ownership or transfer of rights and obligations." The change in the footprint, combining the area for the purposes of an overall ROM footprint will trigger an amendment to the current layout.	**Not Applicable (N/A)**	**N/A**
Project 2: Amendments to the design of existing Waste Rock Dumps (WRDs) in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints	Village Pit North Waste Rock Dump (VP1): Current area approximately 70ha, to be increased with approximately 26ha (final area 96ha) to allow for final slope and footprint upon rehabilitation (clearance of about 25ha) – this will also remove the required Storm Water Dam, which was a recommendation in the associated Village Pit WRD EMPr, but has as of yet not been constructed, due to the low run-off in this area and recommendations in subsequent storm water management studies. The decommissioning of the Storm Water Dam will not trigger a listed activity as the "active activity" does not entail an "operational component". Planned operational height is 111m (upon rehabilitation 112m). GF Waste Rock Dump: Current area approximately 48ha, to be increased by about 6ha (final area about 54ha) to allow for final slope and footprint upon rehabilitation. Based on the location of this WRD between the Discard Dump and the existing Slimes Dam it is unlikely that any clearance will be triggered. Planned operational height is 82m (upon rehabilitation 84m). East Pit Waste Rock Dump: Current area approximately 144ha, to be increased by about 26ha (final area about 170ha) to allow for final slope and footprint upon rehabilitation (will involve clearance in excess of 25ha). Planned operational height is 94m (upon rehabilitation 94m).	x	**Listing Notice 1, Activity 12:** The development of—dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or 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. **Listing Notice 2, Activity 15**: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity. **Listing Notice 2, Activity 19**: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand,	It is assumed that Category A, Activity 15: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which requires a prospecting right or mining right in terms of the MPRDA is not relevant as no additional mining rights are required and the activities entail the expansion of approved facilities. For that reason: Category A waste activities, Activity 13: The expansion of a waste management activity listed in Category A or B of this Schedule which does not trigger an additional waste management activity in terms of this Schedule, is	Yes – Section 21(g) for the WRD expansions and potential Section 21 (c)&(i) for the presence of various dry pans in the area. GN 704 Exemption requirements for the operation of unlined Mine Residue Deposits.

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	West Pit Waste Rock Dump (now referred to as the Village Pit South WRD): Current area approximately 80ha, to be increased with about 55ha (final area 135ha) to allow for final slope and footprint upon rehabilitation (will likely involve clearance of about 35ha). Planned operational height is 98m (upon rehabilitation 106m). HF Waste Rock Dump (new dump on historic dump footprint): Current area approximately 20ha and used for BIS stockpiling, to be reused to allow for HF Pit waste rock disposal, as well as final slope and footprint upon rehabilitation. This area is located on an existing WRD footprint (no additional clearance therefore required). Planned operational height is 39m (upon rehabilitation 63m). Discard Dump: Current area approximately 28ha, to be increased to about 60ha. This area is located within the mining area, between WRDs, the Slimes Dam and Opencast Pits, and no clearance will be required. The heigh of the facility is planned to be up to 60m. The current WUL allows for the following deposition – note that the deposition of material will not increase in annual throughput, however the life of mine and total capacity/footprint will increase: - Village Pit North Waste Rock Dump: 31 500 000t/a - West Pit Waste Rock Dump (now referred to as the Village Pit South WRD): 21 413 403t/a - GF Waste Rock Dump: 7 721 766/a - HL Waste Rock Dump: 10 983 334t/a - BIS ROM North 1 – 2 950 000t/a (on historic HF WRD) - East Pit Waste Rock Dump: 68 850 000t/a - Discard Dump: 9 000 000t/a		shells, shell grit, pebbles or rock of more than cubic metres from watercourse.	more relevant.	
Project 3: Increase of Opencast Footprint Areas, as well as the undertaking of detrital mining for shallow iron ore reserves, including transportation routes (Haul roads). During this phase ongoing exploration will be undertaken.	Village Pit (VP North) will be expanded by 203ha in the future to 269ha and will further include two satellite pits: Pit East and Pit South, with areas of about 37ha and 22ha, respectively. Clearance of vegetation will be required. The depth of the VP North is planned at 180m, with depths of VP East and VP South planned at 160m and 60m, respectively. To the west of the proposed Village Pit expansion area, an area for specific target exploration drilling has been demarcated. This area is about 170ha in extent. East Opencast Pit will not result in an increase in the footprint but rather in the depth of mining within the mining shell. The depth of East Pit is planned at approximately 220m. Around the East Pit potential strategic iron ore resources have been identified. The area in question is about 976ha. Various wetland	x	**<u>Listing Notice 1, Activity 12:</u>** The development of—dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or 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. **<u>Listing Notice 1, Activity 24</u>**: The development of a road—with a reserve wider than 13,5 meters, or where no reserve exists	**N/A**	Yes – Section 21 (c)&(i) for the presence of various dry pans in the area. Section 21 (j) for the abstraction of water for safe mining conditions, and the use thereof as Section 21(a) water uses. There is a further potential for an additional dewatering tank at the Village Pit – this will be a Section 21(g) water use.

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	systems are present within this area, as well as a potential recharge zone. Due to the presence of these sensitive ecosystems, strategic exploration drilling will be undertaken to determine the potential resources within this area. The drilling will be undertaken in terms of a management plan to ensure the least amount of disturbance to these wetland systems. The BF Pit will be expanded from about 30ha (comprising of 3 pits) to about 86ha. Approximately 25ha may require clearance. The depth of the BF Pit is planned at 180m. A Detrital Mining area of about 238ha will be established – it should be noted that entire area will not be utilised, only where minerals are found to be economically viable. Clearance of vegetation will be required. Mining in the detrital area is planned between 20m and 40m in depth. One new haul road is proposed: - Village Haul Road: 1,100m at a width of 30m (about 3.3ha). The road will be located in areas mostly disturbed with existing mining activities or along existing roads.		where the road is wider than 8 metres; but excluding a road—which is 1 kilometre or shorter. **Listing Notice 2, Activity 15**: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity. **Listing Notice 2, Activity 19**: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than cubic metres from watercourse.		
Project 4: Development of the Beneficiation Project which will comprise of a WHIMS Plant and Jig Plant at Beeshoek	- WHIMS Plant ○ WHIMS Construction Laydown Area: approximately 1.5ha. ○ Within the laydown area, a 2 500m² Staging Stockpile comprising low grade feed material will be located. This material will be processed material (i.e. raw material) derived from the Slimes Dam. All waste (oversize and slimes) will be disposed of onto the existing Slimes Dam and no new Mine Residue Stockpile will be developed. ○ WHIMS Plant Clarifier with a capacity of 9 700m³. ○ WHIMS Plant footprint, including access road of 160m in length (approximately 4ha). ○ WHIMS Plant Central Process Dam: 0.4ha, with capacity of 5 000m³. ○ WHIMS Plant Emergency Product Stockpile: 21m² within WHIMS Plant footprint area. ○ WHIMS 1mm Product stockpile: 300m² within the WHIMS Plant footprint area. ○ Tailings Pipeline HDPE: 315mm diameter at 750m³/hr (208.3l/s): ▪ 1.1km pipeline from the WHIMS Plant Clarifier to the northern perimeter of Slimes Dam;	Yes – Tailings Pipeline between WHIMS Plant and Slimes Dam. Potentially – provision is made for the storage of chemicals where required within the	**Listing Notice 1, Activity 10:** The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (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—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. **Listing Notice 1, Activity 14:** The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80	Category A Activity 15: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which requires a prospecting right or mining right in terms of the MPRDA. This will be applicable at the WHIMS Plant for the new transfer and feed stockpiles (specifically the Staging Stockpile, which will be a designed facility). The reworking of the discard, low grade material and slimes are existing approved activities on site in terms of the approved	Yes – Section 21 (g) and (b) water uses WHIMS: 1 000m³ Process Water Tank; 9 700m³ Clarifier; 5 000m³ Central Process Water Dam; 1 000m³ Potable/fire Water Tank; Emergency Plant Stockpile (20m³ at any given time); Staging Stockpile (capacity 6 000m³) and 1mm Product Stockpile (capacity 1 000m³); Sewage Conservancy Tank of 6m³. Jig: 100m³ Potable Water Tank; Intermediate Stockpile (capacity 5 500m³); Arising Stockpile (capacity 6 000m³) and Low low grade Stockpile

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	▪ 1.4km from the WHIMS Plant Clarifier to the southern perimeter of the Slimes Dam; and ▪ existing pipeline of 1.3km to be rerouted from the existing Beneficiation Plant Thickener directly to the WHIMS Plant. ○ Return Water Pipeline HDPE, 280mm diameter at 400m³/hr (111l/s): 1.1km (rerouting of existing pipeline from Slimes Dam to WHIMS Plant Clarifier). ○ Process Water Pipelines (throughput below 120l/s): 350mm diameter - 1.3km [replacement of existing pipeline with new pipeline from Central Water Dam to new Process Water Tank (2 000m³ – see project 5 below) adjacent to exiting Beneficiation Plant Clarifier]. ○ Water from Central Water Dam to existing Beeshoek Plant: 200mm mild steel – 1.3km at 400m³/hr (111l/s). ○ New potable water pipeline 140mm diameter – 1.6km in length with a throughput of 28l/s from the steel potable water tank (100m³) at the new Jig Plant to combined steel potable water/fire water tanks (approximately 1000m³) at the WHIMS Plant. ○ Overland Powerline: 22kV powerline of approximately 700m in length. ▪ New Jig Plant ○ New Jig Plant footprint: approximately 2.6ha on already disturbed areas. ○ New Jig Plant Construction Laydown Area: 2ha on existing Discard Dump footprint. ○ Feed from the existing Discard Dump (low-grade material fed into a loading bin by means of front-end loaders and conveyed to the Washing and Screening Plant). ○ Washing and Screening Plant. ○ Crusher building containing a high pressure grind roll (HPGR) crusher. ○ Jig located in the Jig building. ○ MCC and transformer bay. ○ Re-routed existing water pipelines (buried, internal diameter 450mm). ○ Slurry from the new Jig Plant will be pumped to the existing Plant Thickener (no new activities triggered). ○ New process water tank (located near existing Plant Thickener) – 2,000m³ (this forms part of Project 5). ○ Stockpiles [comprising of both material from the Discard Dump (also referred to as a Low Grade Stockpile] and arising low grade	confines of the Plant footprint areas.	cubic metres or more but not exceeding 500 cubic metres.	EMPr, 2009. However for the purposes of the application, these activities will be clearly described and listed. Note that the Jig Feed Stockpile (intermediate stockpile) will not trigger new WMLs as these will be placed on existing approved WRD footprints and are regarded as ROM feed stockpiles. All final low grade will be deposited back onto the Discard Dump. However the Arising Stockpile and Low low grade stockpile will be regarded as new WMLs as these will be derived from the current Discard Dump.	(capacity 118m³); Sewage Conservancy Tank of 6m³.
		Yes – the current design indicates the need for road development (Road 1 and 2) at the Jig Plant which will be around 1km. For the purposes of this application this listed activity is included for design planning.	**<u>Listing Notice 1, Activity 24</u>**: The development of a road—with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road—which is 1 kilometre or shorter.		
		Yes (WHIMS Plant).	**<u>Listing Notice 1, Activity 27</u>**: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous **<u>vegetation</u>** is required for— except for the undertaking of a linear activity.		
		Yes, new clarifier at the current Jig Plant.	**<u>Listing Notice 1, Activity 34</u>**: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding— (i) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of		

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	material from the existing Jig Beneficiation Plant). The stockpiles created from material reclaimed from the existing Low Grade Stockpile (Discard Dump) and the stockpile created with the arising material (low grade) from the existing Jig Beneficiation Plant are intermediate stockpiles created within the footprint of the existing Discard Dump (the Low Grade Intermediate Stockpile and the Arising Stockpile). Material from these intermediate stockpiles is transported to and fed into the new Jig Plant loading bin located south of the existing Low Grade Stockpile. Low low grade material from the new Jig Plant is then conveyed back to the Low Grade Stockpile footprint, deposited onto the ground and then moved back towards the existing Discard Dump. The three (3) stockpiles associated with the new Jig Plant include the following: ▪ Low Grade -32+1mm Stockpile (Intermediate) (0,5ha) located between the existing Low Grade Stockpile (Discard Dump) and the new Jig Plant loading bin on the existing Low Grade Stockpile foot print. Low grade material transported to and from the intermediate stockpile by means of front end loaders. ▪ Arising -32+1mm Stockpile (Intermediate) (0.6ha) located between the to be constructed arisings conveyor discharge position and the new Jig Plant loading bin and within the existing Low Grade Stockpile footprint. Low grade material transported from the Arising -32+1mm Stockpile by means of front end loaders. ▪ Low low grade material from the new Jig Plant will be conveyed by means of earth moving equipment to positions adjoining the existing Discard Dump within the existing footprint (i.e. waste from the new Jig Plant to return to the approved Discard Dump footprint). No new stockpiles will be constructed outside of the demarcated Discard Dump or other Type 3 Stockpile footprints, these will however be demarcated as part of the EMPr and WUL processes. The area of the Low low Grade Dump (stockpile) ($115m^2$). ○ Jig Plant Conveyors: ▪ Approximately 25m conveyor from existing plant conveyor system to feed Jig Plant to transport arising low grade material and discard (not considered dangerous goods). ▪ Approximately 330m conveyer to feed the new Jig Plant from Discard Dump feed bin. ▪ This excludes in-lant conveyors). ○ New Jig Plant Roads interlinked:		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; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day.		
		Depending on the final road layout, certain existing roads may be redesigned.	**Listing Notice 1, Activity 56**: The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre—where the existing reserve is wider than 13,5 meters; or where no reserve exists, where the existing road is wider than 8 metres.		
		Yes, a WUL will be required for the construction of the Central Water Dam at the WHIMS Plant, stockpiles and potentially for smaller transfer tanks within the two plant systems.	**Listing Notice 2, Activity 6**: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This will be specific to new dirty water tanks and new Process Water Dam.		

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	▪ Road 1: 240m with a width of 30m. ▪ New Jig Plant Road 2: 700m with a width of 30m. ▪ Road 3: 280m with a width of 30m. ▪ Road 4: 135m with a width of about 30m ▪ Decommissioning of existing haul road: approximately 1000m in length and 30m wide. ▪ (this excludes roads to be constructed on the Plant terraces). ○ Overhead Powerline: 22kV powerline of approx. 620m. ○ Rerouting of underground electrical cable: 22kV of approx. 380m. Power supply will comprise of 22kV powerlines. Electricity will be sourced from the existing Beeshoek Substation. Minor upgrades will be undertaken within the footprint area of this substation and the feeding Eskom Substation, but no listed activities will be triggered in this regard. Clearance (potentially 5.6ha), note that the clearance associated with the road does not contribute to the listing activity for clearance: ○ Road 1 – potential clearance of 0.1ha (considered disturbed area). ○ WHIMS Laydown Area: approximately 1.5ha. ○ WHIMS Plant footprint, including access road of 160m: approximately 4ha. ○ WHIMS Plant Central Process Water Dam: 0.4ha, capacity less than 50 000m³.				
Project 5: Water Management	The Mine will also establish additional water storage tanks on site which will include: - An additional storage tank for clean water at the current D300 tank on South Mine. The current intended capacity is about 250m³. - A new additional storage tank near the existing BN Tank of 500m³. The purpose is to provide sufficient storage space for water from the approved in-pit dewatering activities. - 4 x 10m³ plastic tanks at the existing clarifier and thickener area to allow for the storage of water in the water balance system of the mine to capacitate the plant process to start up without delay. - 1 x 2 000 m³ process water tank adjacent to the existing process water tank and is connected to it with a "balancing pipe" to allow for the storage of water in the water balance	x	**<u>Listing Notice 2, Activity 6</u>**: 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.		Yes, Section 21(g) for the storage tanks as listed under the project description: - Twin Tank at D300 for potable water; - BN Tank; - Plastic Tanks; - Process Water Tank; - Steel Dam; and - Zinc Dam.

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	system of the mine to enable the new plant process to start up without delay. - Existing Dam: Steel Dam; 250m^3 with capacity to store process water and allow for the storage of top-up water. - Existing Dam: Zinc Dam:; 90m^3 with capacity to store input water where required. - A new dewatering tank at the Village Opencast Pit.				
Ancillary infrastructure: Topsoil stockpiles	With the expansion of area, soil layers will be stripped and placed on the existing topsoil stockpiles near the detrital area.		**Listing 1, Activity 27:** The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— except for the undertaking of a linear activity.	-	
Project 6: Development of a railway line and associated service road.	The line (main western line) will comprise a 2.8km main link line of approximately 5.5m in width with a 5m bulk fill (varies along the alignment). The line will tie from the existing Sishen/Postmasburg line at the Beeshoek Iron Ore Mine, crossing over the road accessing Tommys Field Airport and the R385 to link to the existing TFR Yard that services Kolomela Mine. The existing R385 road will be lifted such that the road passes over the railway line in a grade separated crossing. Considering that one 4m access road will be constructed along the alignment with an 8m buffer on either side of the railway line, the approximate extent of the development is 9ha (85 400m^2). In addition, construction of the northern link is considered to allow train movement from the Sishen/Postmasburg rail way line directly onto the abovementioned link line. This line is approximately 1.3km in length with similar dimensions as the main western line. This latter line is about 2ha is extent.	x	**Listing Notice 1, Activity 12:** The development of—dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or 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.	**N/A**	**N/A**
	One of two access road options will be constructed linking the R385 to Tommys Field Airport. These will have a width less than 8m and respectively lengths of 550m and 420m. A Rail Contractor Laydown area will be required (Laydown 1). This will be located in an existing disturbed area to the south of the Mine's landfill site.	x	**Listing Notice 1, Activity 24**: The development of a road—with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road—which is 1 kilometre or shorter.		
	Two laydown areas will be required for the bridge construction, which will require clearance. The South laydown area is located to the east of the remnants of the previously decommissioned R385 road, at an area of 0.8ha. The North laydown area is located just north of this area, north of the existing R385 road, at an area of 1ha. Borrow material will be required for the construction of the railway line. The borrow material will be sourced from within the mine		**Listing Notice 1, Activity 27**: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance		

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	EIA LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985*)	WASTE MANAGEMENT AUTHORISATION	WATER USE LICENCE ACTIVITES Section 21 Water Uses
	boundary, at existing opencast pits, such as from the Village Opencast Pit, the existing quartzite stockpile and the existing manganese stockpiles. Two (2) other borrow pit areas have also been identified next to the bridge laydown areas (north and south). These two areas will require clearance of 1.1ha each. A last borrow pit area will be considered, which will not require clearance as this is an existing borrow pit area, previously utilised in the construction of the R385 deviation. During the construction phase, currently planned for about 14 months, a temporary two-way deviation road of less than 1km, will be provided for vehicles travelling on the R385 during the construction of the road bridge.		management plan (likely only around the area of the bridge construction – although this could also be regarded infrastructure as part of the railway line system however in the event that it is required, this will not change the project scope). **Listing Notice 2: Activity 12**: The development of railway lines, stations or shunting yards excluding — (i) railway lines, shunting yards and railway stations in industrial complexes or zones; (ii) underground railway lines in a mining area; or (iii) additional railway lines within the railway line reserve.		

2.b.iii National Water Act, 1998 (NWA)

Chapter 4 of the NWA specifically addresses the use of water and is a tool for an authority to ensure the implementation of the principle that National Government has overall responsibility over water resource management, including the equitable allocation and beneficial use of water in the public interest, including that a person can only be entitled to use water if the use is permissible under the Act. In general, a water use must be licensed unless it is listed in Schedule I, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. Section 21 of the NWA identifies eleven (11) consumptive and non-consumptive water uses which must be authorised.

Table 9: Current approved Water Uses and potential new Water uses (grey to be amended; green new uses)

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
Section 21(a) Uses																
BN Pit Dewatering	-	In pit dewatering for use in Mine processing and associated activities.	a&j	-	429 496		432 000	-	-	432 000	Beesthoek 448	1	28° 16' 14.231" S	23° 0' 9.816" E	Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change as water plumes migrate due to dewatering on site and regional mining activities	**1**
WG28: Supply Borehole	-	WG28: Supply Borehole	a	-	97 474		97 474	-	-	97 474	Beesthoek 448	RE 0	28° 16' 22.155" S	22° 59' 43.749" E	No amendment required	**2**
~~WG66: Dewatering Borehole~~	-	~~WG66: Dewatering Borehole~~	~~a&j~~	-	~~97474~~	-	194 948	-	-	~~194 948~~	~~Beesthoek 448~~	~~1~~	~~28° 16' 11.519" S~~	~~23° 0' 3.795" E~~	This borehole is no longer in use, and has been replaced by OW022 (BN Borehole	~~**3**~~
OW022 (BN Borehole)	-	Dewatering Borehole	a&j				-			135 000	Beesthoek 448	1	28⁰16'15.99" S	22⁰59'59.78"E	Additional borehole requested to assist with dewatering of BN Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**3**
~~WG34: Supply Borehole~~	-	~~WG34: Supply Borehole~~	~~a~~	~~622 872~~	~~318 873~~	-	130 000	-	-	~~130 000~~	~~Olynfontein 475~~	4	~~28° 19' 4.781" S~~	~~22° 59' 20.095" E~~	This borehole is longer in use, and has been replaced by OW024)	**4**
~~WG35: Supply Borehole~~	-	~~West Pit Boreholes (WG34, WG35 & WG37) (replaced WG53 and 56)~~	~~a~~	~~580 641~~	~~318 873~~	-	260 000	-	-	~~260 000~~	~~Olynfontein 475~~	4	~~28° 19' 8.494" S~~	~~22° 59' 23.027" E~~	This borehole is longer in use, and has been replaced by OW023)	~~**5**~~
OW024 (WG 34 Replacement)	-	Supply borehole	a				-			130 000	Olynfontein 476	4	28°19'4.78"S	22°59'20.09"E	WG 34 is currently not pumping, should this borehole not be retrieved the mine will have to source alternative water which will result in the relocation of WG34. Abstraction volumes and Farm Portion to remain the same.	**4**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
OW023 (WG 35 Replacement)	-	Supply borehole	a				-			260 000	Olynfontein 476	4	28°19'8.49"S	22°59'23.03"E	WG 35 is currently not pumping, should this borehole not be retrieved the mine will have to source alternative water which will result in the relocation of WG35. Abstraction volumes and Farm Portion to remain the same.	5
WG37: Supply Borehole	-	West Pit Boreholes (WG34, WG35 & WG37) (replaced WG53 and 56)	a	1 212 191	318 873		600 000	-	-	600 000	Olynfontein 475	4	28° 19' 12.560" S	22° 59' 23.724" E	No amendment required	6
WG 62: Supply Borehole	-	Supply Boreholes	a	-	759 339		759 339	-	-	600 000	Beesthoek 448	RE 0	28° 18' 3.851" S	23° 0' 3.393" E	Abstraction volume has been reduced.	7
Village Pit Dewatering	-	In pit dewatering for safe mining conditions and the use in mine processing and associated activities.	a&j	-	-		420 000	-	-	420 000	Beesthoek 448	RE 0	28° 17' 29.13" S	22° 59' 21.88" E	Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to dewatering on site and regional mining activities	8
~~WG 12 (Village Dewatering)~~ WG75 (Village Dewatering)	-	Dewatering for safe mining conditions and use in mine processing and associated activities.	a&j	-	-		343 360	-	-	540 000	Beesthoek 448	RE 0	28°17'42.449"S	22°59'30.702"E	Name change requested and increase in dewatering volumes required. Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to dewatering on site and regional mining activities	9
WG73: Dewatering Borehole	-	Village Pit Dewatering	a&j	**-**	-		1 900 000	-	-	600 000	Beesthoek 448	RE 0	28°17'57.7" S	22°59'32.4"E	Reduction in water abstraction volumes. Request to remove specific coordinates for dewatering and only refer to the Farm	10

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
															Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to on site and regional mining activities	
OW025 (Village Dewatering, West of Pit)	-	Dewatering borehole	a&j				-		-	160 000	Beesthoek 448	RE 0	28°17'16.11" S	22°59'15.69"E	Additional borehole requested to assist with dewatering of Village Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**11**
OW026 (Village Dewatering, East of Pit 1)	-	Dewatering borehole	a&j				-		-	50 000	Beesthoek 448	RE 0	28°17'20.98" S	22°59'43.27"E	Additional borehole requested to assist with dewatering of Village Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**12**
OW027 (Village Dewatering, East of Pit 2)	-	Dewatering borehole	a&j				-		-	50 000	Beesthoek 448	RE 0	28°17'27.42" S	22°59'43.26"E	Additional borehole requested to assist with dewatering of Village Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**13**
OW028 In-Pit borehole (Village Dewatering)	-	Dewatering borehole	a&j				-		-	160 000	Beesthoek 448	RE 0	28°17'33.9" S	22°59'17.55"E	Additional borehole requested to assist with dewatering of Village Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**14**
WG 70 Dewatering borehole	-	Village Pit Dewatering	a&j				-		-	200 000	Beesthoek 448	RE 0	28°17'57.51" S	22°59'32.27"E	Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer.	**15**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
															This is required as the dewatering areas may change a water plumes migrate due to dewatering on site and regional mining activities	
WG27: Supply Borehole	-	Supply Boreholes	a	-	-		18 250	-	-	18 250	Beesthoek 448	RE 0	28°16'1.06"S	22°59'19.60"E	No amendment required	**16**
WG74 (near HF Pit) - replace WG51 A&B and WG63	-	Supply Borehole	a&j	-	-		500 000	-	-	500 000	Beesthoek 448	1	28°17'26.21"S	23°00'51.41"E	Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to dewatering on site and regional mining activities	**17**
HF Pit Boreholes Additional borehole (OW029)	-	Pit dewatering	a&jj	N/A			-		-	200 000	BEESTHOEK 448	1	28°17'22.66"S	23° 00'53.32"E	Additional borehole requested to assist with dewatering of HF Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**18**
HF Pit dewatering	-	In pit dewatering for safe mining conditions and the use in mine processing and associated activities	a&j				-		-	500 000	BEESTHOEK 449	1	28°17'27.33"S	23° 0'50.12"E	Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to on site and regional mining activities	**19**
Total (S21a)							**5 655 371**			**5 652 724**					No additional water abstraction require	

Water Use Name	Dimensions	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
Section 21(b)																
Airfield Tank	Plastic Jo Jo Tank	Clean Water Storage Dams	b	5m^3	63 764m3/a	5m^3	63 764m3/a	-	5m^3	63 764m3/a	Beesthoek 448	RE 0	28° 15' 59.118" S	22° 59' 26.310" E	No amendment required	**1**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
Dam D 94	Diameter: 8000mm Height: 1960mm Approx. Volume: 98m³ Type: Concrete	Clean Water Storage Dams	b	100m³	131 982m3/a	100m³	131 982m3/a	-	100m³	131 982m3/a	Beesthoek 448	Re 0	28° 18' 50.962" S	22° 59' 32.475" E	No amendment required	2
Dam D 96	Dimension: 4200mm X 3300 Height: 1300mm Approx. Volume: 18m³ Type: Steel	Clean Water Storage Dams	b	16m³	97 474m3/a	16m³	97 474m3/a	-	16m³	97 474m3/a	Beesthoek 448	Re 0	28° 16' 26.291" S	22° 59' 43.561" E	No amendment required	3
Dam D 301 A	Diameter: 19000mm Height: 1960mm Approx. Volume: 555m³ Type: Concrete	Clean Water Storage Dams (Sedibeng Water)	b	537m³	4 093 939m3/a	537m³	4 093 939m3/a	-	537m³	4 093 939m3/a	Beesthoek 448	Re 0	28° 18' 40.770" S	23° 0' 4.824" E	No amendment required	4
Dam 301 B	Diameter: 19000mm Height: 1960mm Approx. Volume: 555m³ Type: Concrete	Clean Water Storage Dams (Sedibeng Water)	b	537m³	386 079m3/a	537m³	386 079m3/a	-	537m³	386 079m3/a	Beesthoek 448	Re 0	28° 18' 41.689" S	23° 0' 3.822" E	No amendment required	5
Dam D 300 A	Diameter: 16200mm Height: 2000mm Approx. Volume: 412m³ Type: Concrete	Clean Water Storage Dams (East Pit Dewatering, as well as W34, W35 and W37)	b	454m³	1 088 600m3/a	454m³	1 088 600m3/a	-	454m³	1 088 600m3/a	Olynfontein 475	4	28° 19' 11.216" S	22° 59' 1.885" E	No amendment required	6
Dam D 90	Diameter: 26000mm Height: 1960mm Approx. Volume: 1040m³ Type: Concrete	Clean Water Storage Reservoirs	b	1 062m³	759 339m3/a	1 062m³	759 339m3/a	-	1 062m³	759 339m3/a	Beesthoek 448	Re 0	28° 17' 59.868" S	23° 0' 8.740" E	No amendment required	7

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
Dam D 91	Diameter: 26000mm Height: 1960mm Approx. Volume: 1040m³ Type: Concrete	Clean Water Storage Reservoirs	b	1 062m³	759 339m3/a	1 062m³	759 339m3/a	-	1 062m³	759 339m3/a	Beesthoek 448	Re 0	28° 18' 0.489" S	23° 0' 9.607" E	No amendment required	8
Dam D 97	Dimension: 4680mm X 4680 Height: 1350mm Approx. Volume: 29.5m³ Type: Steel	Clean Water Storage Dams (Uitsig Tank)	b	28m³	97 474m3/a	28m³	97 474m3/a	-	28m³	97 474m3/a	Beesthoek 448	Re 0	28° 16' 50.593" S	22° 59' 29.297" E	No amendment required	9
Dam D 92	Diameter: 8000mm Height: 1960mm Approx. Volume: 98m³ Type: Concrete	Clean Water Storage Dams	b	100m³	267 894m3/a	100m³	267 894m3/a	-	100m³	267 894m3/a	Beesthoek 448	Re 0	28° 17' 54.349" S	22° 59' 46.384" E	No amendment required	10
Tank 25TK02 a & b	Each: Diameter: 7900mm Height: 2450mm Approx. Volume: 120m³ Type: Concrete	Clean Water Storage Dams (HF and BN Pits Dewatering)	b	100m³	1 518 590m3/a	100m³	1 518 590m3/a	-	100m³	1 518 590m3/a	Beesthoek 448	1	28° 17' 32.469" S	23° 0' 35.663" E	No amendment required	11
				100m³	1 518 590m3/a	100m³	1 518 590m3/a	-	100m³	1 518 590m3/a					No amendment required	
Fire Water Tanks A	Diameter: 7640mm Height: 5700mm Approx. Volume: 2 579m³ Type: Steel, closed	Water in the event of a fire.	b	-	-	-	-	-	2 579m3	Emergency use (throughput regarded as 0m3)	Beesthoek 448	1	28° 17' 20.19" S	23° 00' 06.1" E	New water use	12
Fire Water Tanks B	Diameter: 7640mm Height: 5700mm Approx. Volume: 2 579m³	Water in the event of a fire.	b	-	-	-	-	-	2 579m3	Emergency use (throughput regarded as 0m3)	Beesthoek 448	1	28° 17' 20.0" S	23° 00' 06.54" E	New water use	13

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
	Type: Steel, closed															
WHIMS Potable Water Tank	Bolted galvanised steel tank with bladder made from polyester yarn coated with PVC. Diameter 13m by 8.4m high.	Potable and Emergency Fire Water	b						1000m3	154 500m^3/a	Beesthoek 448	1	28°16'41.50"S	23° 0'24.67"E	New water use	14
Fire Water Tanks WHIMS	Fabricated steel tank. Diameter 13m by 8.4m high	Water in the event of a fire.	b	-	-	-	-	-	2 579m3	Emergency use (throughput regarded as 0m3)	Beesthoek 448	1	28°16'41.50"S	23° 0'24.67"E	New water use	15
New Jig Plant Potable Water Tank	Bolted galvanised steel tank with bladder made from polyester yarn coated with PVC. Diameter 6m by 4.2m high.	Potable Water	b						100m3	190 230m^3/a	Beesthoek 448	1	28°17'23.76"S	23° 0'17.57"E	New water use	16
Dam D 300 B (new)	Diameter: 8000mm Height: 1960mm Approx. Volume: 98m^3 Type: Concrete	Dewatering water from boreholes for use in the mining process. This will serve as a balancing tank for the existing Dam D 300.	b					Olynfontein 475	100m^3	420 000m3/a	Olynfontein 475	4	28° 19' 11.216" S	22° 59' 1.885" E	New water use	17
Temporary supply tank (Railway line construction)	Fabricated steel tank. Diameter 13m by 8.4m high	Potable and Construction water (supply Uitsit Village)	b						2 000m3	Temporary supply during construction	Beesthoek 448	RE 0	28°16'47.36"S	22°59'30.41"E	New water use	18

Water Use Name	Discussion	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a									
Section 21(c&i)																
Village Pit Expansion	Expansion of the Village Pit within 500m buffer.	Within 500m buffer of a Cryptic Wetland (CW16)	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°17'15.75"S	22°59'7.58"E	Coordinate of Village Pit Expansion Boundary provided	1
Village Pit Expansion	Expansion of Village Pit will destroy	Total destruction of Cryptic Wetland CW15.	c&i	-	-	-	-	-		√	Beesthoek 448	RE 0	28°18'3.01"S	22°58'54.28"E	Coordinate of CW provided	2

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
	Cryptic Wetland CW15															
Village Pit Expansion	Expansion of Village Pit will destroy Cryptic Wetland CW21	Total destruction of Cryptic Wetland CW21.	c&i	-	-	-	-	-		√	Beesthoek 448	RE 0	28°18'32.17"S	22°59'12.17"E	Coordinate of CW provided	3
Village Strategic Exploration	Exploration drilling activities, not to encroach within 32m of the Cryptic Wetland. GN704 exemption required	Within 100m of a Cryptic Wetland (CW16).	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°17'12.53"S	22°58'57.68"E	General area coordinate provided	4
Village Strategic Exploration	Exploration drilling activities, not to encroach within 32m of the Cryptic Wetland.	Within 500m of Cryptic Wetland (CW15)	c&i	-	-	-	-	-	-	√	Beesthoek 448	RE 0	28°18'2.98"S	22°58'49.34"E	General area coordinate provided - note that this Section 21c&i are also linked with the application for the expansion of the Village Pit over this CW - Water Use #2	5
Village Pit North WRD	Expansion of the Village Pit North WRD towards a Cryptic Wetland. GN704 exemption required	Within 100m of a Cryptic Wetland (CW21)	c&i	-	-	-	-	-	-	√	Beesthoek 448	RE 0	28°18'29.94"S	22°59'17.73"E	Coordinate of the WRD boundary provided	6
Future Strategic Exploration Area Block A (within 100m from CW)	Exploration drilling activities, not to encroach within 32m of the Cryptic Wetland. GN704 exemption required	Within 100m of a Cryptic Wetland (CW1 - 28°18'29.94"S; 22°59'17.73"E).	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°18'32.93"S	22°58'30.61"E	Corner point of Block A provided	7a
		Within 100m of a Cryptic Wetland (CW5 - 28°20'31.16"S; 22°59'18.34"E).	c&i										28°18'47.97"S	22°59'17.34"E	Corner point of Block A provided	7b
		Within 100m of a Cryptic Wetland (CW6 -	c&i										28°19'10.64"S	22°58'57.95"E	Corner point of Block A provided	7c

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
		28°20'36.79"S; 22°59'12.52"E).														
		Within 100m of a Cryptic Wetland (CW7 - 28°20'31.95"S; 22°58'59.70"E).	c&i										28°19'22.75"S	22°59'19.79"E	Corner point of Block A provided	**7d**
		Within 100m of a Cryptic Wetland (CW8 - 28°20'27.40"S; 22°58'57.66"E).	c&i										28°19'27.94"S	22°59'20.34"E	Corner point of Block A provided	**7e**
		Within 100m of a Cryptic Wetland (CW9 - 28°20'17.48"S; 22°59'7.13"E).	c&i										28°19'43.53"S	22°59'6.83"E	Corner point of Block A provided	**7f**
		Within 100m of a Cryptic Wetland (CW10 - 28°20'25.03"S; 22°59'26.69"E).	c&i										28°19'46.92"S	22°59'10.88"E	Corner point of Block A provided	**7g**
		Within 100m of a Cryptic Wetland (CW11 - 28°20'20.95"S; 22°59'25.87"E).	c&i										28°19'42.43"S	22°59'16.15"E	Corner point of Block A provided	**7h**
		Within 100m of a Cryptic Wetland (CW12 - 28°20'19.05"S; 22°58'58.05"E).	c&i										28°19'52.90"S	22°59'36.44"E	Corner point of Block A provided	**7i**
		Within 100m of a Cryptic Wetland (CW13 - 28°20'10.35"S; 22°59'1.41"E).	c&i										28°19'51.06"S	22°59'48.89"E	Corner point of Block A provided	**7j**
		Within 100m of a Cryptic Wetland (CW14 - 28°20'1.24"S; 22°59'8.02"E).	c&i										28°19'59.76"S	22°59'51.79"E	Corner point of Block A provided	**7k**
		Within 100m of a Cryptic Wetland (CW17 - 28°20'9.17"S; 22°59'23.89"E).	c&i										28°20'5.76"S	22°59'48.25"E	Corner point of Block A provided	**7l**
		Within 100m of a Cryptic Wetland (CW18 - 28°20'16.78"S; 22°59'16.09"E).	c&i										28°20'12.35"S	22°59'37.49"E	Corner point of Block A provided	**7m**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
		Within 100m of a Cryptic Wetland (CW19 - 28°19'37.16"S; 22°58'59.77"E).	c&i										28°20'18.69"S	22°59'35.44"E	Corner point of Block A provided	**7n**
		Within 100m of a Cryptic Wetland (CW20 - 28°19'7.68"S; 22°58'36.93"E).	c&i										28°20'40.02"S	22°59'20.49"E	Corner point of Block A provided	**7o**
Future Strategic Exploration Area Block A (within 500m from CW)	Exploration drilling activities, not to encroach within 32m of the Cryptic Wetland.	Within 500m from a Cryptic Wetland (CW21 - 28°18'32.17"S; 22°59'12.17"E)	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°18'3.01"S	22°58'54.28"E	Boundary point provided. Note that this Section 21c&i are also linked with the application for the expansion of the Village Pit over this CW - Water Use #3	**8a**
		Within 500m from a Cryptic Wetland (CWK1 - 28°20'46.54"S; 22°58'46.77"E)	c&i										28°20'30.70"S	22°58'54.90"E	Boundary point provided. Note that this CW is located on the farm Ploegfontein RE 0 (owned by Sishen Iron Ore)	**8b**
Future Strategic Exploration Area Block B (within 100m from CW)	Exploration drilling activities, not to encroach within 32m of the Cryptic Wetland. GN704 exemption required	Within 100m of a Cryptic Wetland (CW2 - 28°20'40.99"S; 22°59'24.29"E).	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°20'31.68"S	22°59'28.53"E	Corner point of Block B provided	**9a**
		Within 100m of a Cryptic Wetland (CW4 - 28°21'6.18"S; 23° 0'47.02"E).	c&i										28°20'40.17"S	22°59'20.14"E	Corner point of Block B provided	**9b**
		Within 100m from a Cryptic Wetland (CWK5 - 28°21'6.60"S; 23° 0'20.25"E)	c&i										28°21'3.34"S	23° 0'21.79"E	Boundary point provided. Note that this CW is located on the farm Ploegfontein RE 0 (owned by Sishen Iron Ore)	**9c**
Future Strategic Exploration Area Block B (within 500m from CW)	Exploration drilling activities, not to to encroach within 32m of the Cryptic Wetland, within 500m from neighbouring mine property	Within 500m from a Cryptic Wetland (CWK2 - 28°20'52.65"S; 22°59'20.87"E)	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°20'43.76"S	22°59'29.00"E	Boundary point provided. Note that this CW is located on the farm Ploegfontein RE 0 (owned by Sishen Iron Ore)	**10a**
		Within 500m from a Cryptic Wetland (CWK3 - 28°21'0.14"S; 22°59'49.40"E)	c&i										28°20'52.50"S	22°59'53.16"E	Boundary point provided. Note that this CW is located on the farm Ploegfontein RE 0 (owned by Sishen Iron Ore)	**10b**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
		Within 500m from a Cryptic Wetland (CWK4 - 28°21'9.15"S; 22°59'51.92"E);	c&i										28°20'56.78"S	23° 0'3.84"E	Boundary point provided. Note that this CW is located on the farm Ploegfontein RE 0 (owned by Sishen Iron Ore)	**10c**
		Within 500m from a Cryptic Wetland (CW22 - 28°21'3.32"S; 23° 0'27.50"E)	c&i										28°21'25.54"S	23° 1'21.14"E	Corner point of Block B provided	**10d**
													28°20'44.69"S	23° 1'45.64"E	Corner point of Block B provided	**10e**
													28°20'21.81"S	23° 0'44.81"E	Corner point of Block B provided	**10f**
													28°20'53.75"S	23° 0'33.87"E	Corner point of Block B provided	**10g**
Historic West Pit	Located within 500m of a Cryptic Wetland.	Within 500m from a Cryptic Wetland (CW19 - 28°19'37.16"S; 22°58'59.77"E)	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°19'38.59"S	22°59'8.53"E	Cormer point of pit provided	**11**
West Pit WRD (now Village Pit South WRD)	Located within 500m of a Cryptic Wetland.	Within 500m of the south mine Cryptic Wetlands (CW19 - 28°19'37.16"S; 22°58'59.77"E)	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°19'43.93"S	22°59'17.07"E	Corner point of WRD provided	**12**
East Pit WRD	Expansion of the WRD towards a Cryptic Wetland within 100m from Cryptic Wetland).	Within 100m from Cryptic Wetlands (CW10 - 28°20'25.03"S; 22°59'26.69"E)	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°20'26.29"S	22°59'30.29"E	Corner point of WRD provided	**13**
East Pit WRD	Expansion of the WRD towards a Cryptic Wetland within 500m from Cryptic Wetland).	Within 500m of a Cryptic Wetland (CW17 - 28°20'9.17"S; 22°59'23.89"E). Within 500m of a Cryptic Wetland (CW11 - 28°20'20.95"S; 22°59'25.87"E). Within 500m of a Cryptic Wetland (CW18 - 28°20'16.78"S; 22°59'16.09"E). Within 500m of a Cryptic Wetland (CW5 - 28°20'31.16"S; 22°59'18.34"E).	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°20'32.82"S	22°59'32.05"E	Boundary point of WRD provided	**14**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
		Within 500m of a Cryptic Wetland (CW6 - 28°20'36.79"S; 22°59'12.52"E).														
		Within 500m of a Cryptic Wetland (CW2 - 28°20'40.99"S; 22°59'24.29"E).														
		Within 500m from a Cryptic Wetland (CWK3 - 28°21'0.14"S; 22°59'49.40"E)														
		Within 500m from a Cryptic Wetland (CWK5 - 28°21'6.60"S; 23° 0'20.25"E)														
		Within 500m from a Cryptic Wetland (CW22 - 28°21'3.32"S; 23° 0'27.50"E)														
East Pit	Presence of the pit within 500m from Cryptic Wetland.	Within 500m from a Cryptic Wetland (CW22 - 28°21'3.32"S; 23° 0'27.50"E)	c&i	-	-	-	-	-	-	√	Olynfontein 475	4	28°20'47.06"S	23° 0'29.32"E	Boundary point of pit provided	**15**
Water Use Name	**Dimensions**	**Description**	**Water Use**	**2018 WUL**		**2018 WUL (2019 amendment)**		**Disposal Volume (m³)**	**2021 WUL**		**Farm Name**	**Farm Portion**	**South**	**East**	**Comment on Application Form**	**WUL Map Referencing**
				M3	**m3/a**	**Capacity (m3)**	**m3/a**		**Capacity (m3)**	**Throughput (m3/a or tonnes)**						
Section 21(g)																
Dam D 86 (Blou Dam)	Dimension: 12000mm X 18000 Height: 2720mm Approx. Volume: 354m³ Type: Steel	Dirty Water Storage Dams	g	269m³	7 421 078m3/a	269m³	7 421 078m3/a	-	269m³	7 421 078m3/a	Beesthoek 448	1	28° 17' 8.068" S	23° 0' 15.131" E	No amendment required	**1**
Tank 26TK01 a&b	Diameter: 8500mm Height: 2100mm Approx. Volume: 119m³	Dirty Water Storage Dams	g	100m³	225 418m3/a	100m³	225 418m3/a	-	100m³	225 418m3/a	Beesthoek 448	1	28° 16' 45.775" S	22° 59' 56.844" E	No amendment required	**2A**
				100m³	225 418m3/a	100m³	225 418m3/a	-	100m³	225 418m3/a	Beesthoek 448	1	28° 16' 45.775" S	22° 59' 56.844" E	No amendment required	**2B**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
	Type: Concrete															
Thickener TH01	Diameter: 90000mm Height(Conical Shaped): 2400mm(High Level) & 8783mm(Low Point) Approx. Volume: 22000m³ Type: Concrete	Dirty Water Storage Dams	g	23 000m³	7 522 316m3/a	23 000m³	7 522 316m3/a	-	23 000m³	7 522 316m3/a	Beesthoek 448	1	28° 17' 14.947" S	23° 0' 6.662" E	No amendment required	3
Clarifier Dam DD01	Diameter: 30000mm Height: 3000mm Approx. Volume: 2120.58m³ Type: Concrete	Dirty Water Storage Dams	g	2000m³	6 657 912m3/a	2000m³	6 657 912m3/a	-	2000m³	6 657 912m3/a	Beesthoek 448	1	28° 17' 17.194" S	23° 0' 7.841" E	No amendment required	4
Storm Water Dam North		Dirty Water Storage Dams	g	15000m3	76 700m3/a	15000m3	76 700m3/a	-	15000m3	76 700m3/a	Beesthoek 448	1	~~28°17'30.63"S~~ 28°17'28.83"S	~~22°59'46.48"E~~ 22°59'48.22"E	Minor coordinate adjustment to indicate centre point (as built)	5
South Evaporation Ponds	Diameter: 39000mm x 39000mm Height: 1300mm Approx. Volume: 1977.3m³ Type: Concrete	Dirty Water Storage Dams	g	1600m³	1 221m3/a	1600m³	1 221m3/a	-	1600m³	1 221m3/a	Beesthoek 448	RE 0	28° 18' 48.5" S	23° 0' 11.0" E	No amendment required	6
Sewerage Sumps Portion 1 (North Crusher Workshop)		Disposal of domestic effluent into sewage sumps	g	10m³	662,5m3/a	10m³	662,5m3/a	-	10m³	684,50m3/a	Beesthoek 448	1	28° 17' 21.900" S	23° 0' 8.200" E	Name Specifications given to be included into the WUL.	7
Sewerage Sumps Portion 1 (North Crusher Workshop) (near Thickener Workshop)		Disposal of domestic effluent into sewage sumps	g	15m³		15m³			15m³		Beesthoek 448	1	28° 17' 15.200" S	23° 0' 2.800" E		8

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
Sewerage Sumps Portion 1 (near Jig Plant)		Disposal of domestic effluent into sewage sumps	g	$5m^3$		$5m^3$			$5m^3$		Beesthoek 448	1	28° 17' 18.382" S	23° 0' 1.296" E		9
Sewerage Sumps Portion 1 (near W&S Plant)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 25.900" S	23° 0' 2.500" E		10
Sewerage Sumps Portion 1 (near W&S Plant)		Disposal of domestic effluent into sewage sumps	g	$15m^3$		$15m^3$			$15m^3$		Beesthoek 448	1	28° 17' 25.200" S	23° 0' 1.800" E		11
Sewerage Sumps Portion 1 (near Plant Workshops)		Disposal of domestic effluent into sewage sumps	g	$15m^3$		$15m^3$			$15m^3$		Beesthoek 448	1	28° 17' 17.000" S	22° 59' 56.900" E		12
Sewerage Sumps Portion 1 (near Plant Workshops)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 13.400" S	22° 59' 56.900" E		13
Sewerage Sumps Portion 1 (near Plant Workshops)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 14.100" S	22° 59' 54.800" E		14
Sewerage Sumps Portion 1 (Stores)		Disposal of domestic effluent into sewage sumps	g	$15m^3$		$15m^3$			$15m^3$		Beesthoek 448	1	28° 17' 9.100" S	22° 59' 56.100" E		15
Sewerage Sumps Portion 1 (Stores)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 6.700" S	22° 59' 54.700" E		16
Sewerage Sumps Portion 1 (North Workshop)		Disposal of domestic effluent into sewage sumps	g	$15m^3$		$15m^3$			$15m^3$		Beesthoek 448	1	28° 17' 4.000" S	22° 59' 56.100" E		17
Sewerage Sumps Portion 1 (North Main Entrance)		Disposal of domestic effluent into sewage sumps	g	$15m^3$		$15m^3$			$15m^3$		Beesthoek 448	1	28° 16' 57.800" S	22° 59' 57.100" E		18
~~Sewerage Sumps Portion 1 (South~~	-	~~Disposal of domestic effluent into sewage sumps~~	~~g~~	$20m^3$		~~$20m^3$~~					~~Beesthoek 448~~	~~1~~	~~28° 18' 30.800" S~~	~~23° 0' 22.000" E~~	Sewerage Sumps Portion 1 (South Engineering Offices) incorrect	

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
~~Engineering Offices)~~															portion - moved to portion RE (0)	
Sewerage Sumps Portion 1 (Wellness)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 31.100" S	22° 59' 57.400" E		**19**
Sewerage Sumps Portion 1 (Clinic)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 30.879" S	22° 59' 59.288" E		**20**
Sewerage Sumps Portion 1 (Main Security Office)		Disposal of domestic effluent into sewage sumps	g	$15m^3$		$15m^3$			$15m^3$		Beesthoek 448	1	28° 17' 32.025" S	22° 59' 59.401" E		**21**
Sewerage Sumps Portion 1 (Carwash)		Disposal of domestic effluent into sewage sumps	g	$15m^3$		$15m^3$			$15m^3$		Beesthoek 448	1	28° 17' 34.400" S	23° 0' 2.000" E		**22**
Sewerage Sumps Portion 1 (Oppikoppi Restaurant)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 47.925" S	23° 0' 6.115" E		**23**
Sewerage Sumps Portion 1 (Training Offices)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 25.800" S	22° 59' 48.600" E	Name Specifications given to be included into the WUL.	**24**
Sewerage Sumps Portion 1 (Loadout)		Disposal of domestic effluent into sewage sumps	g	$40m^3$		$40m^3$			$40m^3$		Beesthoek 448	1	28° 17' 17.200" S	22° 59' 45.600" E		**25**
Sewerage Sumps Portion 1 (Training Offices)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 16.800" S	22° 59' 46.600" E		**26**
Sewerage Sumps Portion 1 (Training Offices)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 16.600" S	22° 59' 46.800" E		**27**
Sewerage Sumps Portion 1 (Stadium)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 28.600" S	22° 59' 54.900" E		**28**
Sewerage Sumps Portion 1		Disposal of domestic effluent into sewage sumps	g	$40m^3$		$40m^3$			$40m^3$		Beesthoek 448	1	28° 17' 26.200" S	22° 59' 53.600" E		**29**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
(Ammosal Rec Club)																
Sewerage Sumps Portion 1 (Laboratory)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 32.400" S	22° 59' 52.800" E		30
Sewerage Sumps Portion 1 (School)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 16' 59.500" S	22° 59' 40.100" E		31
Sewerage Sumps (Main Office Security Entrance)		Disposal of domestic effluent into sewage sumps	g	26m3		26m3			$26m^3$		Beesthoek 448	1	28°17'29" S	22°59'52" E		32
Sewerage Sumps (Road Transport 2)		Disposal of domestic effluent into sewage sumps	g	1,5m3		1,5m3			$1,5m^3$		Beesthoek 448	1	28°16'36.50"S	22°59'48.43"E		33
Sewerage Sumps (North Crusher Workshop)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	1	28° 17' 20.659" S	23° 0' 6.814" E		34
Sewerage Sumps (WHIMS Plant)		Disposal of domestic effluent into sewage sumps	g			-			$6m^3$		Beesthoek 448	1	28°16'45.69"S	23° 0'25.11"E	New Water Use	35
Sewerage Sumps (new Jig Plant)		Disposal of domestic effluent into sewage sumps	g			-			$6m^3$		Beesthoek 448	1	28°17'24.69"S	23° 0'17.49"E	New Water Use	36
Sewerage Sumps (North Mine Security Entrance)		Disposal of domestic effluent into sewage sumps	g	150m3		150m3			150m3		Beesthoek 448	1	28°16'59.53"S	22°59'56.35"E	Name Specifications given to be included into the WUL.	37
Sewerage Sumps Portion Re (South Engineering Offices)		Disposal of domestic effluent into sewage sumps	g			$20m^3$			$20m^3$		Beesthoek 448	RE 0	28° 18' 30.800" S	23° 0' 22.000" E	Sewerage Sumps Portion 1 (South Engineering Offices) incorrect portion - moved to portion RE (0)	38
Sewerage Sumps Portion Re (North Mine Security Entrance)		Disposal of domestic effluent into sewage sumps	g	$80m^3$	498,5m3/a	$80m^3$	498,5m3/a		$80m^3$	518,50m3/a	Beesthoek 448	RE 0	28° 18' 29.716" S	23° 0' 14.846" E	Name Specifications given to be included into the WUL.	39
Sewerage Sumps Portion Re (South TMM Workshop)		Disposal of domestic effluent into sewage sumps	g	$20m^3$		$20m^3$			$20m^3$		Beesthoek 448	RE 0	28° 18' 34.000" S	23° 0' 18.500" E	Name Specifications given to be included into the WUL.	40

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
Sewerage Sumps Portion Re (South TMM Workshop)		Disposal of domestic effluent into sewage sumps	g	15m³		15m³			15m³		Beesthoek 448	RE 0	28° 18' 39.600" S	23° 0' 17.400" E	Name Specifications given to be included into the WUL.	**41**
Sewerage Sumps Portion Re (South Bulk Diesel Storage Area)		Disposal of domestic effluent into sewage sumps	g	15m³		15m³			15m³		Beesthoek 448	RE 0	28° 18' 42.900" S	23° 0' 16.500" E	Name Specifications given to be included into the WUL.	**42**
Sewerage Sumps Portion Re (South Mine Crusher Workshop)		Disposal of domestic effluent into sewage sumps	g	20m³		20m³			20m³		Beesthoek 448	RE 0	28° 18' 46.200" S	22° 59' 59.300" E	Name Specifications given to be included into the WUL.	**43**
Sewerage Sumps Portion Re (Airport)		Disposal of domestic effluent into sewage sumps	g	15m³		15m³			15m³		Beesthoek 448	RE 0	28° 15' 59.800" S	22° 59' 25.800" E	Name Specifications given to be included into the WUL.	**44**
Sewerage Sumps Portion Re (Airport)		Disposal of domestic effluent into sewage sumps	g	10m³		10m³			10m³		Beesthoek 448	RE 0	28° 15' 58.800" S	22° 59' 26.800" E	Name Specifications given to be included into the WUL.	**45**
Sewerage Sumps Portion Re (Landfill)		Disposal of domestic effluent into sewage sumps	g	10m³		10m³			10m³		Beesthoek 448	RE 0	28° 16' 46.700" S	22° 59' 40.100" E	Name Specifications given to be included into the WUL.	**46**
Sewerage Sumps Portion Re (Road Transport 1)		Disposal of domestic effluent into sewage sumps	g	26m3		26m3			26m3		Beesthoek 448	RE 0	~~28°16’34.61”S~~ 28°16'28.12"S	~~22°59’44”E~~ 22°59'45.20"E	Name Specifications given to be included into the WUL. Coordinate amendment	**47**
Sewerage Sumps Portion Re (Road Transport 3)		Disposal of domestic effluent into sewage sumps	g	1.5m3		1.5m3			1.5m3		Beesthoek 448	RE 0	~~28°16’36.06”S~~ 28°16'31.94"S	~~22°59’46.43”E~~ 22°59'49.92"	Name Specifications given to be included into the WUL. Coordinate amendment	**48**
Sewerage Sumps Portion Re (Long distance parking)		Disposal of domestic effluent into sewage sumps	g	26m3		26m3			26m3		Beesthoek 448	RE 0	28°16’46” S	22°59'39” E	Name Specifications given to be included into the WUL.	**49**
Sewerage Sumps Portion Re (Conservancy tank at South Change house)		Disposal of domestic effluent into sewage sumps	g	240m3		240m3			240m3		Beesthoek 448	RE 0	28°18’34” S	23°00’15” E	Name Specifications given to be included into the WUL.	**50**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
Sewerage Sumps Portion Re (Uitsig)		Disposal of domestic effluent into sewage sumps	g			-			20m3		Beesthoek 448	RE 0	28°16'50.90"S	22°59'29.40"E	New Water Use	51
HH Pit Backfill		Backfilling of opencast pits	g	N/A	459 860t/a	-	459 860t/a	-	-	459 860t/a	Beesthoek 448	1	28° 16' 43.7" S	23° 1' 20.2" E	No amendment required	52
HL pit area Backfill		Backfilling of opencast pits	g	-	2 212 010t/a	-	2 212 010t/a	-	-	2 212 010t/a	Beesthoek 448	1	28° 17' 21.6" S	23° 00' 55.6" E	No amendment required	53
BN Pit Backfill		Backfilling of opencast pits	g	-	1 625 221t/a	-	1 625 221t/a	-	-	1 625 221t/a	Beesthoek 448	1	28° 16' 13.9" S	23° 0' 17.2" E	Existing Water Use Name change from BN N Pit Backfill to BN Pit Backfill.	54
East Pit Backfill		Backfilling of opencast pits	g	-	2 119 897t/a	-	2 119 897t/a	-	-	2 119 897t/a	Olynfontein 475	4	~~28° 20' 31.2" S~~ 28°20'32.62"S	~~22° 59' 37.7" E~~ 23° 0'29.03"E	Minor Coordinate adjustment to indicate centre point	55
GK Pit Backfill		Backfilling of opencast pits	g	-	1 468 839t/a	-	1 468 839t/a	-	-	1 468 839t/a	Beesthoek 448	1	28° 18' 23.4" S	23° 1' 9.6" E	No amendment required	56
Detrital Area		Backfilling of opencast pits	g	-	1 224 840t/a	-	1 224 840t/a	-	-	1 224 840t/a	Olynfontein 475	4	28° 19' 40.3" S	23° 1' 9.6" E	No amendment required	57
West Pit Backfilling		Backfilling of opencast pits	g	-	10 536 114t/a	-	10 536 114t/a	-	-	10 536 114t/a	Olynfontein 475	4	28° 19' 18.6" S	22° 59' 30.8" E	No amendment required	58
Product Stockpile Area		Product Stockpile Area 1&2	g	-	5 998 500t/a	-	5 998 500t/a	-	-	5 998 500t/a	Beesthoek 448	1	28°16'51.18"S	23° 0'3.31"E	No amendment required	59
Plant Stockpiles		Stockpiles	g	-	300 000t	-	300 000t/a		-	1 500 000t/a	Beesthoek 448	1	28° 17' 20.9" S	22° 59' 58.6" E	Increase in volumes required.	60
South Combined Off Grade Stockpiles		Off Grade Stockpiles	g	-	4 450 000t/a	-	4 450 000t/a	-	-	7 090 000t/a	Olynfontein 475 Beeshoek 448	4 RE 0	~~28° 19' 1.487" S~~ 28°19'16.70"S	~~22° 59' 57.711" E~~ 23° 0'10.72"E	Existing Water Use. Combination of ROM Stockpile area (South Contaminated ROM 1, South Contaminated ROM 2 - including BIS and South ROM Stockpile 1), no change in throughput. Centre Coordinate provided.	61
			g	-	1 920 000t/a	-	1 920 000t/a	-	-				~~28° 19' 17.636" S~~	~~23° 0' 8.749" E~~		
			g	-	720 000t/a	-	720 000t/a		-				~~28° 18' 55.383" S~~	~~23° 0' 2.324" E~~		
South Off Grade ROM 1		Off-grade Waste Dump 3 (ROM South)	g	-	2 508 000t/a	-	2 508 000t/a	-	-	2 508 000t/a	Beesthoek 448	RE 0	28° 18' 54.499" S	23° 0' 19.721" E	No amendment required	62
South ROM Stockpile 1		Stockpiles	g	-	720 000t/a	-	720 000t/a		-	720 000t/a	Beesthoek 448	RE 0	28° 18' 55.383" S	23° 0' 2.324" E	No amendment required	63
South ROM Stockpile 2		Stockpiles	g	-	1 000 000t	-	1 000 000t/a	-	-	1 000 000t/a	Olynfontein 475	4	28°18'54.90"S	22°59'25.88"E	No amendment required	64
S Offgrade ROM 2		Stockpiles	g	-	1 000 000t	-	1 000 000t/a	-	-	1 000 000t/a	Beesthoek 448	RE 0	28°18'40.23"S	22°59'48.08"E	No amendment required	65
N Offgrade ROM 1		Offgrade ROM stockpiles	g	-	1 000 000t	-	1 000 000t/a	-	-	1 000 000t/a	Beesthoek 448	1	28°17'33.46"S	23° 0'22.67"E	No amendment required	66
~~BIS ROM North 1~~	-	~~Stockpiles being reworked - no further deposition~~	~~g~~	-	~~2 950 000 tons (current capacity~~	-	~~2 950 000 tons (current capacity~~	-	-	~~2 950 000 tons (current capacity~~	~~Beesthoek 448~~	~~1~~	~~28° 17' 40.35" S~~	~~23° 0' 53.51" E~~	Existing Water Use This use is replaced by reinstating the HF WRD	-

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
					~~stored, no further deposition)~~		~~stored, no further deposition)~~			~~stored, no further deposition)~~					which was previously rehabilitated.	
BIS ROM North 2		Stockpiles	g	-	3 150 000 tons	-	3 150 000t/a		-	3 150 000t/a	Beesthoek 448	1	~~28° 16' 57.23" S~~ 28°16'47.85"S	~~23° 1'5.97" E~~ 23° 1'13.21"E	Minor Coordinate adjustment to indicate centre point	**67**
Shale Stockpile		Stockpiles being reworked - no further deposition	g	-	361 633 tons (current capacity stored, no further deposition)	-	361 633 tons (current capacity stored, no further deposition)	-	-	361 633 tons (current capacity stored, no further deposition)	Beesthoek 448	1	28° 16' 34.66" S	23° 0'4.95" E	No amendment required	**68**
Quartzite Stockpile		Stockpiles being reworked - no further deposition	g	-	1 668 163 tons (current capacity stored, no further deposition)	-	1 668 163 tons (current capacity stored, no further deposition)	-	-	1 668 163 tons (current capacity stored, no further deposition)	Beesthoek 448	1	28°16'46.03"S	23° 0'12.39"E	No amendment required	**69**
Jig Discard Dump		Stockpiles (will include the feed stockpiles into the Jig Plant namely intermediate transfer stockpile)	g	-	9 000 000t	-	9 000 000t/a		-	9 000 000t/a 60ha	Beesthoek 448	1	28°17'16.38"S	23° 0'23.44"E	Existing Water Use This facility will increase in footprint towards the north, to allow for reworking practices to continue from the southern periphery of the facility through the new Jig Plant. No change in approved throughput.	**70**
Fine Residue Dam (Slimes Dam)		Disposal of contaminated water and slimes into fine residue dam	g	-	4 864 520m3/a	-	4 864 520m3/a	-	-	4 864 520m3/a	Beesthoek 448	1	28° 16' 27.0" S	23° 0' 48.0" E	No amendment required	**71**
North ROM Stockpile		Stockpiles	g	-	1 400 000t	-	1 400 000t/a	-	-	1 400 000t/a	Beesthoek 448	1	28° 16' 39.3" S	23° 0' 11.6" E	No amendment required	**72**
South Detrital Stockpile Area		Stockpiles	g	-	2 240 000t/a	-	2 240 000t/a	-	-	2 240 000t/a	Olynfontein 475	4	28° 19' 40.540" S	23° 0' 50.227" E	No amendment required	**73**
East Pit WRD		Stockpiles	g	-	68 850 000t	-	68 850 000t/a		-	68 850 000t/a 170ha	Olynfontein 475	4	28° 20' 17.916" S	23° 0' 10.965" E	Existing Water Use The operational design of this facility will change, which will change the footprints. No change in approved throughput.	**74**
Village North WRD (VP1)		Stockpiles	g	-	31 500 000t	-	31 500 000t/a	-	-	31 500 000t/a 96ha	Beesthoek 448	RE 0	28° 18' 21.630" S	22° 59' 26.890" E	Existing Water Use Name Change from Village WRD to Village North WRD (VP 1).	**75**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
															The operational design of this facility will change, which will change the footprints. No change in approved throughput.	
WRD North		Stockpiles	g	-	7 000 000t	-	7 000 000t/a	-	-	7 000 000t/a	Beesthoek 448	1	28°17'43.93"S	23° 0'36.85"E	No amendment required	76
HH Pit WRD		Stockpiles	g	-	6 800 000t	-	6 800 000t/a	-	-	6 800 000t/a	Beesthoek 448	1	28°16'47.08"S	23° 1'21.81"E	No amendment required	77
West Pit WRD (VP2) (now to be referred to as Village South WRD)		Stockpiles	g	-	21 413 403t	-	21 413 403t/a	-	-	21 413 403t/a 135ha	Olynfontein 475	4	28°19'25.69"S	22°59'46.02"E	Existing Water Use Name Change from West Pit WRD to Village South WRD. The operational design of this facility will change, which will change the footprints. No change in approved throughput.	78
HL WRD		Stockpiles	g	-	10 983 334t	-	10 983 334t/a	-	-	10 983 334t/a	Beesthoek 448	1	28°17'7.01"S	23° 1'8.32"E	No amendment required	79
HF WRD		Stockpiles	g			-	-		-	6 000 000t/a	Beesthoek 448	1	28°17'42.05"S	23° 0'50.71"E	New Water Use This was the original WRD Footprint. HF WRD is a previously reworked WRD. The mine applied for this Section 21g to be reused as the North BIS ROM 1 Stockpile	80
GF WRD		Stockpiles	g	-	7 721 766t	-	7 721 766t/a	-	-	7 721 766t/a 54ha	Beesthoek 448	1	28° 17' 3.12" S	23° 0' 38.58" E	Existing Water Use The operational design of this facility will change, which will change the footprints. No change in approved throughput.	81
Dust Suppression North		Dust Suppression (BN Truck filling point)	g	-	257 518m3/a	-	257 518m3/a	-	-	257 518m3/a	Beesthoek 448	1	28° 16' 12.559" S	23° 0' 10.784" E	No amendment required	82
Dust Suppression South		Dust Suppression (SM Filling Point)	g	-	211 660m3/a	-	211 660m3/a	-	-	211 660m3/a	Beesthoek 448	RE 0	28° 18' 49.821" S	22° 59' 54.705" E	No amendment required	83
Village dewatering dam	Diameter: 12 000mm Height: 2 000mm Approx. Volume: 250m³ Type: Steel	Additional dam to transfer/store pit detwatering influx of water when needed.	g						250 m3	350 000 m3/a	Beesthoek 448	1	28°17'32"S	22° 59'46"E	New water use	84

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
Land-fill Site		Land Fill Site	g	-	500 000t	-	500 000t/a	-	-	500 000t/a	Beesthoek 448	RE 0	28° 16' 39.725" S	22° 59' 40.088" E	No amendment required	85
WHIMS Staging Stockpile x 2		Feed to the WHIMS Plant	g						6 000m3 (2 x 3000m3)	1 147 330t/a	Beesthoek 448	1	28°16'38.53"S	23° 0'26.85"E	New Water Use	86
WHIMS Plant Clarifier	Elevated steel fabricated tank. Diameter 56m by 6.3m deep	Fines Processing Water Tank	g						9 700m3	6 737 686m^3/a	Beesthoek 448	1	28°16'42.41"S	23° 0'23.05"E	New Water Use	87
Process Water Tank (WHIMS Plant)	Steel fabricated tank. Diameter 30m by 3.9m high	Process Water Tank for new Jig Plant	g						2 000m^3	1 544 783m^3/a	Beesthoek 449	1	28°16'41.88"S	23° 0'24.32"E	New Water Use	88
WHIMS Plant Central Water Dam	HDPE lined eartdam. 75.8m by 41.9m by 2.7m deep with 0.8m freeboard.	Process Water Tank at WHIMS Plant	g						5 000m3	1 544 783m^3/a	Beesthoek 448	1	28°16'37.00"S	23° 0'23.00"E	New Water Use	89
WHIMS Plant Emergency Product Stockpile		Emergency Feed	g						20 m^3	-	Beesthoek 448	1	28°16'40.96"S	23° 0'26.54"E	New Water Use	90
WHIMS 1mm Product Stockpile		Product Stockpile	g						1000 m^3	360 436t/a	Beesthoek 448	1	28°16'43.40"S	23° 0'21.04"E	New Water Use	91
Process Water Tank	Potential design	Balancing Tank for existing Clarifier	g						2000m3	8 631 851m^3/a	Beesthoek 448	1	28°17'17.40"S	23° 0'9.14"E	New Water Use	92
BN Tank	Potential design	Providing storage for input dewatering water	g						500m3	178 743 m^3/a	Beesthoek 448	1	28°16'45.26"S	22°59'56.60"E	New Water Use	93
Plastic Tanks	4x10m3 plastic covered tanks.	4x10m3 plastic tanks to allow for the efficient storage and transfer of process water within the existing Beneficiation Plant circuit (back up storage for the beneficiation plant area)	g						40m3 4x10m3	15 000 m^3/a	Beesthoek 448	1	28°17'17.70"S	23° 0'7.22"E	New Water Use	94
Zinc Dam	Diameter: 8550mm Height: 1600mm Approx. Volume: 91.86m^3	To store process water where required.	g	-	-				90 m3	15 000 m^3/a	Beesthoek 448	1	28°17'23.04"S	23° 0'5.48"E	Existing dams on site, which will be reinstated as part of internal transfer dams. New Water Use	95

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
	Type: Concrete															
Steel Dam	Diameter: 15000mm Height: 2400mm Approx. Volume: 424.12m³ Type: Zink	To store process water and allow for the storage of top-up water	g	-	-				250 m3	180 000 m³/a	Beesthoek 448	RE 0	28°17'42.61"S	23° 0'16.02"E	Existing dams on site, which will be reinstated as part of internal transfer dams. New Water Use	**96**
New Jig Plant Arising - 32+1mm ROM Transfer Stockpile		New Low Grade Stockpile from existing Jig Plant feed into new Jig Plant	g						6000m³	992 500t/a	Beesthoek 448	1	28°17'17.17"S	23° 0'31.32"E	New Water Use	**97**
New Jig Plant Low Grade - 32+1mm Intermediate ROM Stockpile		New Low Grade Stockpile from existing Low Grade Stockpile (Discard Dump) feed into new Jig Plant	g						5500m³	1 500 660t/a	Beesthoek 448	1	28°17'18.70"S	23° 0'35.48"E	New Water Use	**98**
New Jig Plant Low Low Grade Stockpile (placed on Discard Dump footprint)		New ROM Stockpile feed into new Jig Plant	g						118m³	594 468t/a	Beesthoek 448	1	28°17'20.21"S	23° 0'18.30"E	No new water use - to be place on the existing Discard Dump Footprint	**99**
Village Pit (main, south and east) backfill		Backfilling of opencast pits	g					-	-	1 872 559t/a	Beesthoek 448	1	28°17'51.24"S	22°59'29.24"E	New Water Use	**100**

Water Use Name	Dimensions	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	Throughput (m3/a or tonnes)						
Section 21(j)																
BN In Pit Dewatering	-	In pit dewatering	a&j			-	432 000	-	-	432 000	Beesthoek 448	1	28° 16' 14.231" S	23° 0' 9.816" E	Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to on site and regional mining activities	**1**
~~BN In Pit Dewatering~~	-	~~WG66: Dewatering Borehole~~	~~a&j~~	-	-	-	194 948	-	-	-	~~Beesthoek 448~~	~~1~~	~~28° 16' 11.519" S~~	~~23° 0' 3.795" E~~	Borehole no longer in use	~~**2**~~

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
OW022 (BN Borehole)	-	Dewatering Borehole	a&j			-			-	135 000	Beesthoek 448	1	28°16'15.99" S	22°59'59.78"E	Additional borehole requested to assist with dewatering of BN Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**2**
Village Pit Dewatering	-	In pit dewatering	a&j			-	420 000	-	-	420 000	Beesthoek 448	RE 0	28° 17' 29.13" S	22° 59' 21.88" E	Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to on site and regional mining activities	**3**
	-	~~WG 12 (Village Dewatering)~~ WG75 (Village Dewatering)	a&j			-	343 360	-	-	540 000	Beesthoek 448	RE 0	28°17'42.449"S	22°59'30.702"E	Name change requested and increase in dewatering volumes required. Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to on site and regional mining activities	**4**
WG73: Dewatering Borehole	-	Village Pit Dewatering	a&j	-	-	-	1 900 000	-	-	600 000	Beesthoek 448	RE 0	28°17'57.7" S	22°59'32.4"E	Reduction in water abstraction volumes. Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to on site and regional mining activities	**5**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m³)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
OW025 (Village Dewatering, West of Pit)	-	Dewatering borehole	a&j			-	-		-	160 000	Beesthoek 448	RE 0	28°17'16.11" S	22°59'15.69"E	Additional borehole requested to assist with dewatering of Village Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**6**
OW026 (Village Dewatering, East of Pit 1)	-	Dewatering borehole	a&j			-	-		-	50 000	Beesthoek 448	RE 0	28°17'20.98" S	22°59'43.27"E	Additional borehole requested to assist with dewatering of Village Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**7**
OW027 (Village Dewatering, East of Pit 2)	-	Dewatering borehole	a&j			-	-		-	50 000	Beesthoek 448	RE 0	28°17'27.42" S	22°59'43.26"E	Additional borehole requested to assist with dewatering of Village Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**8**
OW028 In-Pit borehole (Village Dewatering)	-	Dewatering borehole	a&j			-	-		-	160 000	Beesthoek 448	RE 0	28°17'33.9" S	22°59'17.55"E	Additional borehole requested to assist with dewatering of Village Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**9**
WG 70 Dewatering borehole	-	Village Pit Dewatering	a&j			-	-		-	200 000	Beesthoek 448	RE 0	28°17'57.51" S	22°59'32.27"E	Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to on site and regional mining activities	**10**

Water Use Name	Dimensions for application	Description	Water Use	2018 WUL		2018 WUL (2019 amendment)		Disposal Volume (m^3)	2021 WUL		Farm Name	Farm Portion	South	East	Comment on Application Form	WUL Map Referencing
				M3	m3/a	Capacity (m3)	m3/a		Capacity (m3)	m3/a						
WG74 (near HF Pit) - replace WG51 A&B and WG63	-	Pit dewatering	a&j	-	-	-	500 000	-	-	500 000	Beesthoek 448	1	28°17'26.21"S	23°00'51.41"E	Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to on site and regional mining activities	**11**
HF Pit Boreholes Additional borehole (OW029)	-	Pit dewatering	a&j	N/A		-	-		-	200 000	Beesthoek 448	1	28°17'22.66"S	23° 00'53.32"E	Additional borehole requested to assist with dewatering of HF Pit. Request that location not be fixed with a coordinate but rather the Farm Portion. Borehole not yet in place therefore no name or location is available.	**12**
HF Pit dewatering	-	In pit dewatering for safe mining conditions and the use in mine processing and associated activities	a&j			-	-		-	500 000	Beesthoek 448	1	28°17'27.33"S	23° 0'50.12"E	Request to remove specific coordinates for dewatering and only refer to the Farm Portion - same aquifer. This is required as the dewatering areas may change a water plumes migrate due to on site and regional mining activities	**13**
Total (S21j)							**3 790 308**			**3 947 000**						

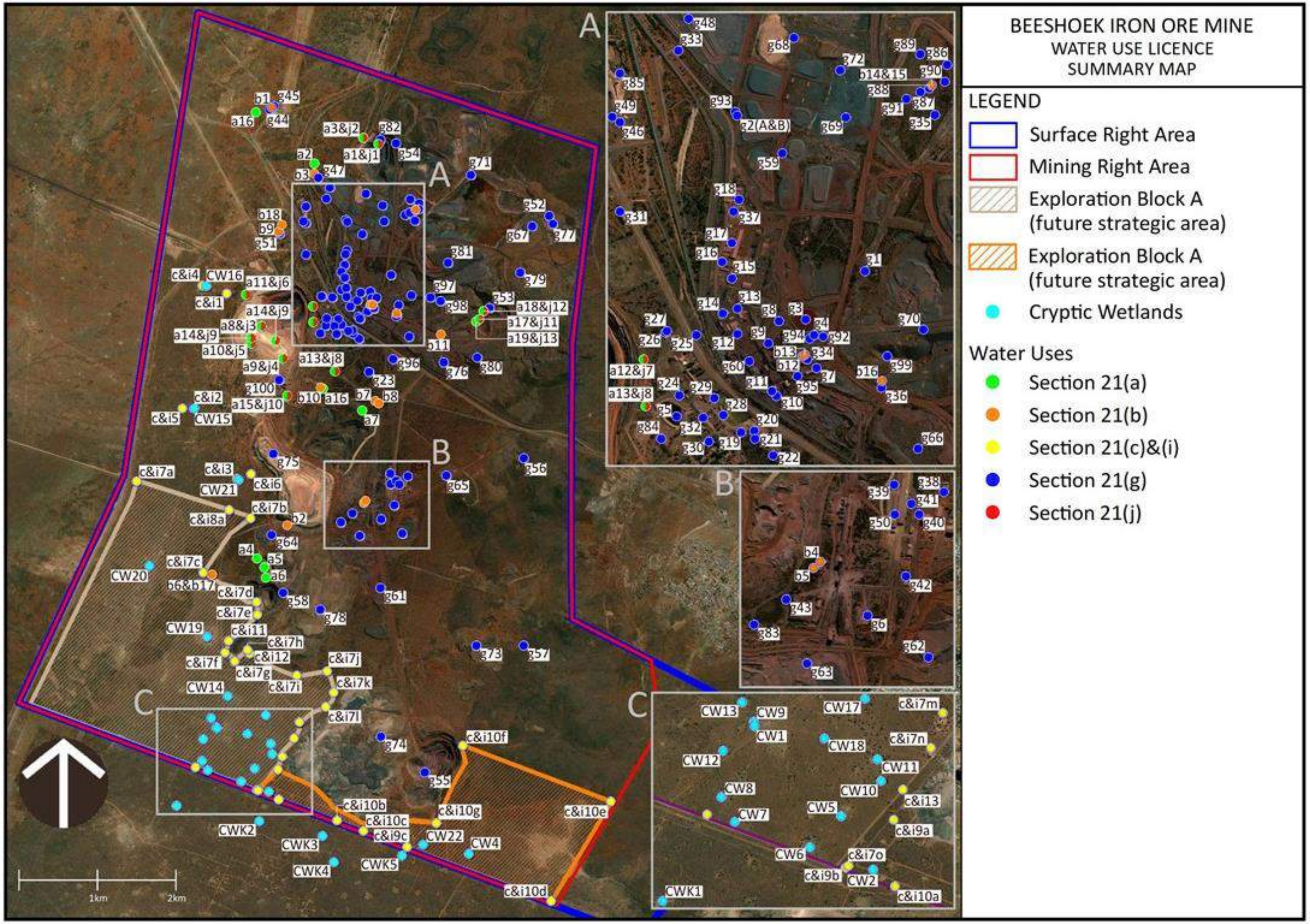


Figure 4A: Preliminary Water Use Map

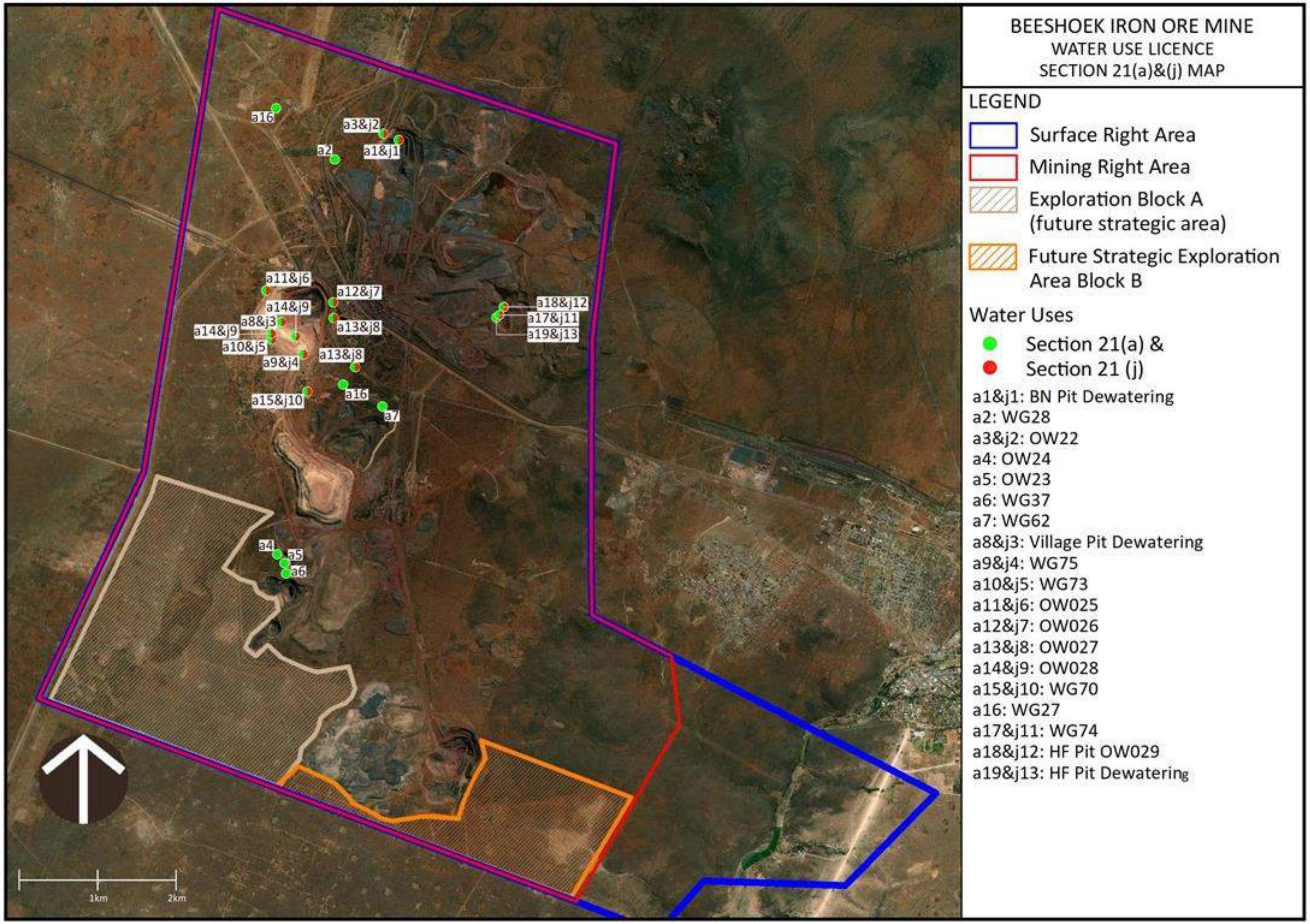


Figure 5B: Preliminary Water Use Map - Section 21a&j water uses

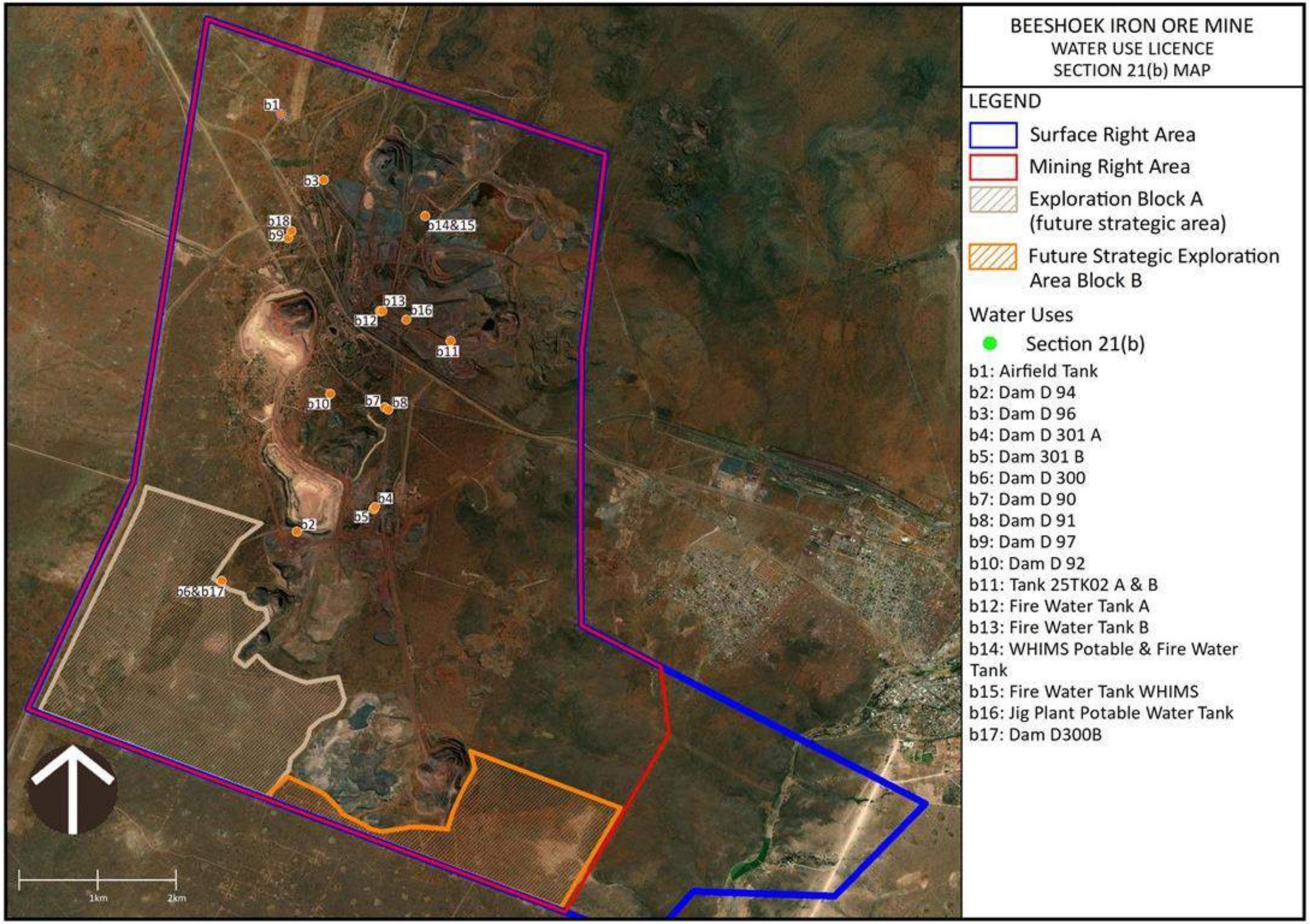


Figure 6C: Preliminary Water Use Map - Section 21b water uses

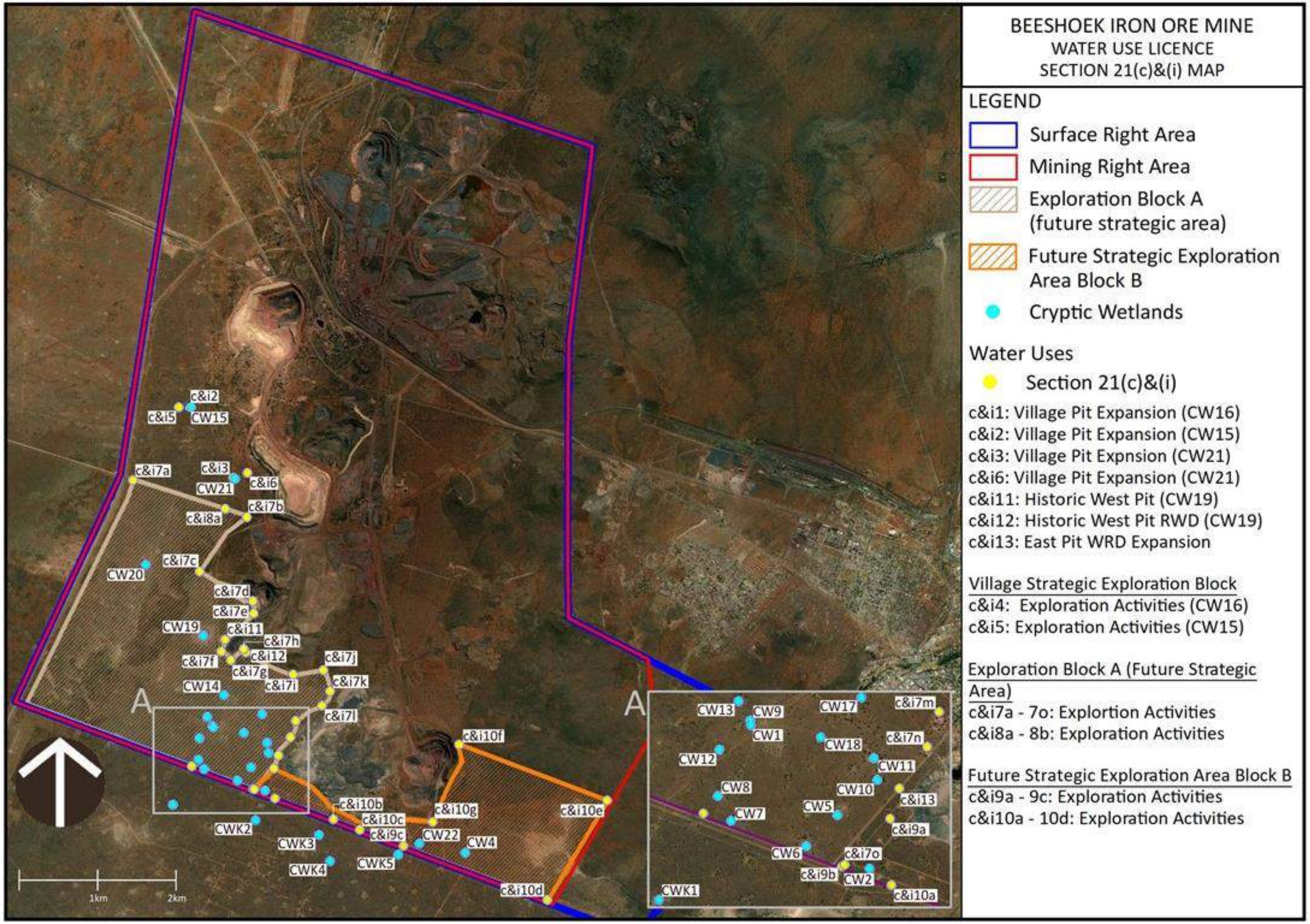


Figure 7D: Preliminary Water Use Map - Section 21c&i water uses

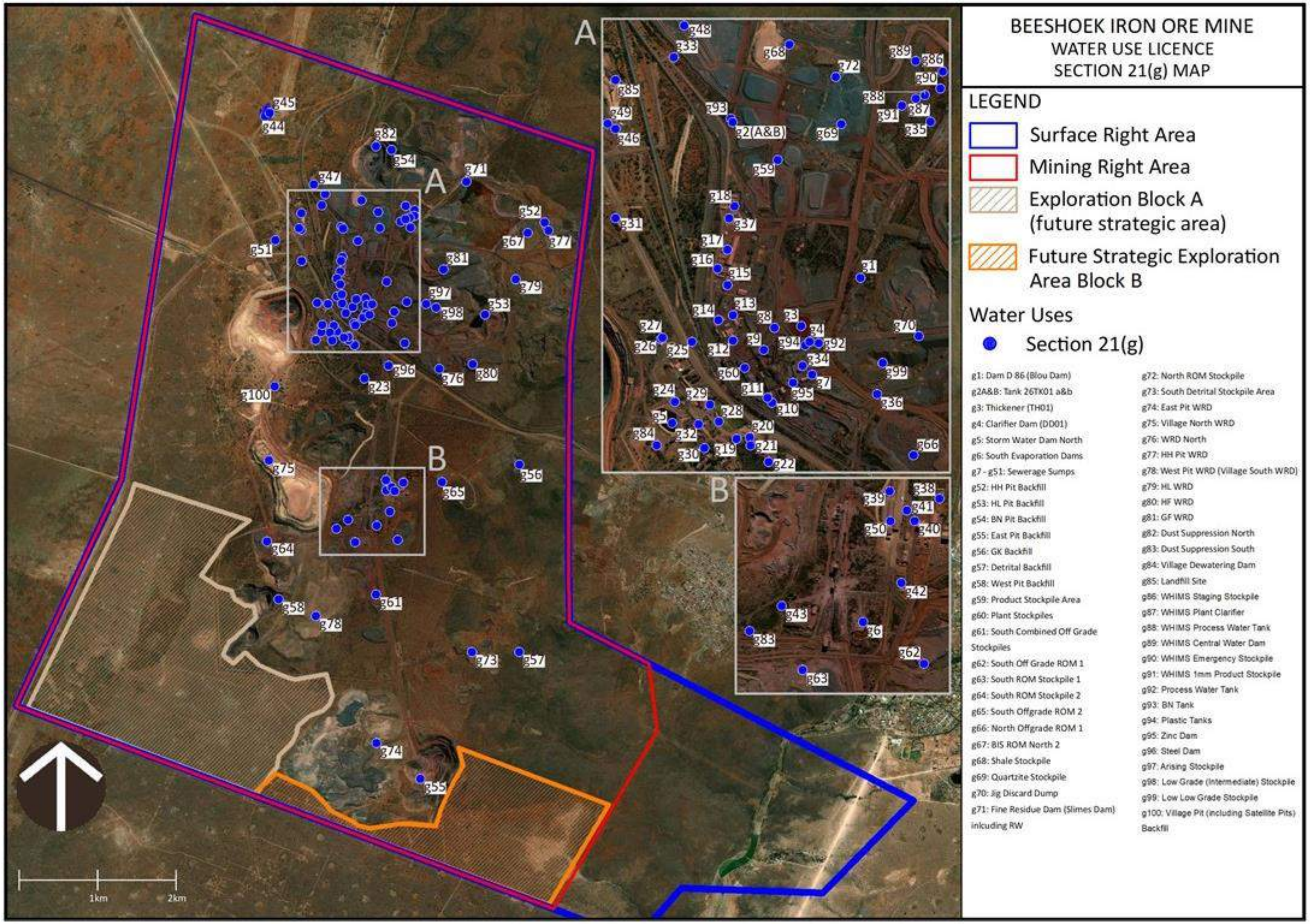


Figure 8E: Preliminary Water Use Map - Section 21g water uses

2.c Project Description

2.c.i Project 1: Consolidation of Run of Mine (ROM) Stockpiles on South Mine

2.c.i.1 Current Status on Site

Iron Ore rich material removed from the Beeshoek opencast operations are stored on ROM Stockpiles (both on-grade and off-grade) on site. ROM Stockpiles are processed through the plant process. The on-grade and off-grade are blended when required to meet the specific market requirements.

Please refer to the following table for a list of ROM Stockpiles occurring on the Mine. The ROM Stockpiles to be consolidated as part of the proposed project are highlighted in green in the table below.

Table 10: Current approved ROM Stockpiles

Name	Description	Farm Name	Farm Portion	South	East
Off-grade Waste Dump 1, 2 and 3	**South Contaminated ROM 1**	Olynfontein 475	4	28° 19' 1.487" S	22° 59' 57.711" E
	South Contaminated ROM 2 (including BIS)	Olynfontein 475	4	28° 19' 17.636" S	23° 0' 8.749" E
	South Off-Grade ROM 1	Beesthoek 448	RE 0	28° 18' 54.499" S	23° 0' 19.721" E
ROM Stockpile	**South ROM Stockpile 1**	Beesthoek 448	RE 0	28° 18' 55.383" S	23° 0' 2.324" E
South ROM Stockpile 2	Village ROM Stockpile	Beesthoek 448	RE 0	28°18'54.90"S	22°59'25.88"E
South Off-Grade ROM 2	Village ROM Stockpile	Beesthoek 448	RE 0	28°18'40.23"S	22°59'48.08"E
North Off-Grade ROM 1	ROM Stockpiles	Beesthoek 448	1	28°17'33.46"S	23° 0'22.67"E
BIS ROM North 1	ROM Stockpiles	Beesthoek 448	1	28° 17' 40.35" S	23° 0' 53.51" E
BIS ROM North 2	ROM Stockpiles	Beesthoek 448	1	28° 16' 57.23" S	23° 1'5.97" E
North ROM Stockpile	Stockpiles	Beesthoek 448	1	28° 16' 39.3" S	23° 0' 11.6" E

2.c.i.2 Proposed Project

In areas where individual ROM stockpiles are located, these will be consolidated to allow for further capacity and operational management. The table before highlights the stockpiles applicable to the consolidation. The sites required by the mine include:

- South ROM Stockpiles (ROM Stockpile 1, South Contaminated ROM 1 and Contaminated Dump 2) and the South BIS Stockpile. Refer to the following figure.

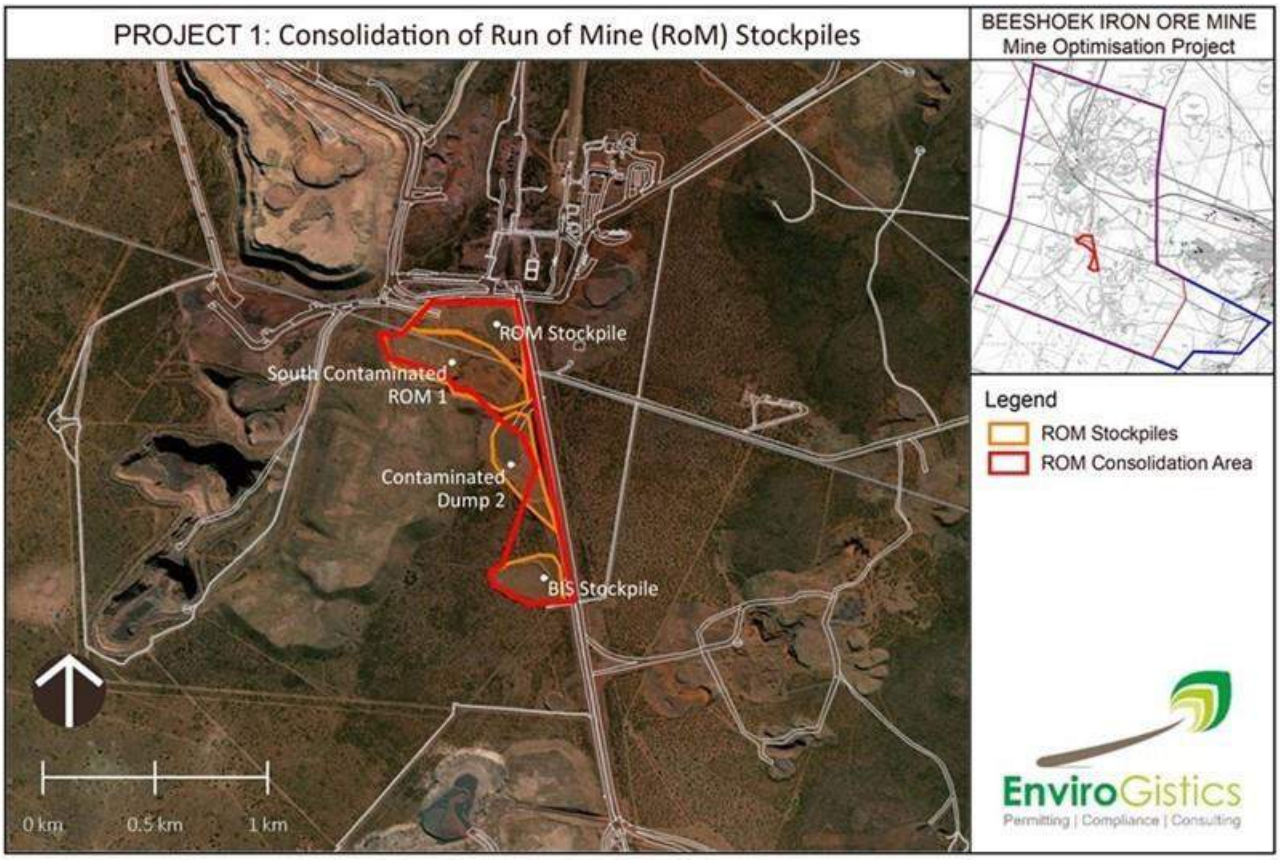


Figure 9: ROM Stockpiles (red) to be consolidated (orange)

Please see the following photo of the illustration of this area.

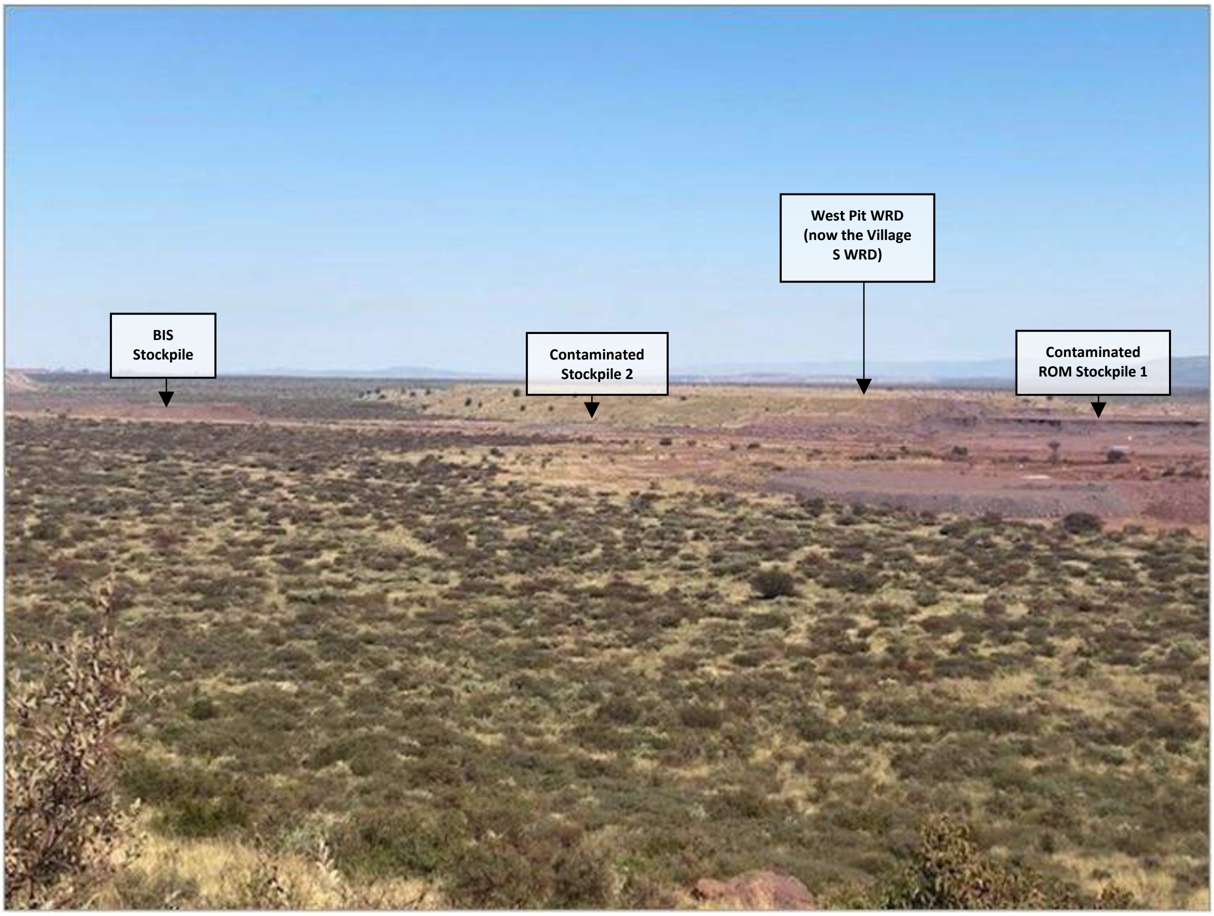


Photo 1: ROM Stockpile Footprint on South Mine

The following table provides the area and location of the proposed ROM Stockpile consolidation.

Table 11: Project 1: Consolidation of ROM Stockpiles

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
Project 1: Consolidation of Run of Mine (ROM) Stockpiles on South Mine	The ROM stockpile areas on South Mine will be demarcated as a combined ROM Stockpile area for both on-grade, off-grade and BIS. The current WUL allows for the following ROM deposition on the stockpiles in question – note that the deposition of ROM will not increase in annual throughput: South Contaminated ROM 1: 4 450 000t/a South Contaminated ROM 2 Off-Grade ROM Stockpile, including BIS: 1 920 000t/a ROM Stockpile: 720 000t/a	Overall Area: 35ha [no clearance of vegetation is required; this area is located on the north-eastern perimeter of the West Pit WRD (now referred to as the Village Pit South WRD) and the western boundary of the haul road towards East Pit] Operational heights may differ.	28°18'59.31"S; 22°59'48.38"E 28°18'53.98"S; 22°59'55.75"E 28°18'53.83"S; 23° 0'7.64"E 28°19'37.47"S; 23° 0'16.29"E 28°19'37.95"S; 23° 0'9.79"E 28°19'35.28"S; 23° 0'4.64"E Centre coordinate: 28°19'16.70"S; 23° 0'10.72"E	Part 1, Regulation 29: "An environmental authorisation may be amended by following the process prescribed in this Part if the amendment; a) Will not change the scope of a valid environmental authorisation nor increase the level or nature of the impact, which impact was initially assessed and considered when the application was made for an environmental authorisation; or b) Relates to the change of ownership or transfer of rights and obligations".
Temporary Access Roads	N/A			
Permanent linear infrastructure (roads or pipelines)	N/A			
Clearance	N/A. The consolidated ROM Stockpiles on South Mine will be located within the existing cleared area associated with the existing ROM Stockpile Areas and West WRD (now referred to as the Village Pit South WRD) to the west of the ROM Stockpile.			

2.c.ii Project 2: Amendments to the design of existing Waste Rock Dumps (WRDs) in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints

2.c.ii.1 Current Status

2.c.ii.1.a Existing Mine Residue Deposits and Stockpiles as well as Low Grade and ROM Stockpiles

The historical extent of mining operations at Beeshoek, over the course of various regulatory requirement changes, since the 1991 Minerals Act and internal allocation of management units, has resulted in changes to the original naming convention of Mine Residue Deposits, which has created extensive confusion over time. For example, the 2004 EMP makes reference to 54 Discard Dumps of varying size on the northern mining area and 10 Waste Dumps on the southern mining rea. The 2009 EMP again makes reference to WRDs, which include:

- "Two (2) waste rock dumps at the BN Pit at North Mine (new);
- One (1) waste rock dump, which has been constructed within the footprints of the HB;
- Quarry at the North Mine (new);
- One (1) waste rock dump, situated to the south of the HH Quarry at the North Mine;
- One (1) waste rock dump, situated to the west of the HL Quarry at North Mine;
- Two (2) waste rock dumps are situated to the south of HF Quarry at the North Mine;
- Two (2) waste rock dumps are situated to the south and north of the GF Quarry respectively at the North Mine;
- One (1) waste rock dump to the east of the Beeshoek Village situated on to the north of the R385;
- One (1) waste rock dump situated to the west of the BF Quarry at South Mine;
- One (1) waste rock dump situated to the west of the crusher at South Mine; and
- One (1) waste rock dump situated to the south of the crusher at South Mine.

For this reason, a study was initiated to assess the drawings submitted with the 2004 and subsequent EMPs and the approved WUL, and a process of grouping and naming these facilities were initiated."

The waste streams associated with Beeshoek include:

- Waste Rock Dumps (WRDs) or Low Grade Stockpiles:
  - North Mine:
    - BN WRD;
    - HH WRD;
    - HL WRD;
    - WRD North;
    - Discard Dump; and
    - GF WRD.
    - Other non-waste stockpiles on Beeshoek in this area include:
      - ROM Stockpile (North);
      - BIS ROM North 1 & 2;
      - North Off-grade ROM;
      - B Dump ROM;
      - In-Plant Stockpiles;
      - Shale Dump (product to be used in construction – not a waste);
      - Quartzite Stockpile (product to be used in construction – not a waste); and
      - Plant Stockpiles (mine products).
  - South Mine:
    - Village (previously BF) WRD (now Village Pit North WRD)
    - Detrital Stockpiles;
    - East Pit WRD;
    - West Pit WRD (now referred to as the Village Pit South WRD);
    - Other non-waste stockpiles on Beeshoek in this area include:
      - Contaminated ROM Stockpile 1 & 2;
      - Off-grade ROM;
      - South ROM;
      - Village Off-grade ROM;
      - Village ROM; and
      - BIS ROM.

The table below present the approved WRDs according to the EMPrs.

Table 12: Mine Residue Deposits according to approved Environmental Authorisations/EMPrs

Name	Definition	Centre Coordinate	Slope	Footprint (approx. ha)	Height
HH Waste Rock Dump	Discard	28° 16' 56.8" S; 23° 1' 19.7" E	General slope of the WRDs is approximately 40 degrees. For the Village Pit WRD approval it is stated that at closure the side slopes will have been constructed at an angle of no steeper than 1:3.	19	Not stated/restricted in the EMP Alignment (Village Pit WRD approved height is 45m)
HL Waste Rock Dump	Discard	28°17'7.01" S; 23° 1'8.32" E		73	
Waste Rock Dump North	Contaminated Material	28° 17' 34.2" S; 23° 0' 32.7" E		15	
GF Waste Rock Dump (including BN Waste)	Discard	28° 17' 3.12" S; 23° 0' 38.58" E		43	
Discard Dump	Contaminated Material	28° 17' 12.7" S; 23° 0' 21.5" E		29	
Shale Waste Rock Dump	Byproduct – not a Waste Product, but incidental to mining operation. As this is not included into the Mining Right, it cannot be sold off as a product.	28° 16' 34.66" S; 23° 0'4.95" E		3	

Name	Definition	Centre Coordinate	Slope	Footprint (approx. ha)	Height
Quartzite Waste Rock Dump	By product – not a Waste Product, incidental to mining operation, as this is not included into the Mining Right, it cannot be sold off as a product.	28° 16' 35.21" S; 23° 0'8.60" E		1	
Village (previously BF) WRD	Discard	28° 18' 21.630" S; 22° 59' 26.890" E	No steeper than 1:3.	70	45m
Detrital Stockpiles	Discard	28° 19' 40.540" S; 23° 0' 50.227" E	According to the EMP Alignment the general slope of the WRDs is approximately 40 degrees. For the Village Pit WRD approval it is stated that at closure the side slopes will have been constructed at an angle of no steeper than 1:3.	101	Never stated in EMPs – will not exceed 45m, which is the maximum approved height for WRDs on site (Village Pit WRD approved height).
East Pit Waste Rock Dump	Discard	28° 20' 17.916" S; 23° 0' 10.965" E		142	
West Pit Waste Rock Dump (now referred to as the Village Pit South WRD)	Discard	28°19'19.70"S; 22°59'28.06"E		76	
Slimes Dam	Contaminated Material	28° 16' 27.0" S; 23° 0' 48.0" E	Disposal into old pit no slope applicable.	73	10m

The Shale and Quartzite WRDs arose from overburden removal during the development of the opencast pits. No further material is deposited on these areas. The Licence Holder may want to rework or remove these dumps from site, but will require approval from the DMRE as these are regarded as WRDs (i.e. do not form part of allowable mineable resources in terms of the Mining Right, and are disposed of as it is unwanted).

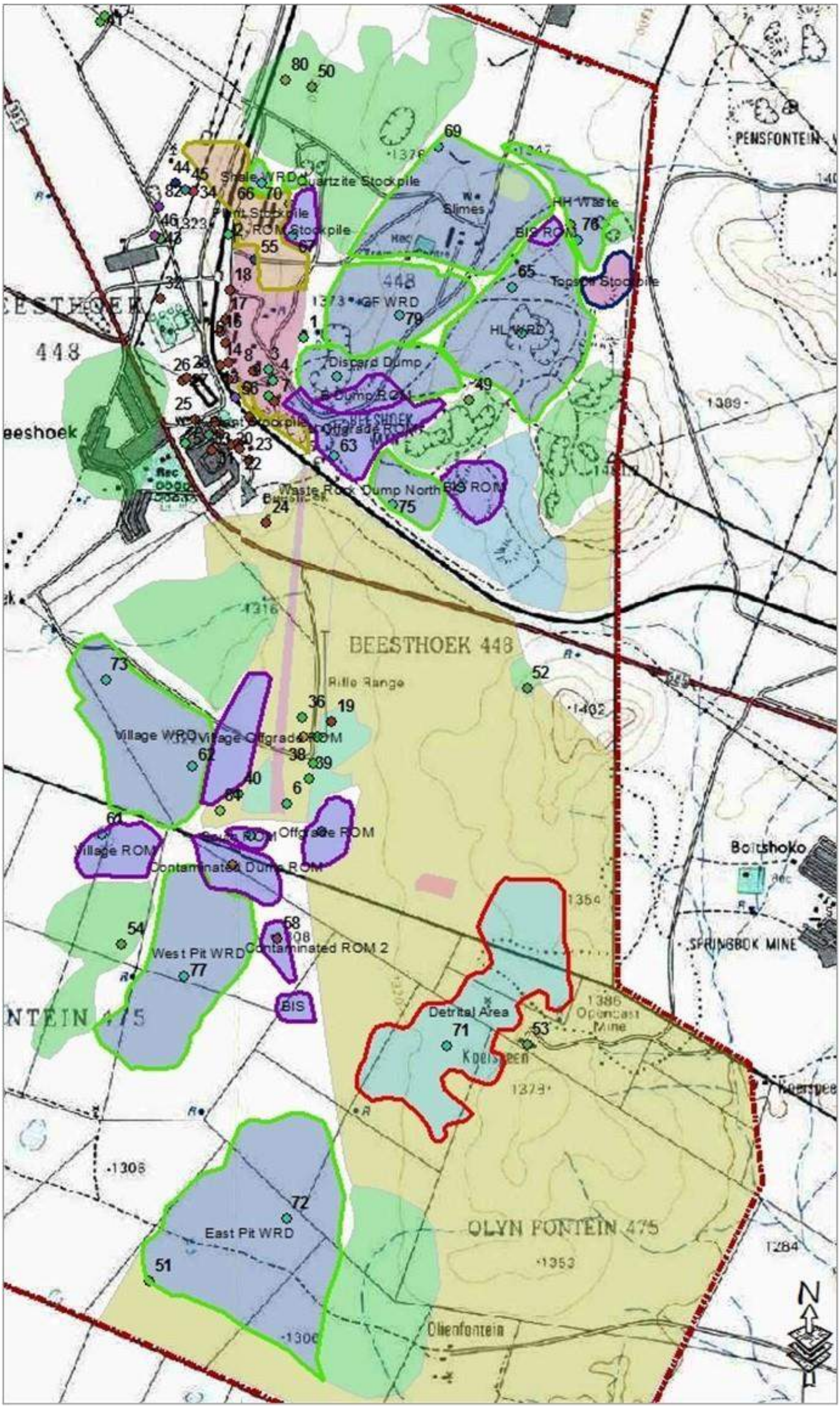


Figure 10: Approved layout in terms of the WUL, 2018 and as combined from past drawings(light green indicates opencast pit areas; light blue - north indicates rehabilitated WRDs)

2.c.ii.1.b Discard Dump

In addition to the waste rock, material from the current Jig Plant is sent to the "Discard Stockpile", which is in fact considered a stockpile with sufficient iron ore grade for reworking.

Table 13: Current approved Discard Dump

Name	Definition	Centre Coordinate	Slope	Footprint (approx. ha)	Height
Discard Dump	Contaminated Material	28° 17' 12.7" S; 23° 0' 21.5" E	According to the EMP Alignment the general slope of the WRDs is approximately 40 degrees. For the Village Pit WRD approval it is stated that at closure the side slopes will have been constructed at an angle of no steeper than 1:3.	29	Not specified in EMPr. Operational hight is maximum of 60m.

It should be noted that the Mine intends to optimise approved Mine Residue Footprints. For this reason, should additional storage of discard be required or any other waste, classified within the same type (i.e. Type 3), these may be stored on such footprints (Type 3 waste stockpiled on Type 3 footprints and not specifically limited to the name of the facility). This will optimise waste disposal and reduce the need to expand Mine Residue Footprints where these are not specifically required.

2.c.ii.1.c Existing Slimes Dam

An old Slimes Dam was present on site prior to the 2004 EMP. The 2004 EMP stated that the previous slimes dam (constructed in an old quarry) reached the end of its life and that a new Slimes Dam will be implemented. The new Slimes Dam was included into the 2009 EMP Alignment. This facility was instated within the footprints of a quarry which was located to the northeast of the Plant. The historic (old) Slimes Dam was backfilled and used for the GF WRD development.

The new Slimes Dam is operating in the same manner as the previous slimes dam.

<u>Description</u>

According to the Geo Tail (Pty) Ltd (Geo Tail) Slimes Dam Conceptual Design Report, 2009 (approved as part of the initial 2015 WUL), impoundment embankments and existing WRDs provide storage capacity for fine residue disposal. Waste material from opencast mining is used for embankment construction and material is placed mechanically in horizontal layers with the mining fleet. The maximum vertical height of the facility is approximately 20m along the north flank, with the vertical height of the impoundment embankment along the wet flank generally less than approximately 5m.

The slimes generated from the plant processing activities represent approximately 14-16% of ore put through the Plant. Water from the dewatering screen is pumped to the Slimes Dam. The slurry delivery pipeline is placed on the impoundment embankment crest. The fine residue is designed to be discharged at a concentration of approximately 25% solids by mass through pen and delivery stations from the impoundment embankments to form a beach that slopes downwards away from the embankments. Currently tests are undertaken to investigate a ring-feed method of disposal to further improve settling and capacity management. The mud is allowed to settle, and the clear water is pumped back to the Plant. A supernatant pool is maintained in the immediate vicinity of the decant barge. The floating barge decants from an old quarry located in the northeast corner of the basin. The design is stated in such a manner that, if necessary, the pool will be relocated, or the embankment will be lined/ sealed to control the phreatic level in the impoundment embankment adjacent to the pool.

The Slimes Dam is operated on a ring feed system. Slimes are strategically deposited from the perimeter of the facility to allow for the required settling of material. This method will further assist with the re-mining through the WHIMS Plant.

The design characteristics, including the dimensions and capacity of the Slimes Dam as per the 2009 Geo Tail Slimes Dam Conceptual Design Report are:

<u>Dam Classification</u>

The overall safety hazard rating for the facility is 'Low', with no potential significant impact on the environment.

<u>Design Criteria</u>

The following design for the Slimes Dam was included in the 2009 EMP Alignment:

Table 14: Slimes Dam Design as per approved EMP

Infrastructure	Dimension	
Waste Walls	Top Width	10m
	Bottom Width	36.5m
	Height	10m
	Waste wall material requirements	615 100m^3 or 1.7 million tonnes
Rehabilitation	Waste required to rehabilitate	1 000 000 tonnes
Liner		None
Capacity		6 953 460 tonnes

The following table presents the detailed design as per the approved design report:

Table 15: Slimes Dam Design as per approved WUL (2015) and subsequent update (2018)

Infrastructure	Dimension
Full Supply Level	Total airspace volume: 7.4 million m^3 or 16.7 million tonnes
Final Top Surface Area of the basin	Approximately 60ha
Final Rate of rise	Approximately 1.0m/a
Design life of mine	Approximately 12.6 years from 2009

Please refer to the following table for the location of the Slimes Dam:

Table 16: Slimes Dam Location

Name	Definition	Centre Coordinate	Slope	Footprint (approx. ha)	Height
Slimes Dam	Contaminated Material	28° 16' 27.0" S; 23° 0' 48.0" E	N/A	73	10m

No changes to the Slimes Dam are made as part of this application.

2.c.ii.1.d Waste Classification

Mine Residue Deposits, i.e. the Slimes Dam and WRDs, present potential point sources of groundwater pollution and continued visual intrusion following closure of a mine. These facilities will, unless otherwise recovered, remain on surface at mine closure and require specific actions at closure, or concurrent to operation, to mitigate the potential long-term impacts thereof on groundwater quality (if determined by a groundwater investigation) and the visual and aesthetic character of the landscape. It should be noted that the Mine Residue Deposits have been classified as Type 3 Waste.

The mine appointed Geo Pollution Technologies (Pty) Ltd (GPT) to conduct a critical evaluation of the groundwater quality monitoring network at the Mine and also to develop groundwater-related management plans. In the report (Reference ASBEE-16-1240), dated April 2016 the following was concluded:

The study stated that:

- Surface sources of contamination are currently not characterised in terms of contamination potential, which will be required if the monitoring network is to be expanded sufficiently.
- The groundwater quality limits should be re-evaluated based on exceedances from background water qualities. Pre-mining contamination status of the aquifer already exceeds WUL limits under natural conditions. Therefore, the WUL limits set unrealistic targets for water quality.
- Additional monitoring positions should be determined based on contamination potential of existing sources.

A second study was conducted by GPT, dated April 2017 (Reference ASBEE-16-1987) to determine the groundwater risk and required monitoring network amendments and address recommendations from the previous study.

According to the 2017 Groundwater Risk Assessment and Monitoring Network Audit conducted by GPT the following statements are made:

- Based on the groundwater quality analyses, solid waste analyses and liquid waste analyses, as well as the statistical analysis of the data, it can be deduced that the chemical signatures of the three (3) mediums (solid waste, liquid waste and groundwater) are quite similar.
- Additionally, it was found that the constituents exceeding the relevant screening levels for each of the three mediums are also similar.
- Also, most of the sources are located within the dewatered area, directing any contaminants towards the active mining areas.
- Therefore, groundwater monitoring in terms of chemistry is not recommended for expansion as the effects of sources on the groundwater environment are likely to be negligible and are unlikely to be observed in samples as the chemical signatures of the different mediums are so similar.

The report also states the following: "The available hydrogeochemical data (including solid waste, liquid waste and groundwater) were analysed using IBM.s SPSS v. 20. The corresponding chemical constituents between each of the samples were defined as chemical fingerprints, which could be correlated and cross-correlated with each other in an attempt to identify the similarities between the waste samples and background water quality. All the chemical compositions of the solid waste and liquid waste samples show a significant correlation (á = 0.01 or 0.05) with that of at least one background groundwater sample. This illustrates that contamination from these sources is likely to have the same geochemical signature as the local groundwater. This shows that contamination to the aquifer from the identified sources is unlikely."

A further follow up study was conducted by GPT, dated May 2019. The study concluded:

- While nitrate concentration exceeds the SANS241-1:2015 standard limit in BN Pit, WG74 and WG32, none of the contaminants of concerns (Nitrates, Barium and Manganese) exceed the prescribed WUL limits.
- Of the three (3) contaminants investigated, only Nitrates may be regarded as a contaminant of concern in groundwater.
- However, the occurrence of Nitrate in groundwater indicates that Nitrate is naturally occurring outside of the mining areas with minor contribution from the use of explosives in the mining area.
- A cone of groundwater depression has developed within the active mining area with flow directed towards the mining excavation due to mine dewatering.
- The dewatering process negates any build-up of contaminants in the groundwater on and under the mining area.
- In the mining environment, the leaching of blasting residue from waste rock., slimes and mine water impoundments are also potential sources of nitrate in groundwater.
- The contribution of Nitrogen (N)-based explosives to nitrate concentration in groundwater is negligible compared to background values.
- Based on the scope and findings of the investigation within the mining area and immediate surroundings, Barium and Manganese were not regarded as contaminants of concern in groundwater.
- Dewatering in the pits contributes significantly to minimising the potential for groundwater contamination.

Based on the sections above, the following is reiterated: "contamination to the aquifer from identified sources unlikely".

2.c.ii.2 Proposed Project

The Mine indicated the need to update the heights and designs of certain WRDs on site to take into consideration rehabilitation requirements. These include:

- HF WRD;
- GF WRD;
- Discard Dump (for this an operational layout will suffice);
- Village Pit North Waste Rock Dump (VP1) WRD;
- West Pit WRD (now referred to as the Village Pit South WRD);
- East Pit WRD.

The increase in the heights as well as achieving the planned rehabilitation slopes will also require the increase in the footprint areas.

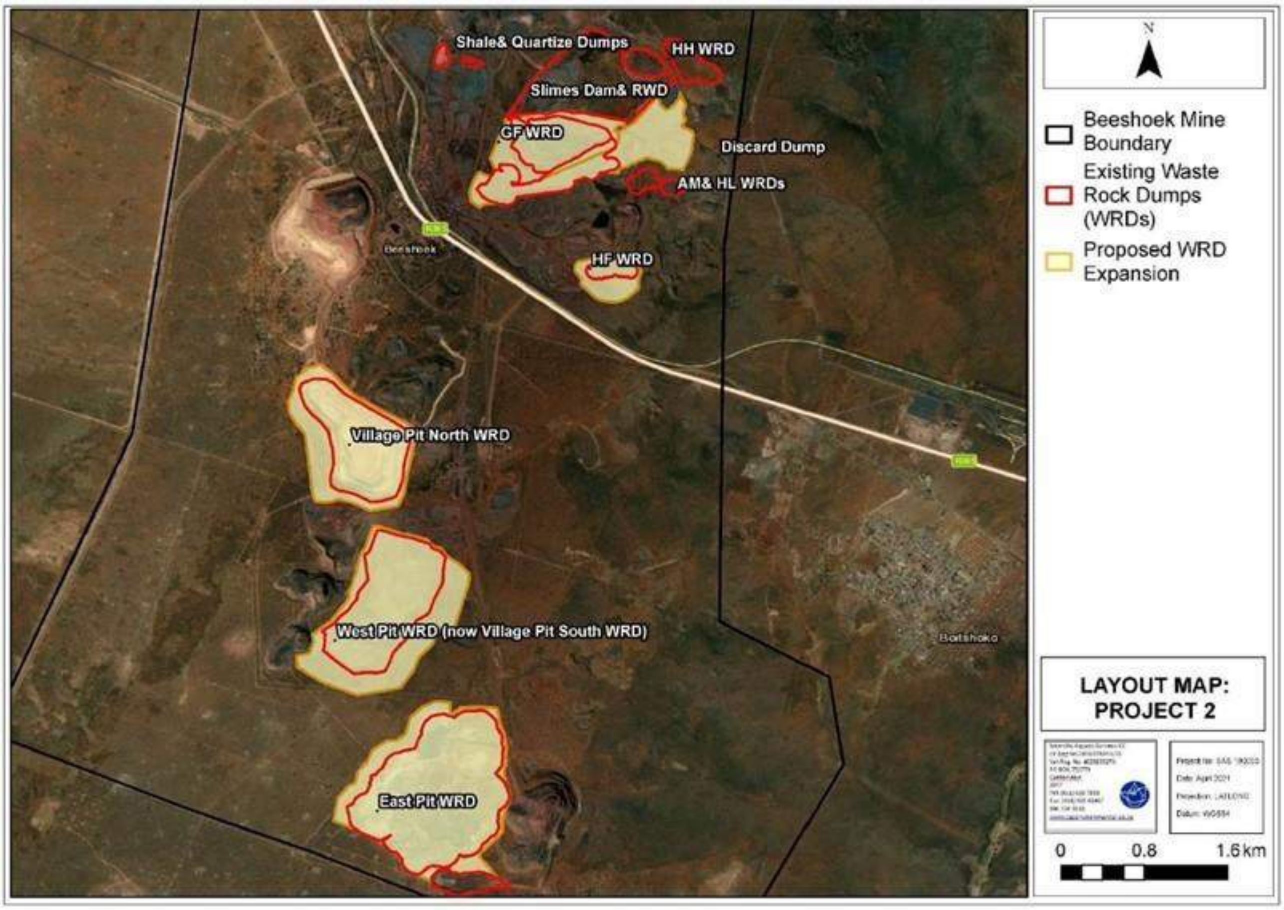


Figure 11: WRDs in question

This project also includes the demarcation of the Discard Dump and associated increase in this area. The following table describes the Environmental Authorisations associated with this part of the project:

Table 17: WRD Project

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
Project 2: Amendments to the design of existing Waste Rock Dumps in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints	- Village Pit North Waste Rock Dump (VP1): Current area approximate 70ha, to be increased with approximately 26ha (final area 96ha) to allow for final slope and footprint upon rehabilitation (will involve clearance of about 25ha) – this will also remove the required Storm Water Dam, which was a recommendation in its associated EMPr for the Village WRD EMPr, but has as yet not been constructed, due to the low run-off in this area and subsequent storm water management studies - The decommissioning of the Storm Water Dam will not trigger a listed activity as the "active activity" does not entail an "operational component"). The current operational height is a maximum of 93m, and the planned operational height is 111m (upon rehabilitation 112m) (height increase of 18m). - GF Waste Rock Dump: Current area approximately 48ha, to be increased by about 6ha (final area about 54ha) to allow for final slope and footprint upon rehabilitation. Based on the location of this WRD between the Discard Dump and the existing Slimes Dam it is unlikely that any clearance will be triggered. The	<u>Village Pit North WRD</u> Footprint – 96ha Height – 111m, upon rehabilitation 112m <u>GF WRD</u> Footprint – 54ha Height – 82m, upon	<u>Village Pit North WRD</u> Centre Coordinate: 28°18'38.34"S; 22°59'32.55"E <u>GF WRD</u> Centre Coordinate: 28°17'0.37"S; 23° 0'33.46"E	**<u>Listing Notice 1, Activity 12:</u>** The development of—dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or 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. **<u>Listing Notice 1, Activity 19</u>**: 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 cubic metres from watercourse. **<u>Listing Notice 2, Activity 15</u>**: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for—the undertaking of a linear activity. It is assumed that Category A Activity

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
	current heigh of this facility is approximately 55m, with a planned operational height of 82m (upon rehabilitation 84m) (height increase of 29m). - East Pit Waste Rock Dump: Current area approximately 144ha, to be increased by about 26ha (final area about 170ha) to allow for final slope and footprint upon rehabilitation (will involve clearance in excess of 25ha). The current height of this facility is about 40m, with a planned operational height is 94m (upon rehabilitation 94m (height increase of 54m). - West Pit Waste Rock Dump (now referred to as the Village Pit South WRD): Current area approximately 80ha, to be increased with about 55ha (final area 135ha) to allow for final slope and footprint upon rehabilitation (will likely involve clearance of about 35ha). This facility has been rehabilitated. The planned operational height is 98m (upon rehabilitation 106m). - HF Waste Rock Dump (new dump on historic dump footprint): Current area approximately 20ha and used for BIS stockpiling, to be reused to allow for HF Pit waste rock disposal, as well as final slope and footprint upon rehabilitation. This area is located on an existing WRD footprint (no additional clearance therefore required). The currently height is 26m, with a planned operational height of 39m (upon rehabilitation 63m). - Discard Dump: Current area approximately 28ha, to be increased to about 60ha. This area is located within the mining area, between WRDs, Slimes Dam and Opencast Pits, no clearance will be required. The height of the facility is planned to be up to 60m, where currently it is at approximately 30m. The current WUL allows for the following deposition – note that the deposition of material will not increase in annual throughput, however the life of mine and total capacity/footprint will increase: - Village Pit North WRD: 31 500 000t/a - West Pit WRD (now referred to as the Village Pit South WRD): 21 413 403t/a - GF WRD: 7 721 766t/a - HL WRD: 10 983 334t/a - BIS ROM North 1 – 2: +50 000t/a (on historic HF WRD) - East Pit WRD: 68 850 000t/a - Discard Dump: 9 000 000t/a	rehabilitation 84m <u>East Pit WRD</u> Footprint – 170ha Height – 94m, upon rehabilitation 94m <u>West Pit WRD</u> (now referred to as the Village Pit South WRD) Footprint – 135ha Height – 98m, upon rehabilitation 106m <u>HF WRD</u> Footprint – 20ha Height – 39m, upon rehabilitation 63m <u>Discard Dump</u> Footprint – 60ha Height – 60m	<u>East Pit WRD</u> Centre Coordinate: 28°20'21.91"S; 22°59'59.19"E <u>West Pit WRD</u> (now referred to as the Village Pit South WRD) Centre Coordinate: 28°19'27.99"S; 22°59'46.23"E <u>HF WRD</u> Centre Coordinate: 28°17'42.05"S; 23° 0'50.71"E <u>Discard Dump</u> Centre Coordinate: 28°17'6.65"S; 23° 0'51.98"E	15: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which requires a prospecting right or mining right in terms of the MPRDA is <u>not relevant as no additional mining rights are required and the activities entail the expansion of approved facilities</u>. For that reason: **<u>Waste Management Activities</u>: Category A, Activity 13**: The expansion of a waste management activity listed in Category A or B of this Schedule which does not trigger an additional waste management activity in terms of this Schedule is more relevant. **<u>Water Uses</u>**: Section 21(g) and potential Section 21 (c)&(i) for the presence of various dry pans in the area. GN704 Exemption requirements for the operation of unlined Mine Residue Deposits.
Temporary Access Roads	N/A			
Permanent linear infrastructure (roads or pipelines)	N/A			

ABGM (Pty) Ltd - Australia (ABGM) is involved in all the planning activities (medium- and long-range planning) for Beeshoek Mine's deposits. A Design Report, dated December 2020, was compiled by the company to present a summary of a review completed for the WRD designs of Beeshoek Mine.

2.c.ii.2.a WRD Composition and Classification

The WRDs consist of a mixture of material as a result of the various lithology's that make up the waste material at Beeshoek. Based on historic drilling conducted at the Mine, the rock mass is made up of the following geological units:

- Overburden;
- Calcrete;
- Paling Shale;
- Quartzites;
- Sishen Shales;
- Banded Iron Stone;
- Manganese;
- Chert Breccia; and
- Dolomite.

Mine Residue Deposits, i.e. the Slimes Dam and WRDs, present potential point sources of groundwater pollution and continued visual intrusion following closure of a mine. These facilities will, unless otherwise recovered, remain on surface at mine closure and require specific actions at closure, or concurrent to operation, to mitigate the potential long-term impacts thereof on groundwater quality (if determined by a groundwater investigation) and the visual and aesthetic character of the landscape. It should be noted that the Mine Residue Deposits have been classified as Type 3 Waste.

2.c.ii.2.b Geotechnical Considerations

A Geotechnical study was also considered as part of the engineering study and concluded that five (5) WRD's at Beeshoek are well within the required limits for long term stability. To reduce the need for assumptions and ensure a high level of confidence in the analysis, conservative material parameters were selected for the models. The minimum safety factor required for long-term stability is 1.3, as taken from the work conducted by Stacey (2009). The Factors of Safety (FoS) obtained for each of the sections taken along the dumps are summarised below.

Table 18: WRD Factors of Safety (FoS)

Name	Safety Factor (Section along ramp)	Safety Factor (Section away from ramp)
Village North WRD	1.741	1.448
GF WRD	1.385	1.517
East WRD	1.769	1.702
West Pit (Village South) WRD	2.026	1.530
HF WRD	2.971	1.500

2.c.ii.3 Rehabilitation Consideration

The rehabilitation principles of the WRDs below are as follows:

- Using existing material on the facility to shape and blend the facility;
- Final side slopes to about 18 degrees;
- Utilisation of graders to shape the facility;
- Rip the facility and construct wind breaks/berms to manage water and wind erosion;
- Allow for the self-succession of vegetation;
- Targeted Alien Invasive Species management; and
- Ongoing maintenance which will included:
    - Weed eradication;
    - Erosion control and correction; and
    - Addition of seeds or plant species should self-succession be delayed.

2.c.ii.4 Village Pit North Waste Rock Dump (VP1) WRD

The Village WRD North design is also deemed reasonable and within the expected WRD design criteria according to the December 2020 engineering report.

The current operational height is 93m with a footprint of 70ha. The planned operational height is about 111m. The design criteria are in line with typical WRD designs and the angle of repose seems very reasonable.

The average total slope on design angle is approximately 26.2 degrees. The average bench angles (repose) are approximately 34.8 degrees.

It is planned that the Village Pit North WRD will be rehabilitated to a slope of 18 degrees. The final rehabilitation height at the highest point of the facility will be 112m. The rehabilitation activities will result in an increase in the footprint to 96ha, an overall increase of about 26ha.

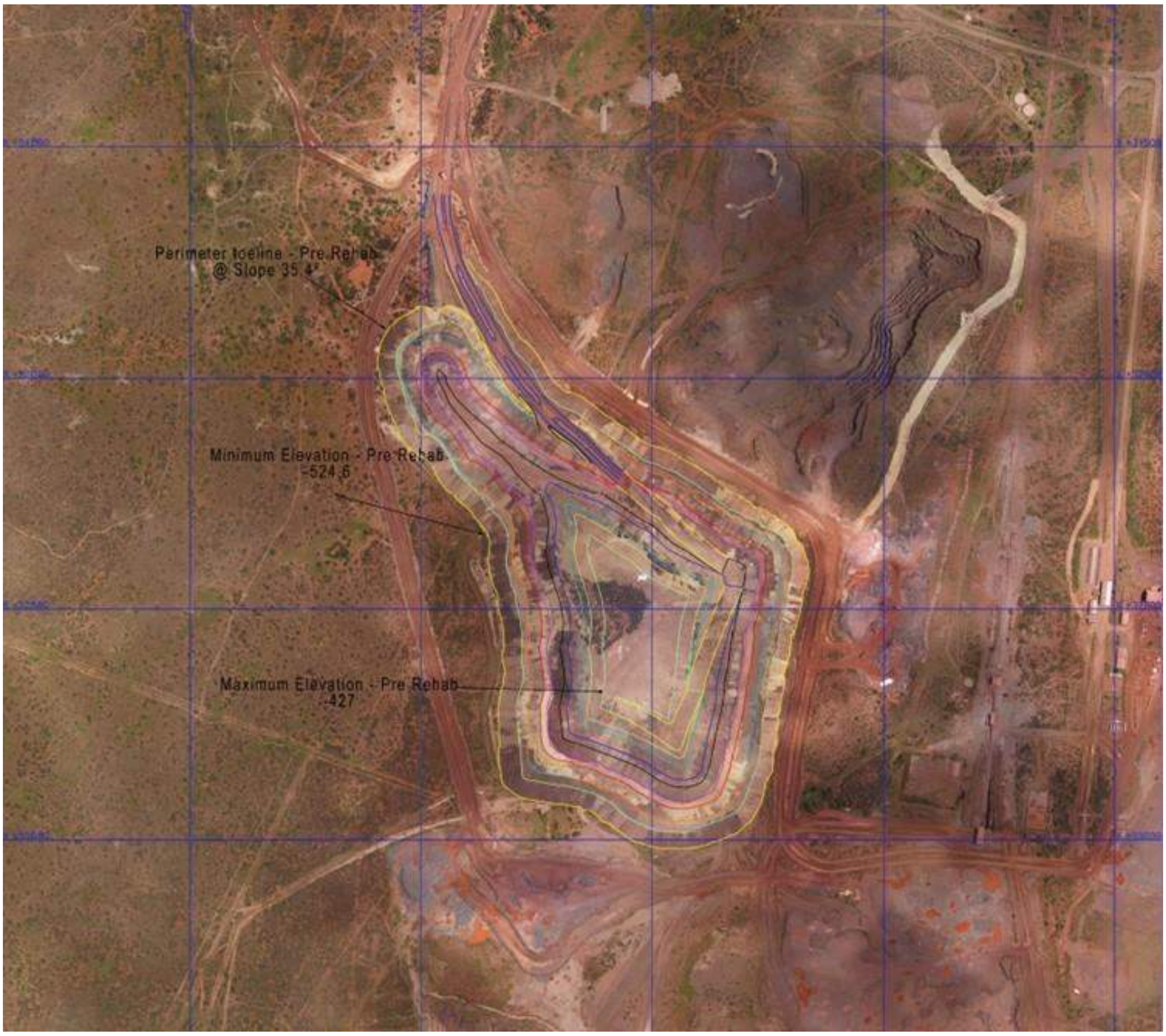


Figure 12: Village Pit North WRD Pre-Rehabilitation (ABGM, 2020)

Figure 13: Village Pit North WRD Post-Rehabilitation (ABGM, 2020)

Table 19: Village Pit North Waste Rock Dump (VP1) WRD

Current Height (m)	Current Slope	Operation Height (m)	Planned Rehabilitation Height (m)	Planned Rehabilitation Slope
111	26	111	112	18

2.c.ii.5 GF WRD

The GF WRD is currently operating at a heigh of 55m, within a footprint of about 48ha. This facility is a large rock dump and have a maximum available operational height of approximately 81.5m. The design criteria are in-line with typical WRD designs and the angle of repose seems very reasonable.

The average total slope of the WRD design angle is approximately 24.5 degrees, with bench angles (repose) of approximately 33.7 degrees.

It is planned that this WRD will be rehabilitated to a slope of 18 degrees. The final rehabilitation height at the highest point of the facility will remain at 84m. The rehabilitation activities will result in an increase in the footprint to 54ha, an overall increase of about 6ha.

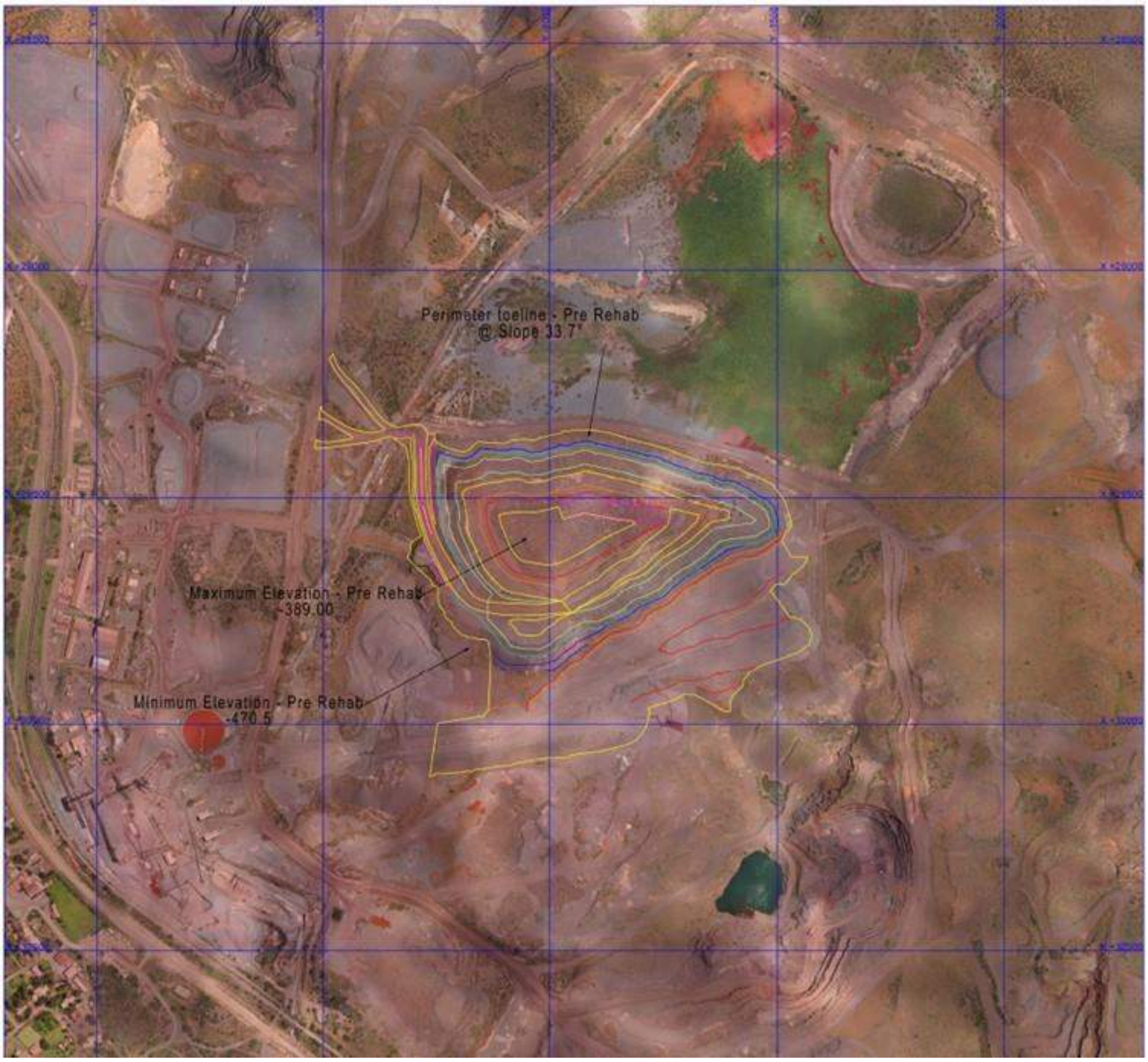


Figure 14: GF Pit WRD Pre-Rehabilitation (ABGM, 2020)

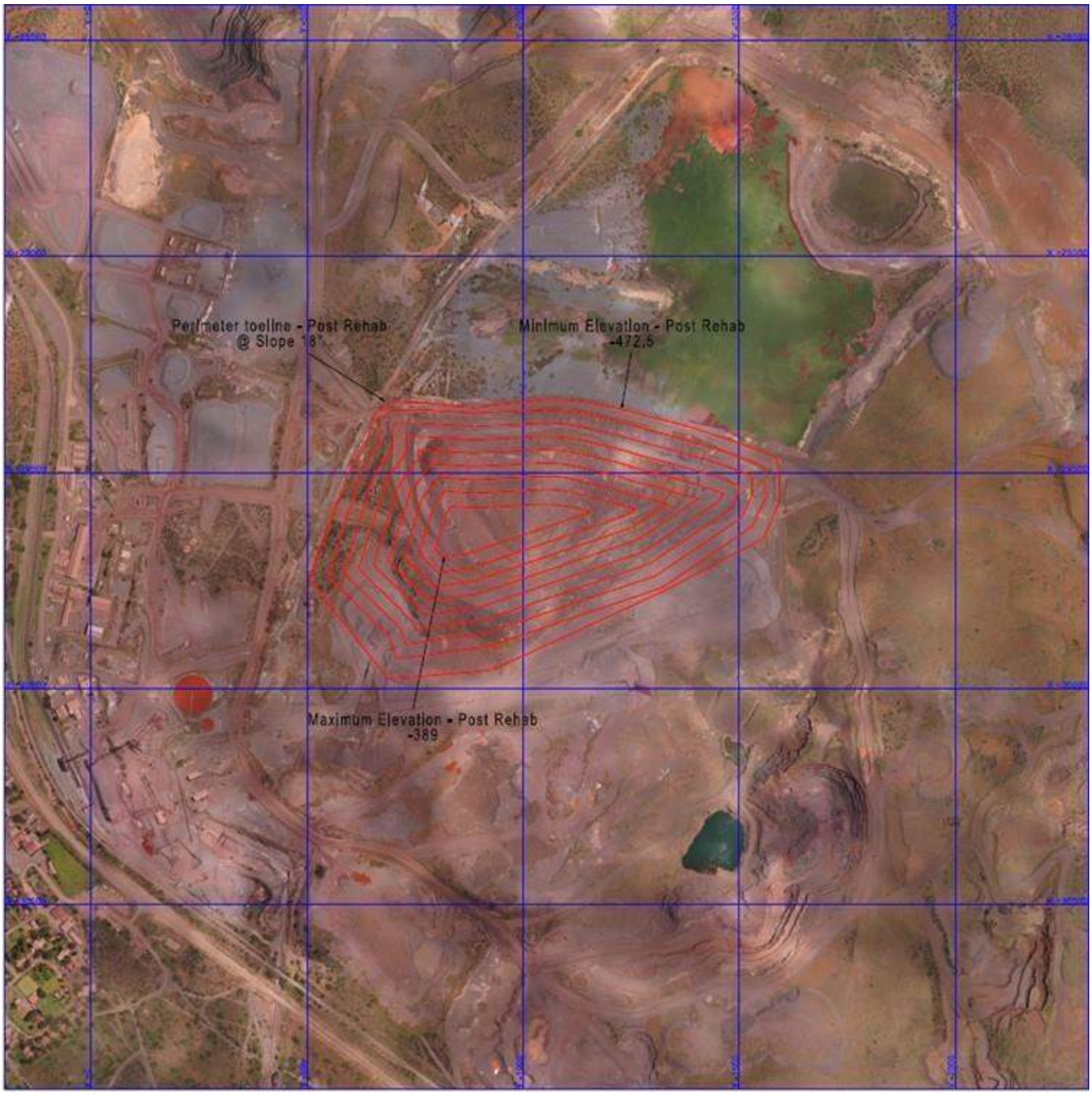


Figure 15: GF Pit WRD Post Rehabilitation (ABGM, 2020)

Table 20: GF Waste Rock Dump (VP1) WRD

Current Height (m)	Current Slope	Operational Height (m)	Planned Rehabilitation Height (m)	Planned Rehabilitation Slope
55	25	82	84	18

2.c.ii.6 East Pit WRD

East Pit WRD also abides by reasonable WRD design criteria. The East Pit WRD design is deemed reasonable and within the expected WRD design criteria.

The East Pit WRD currently operates at a heigh of 40m, but have a maximum available height of approximately 93.52m. The footprint of this facility is currently 144ha. The design criteria are in-line with typical WRD design and the angle of repose seems very reasonable.

The average total design slope angle is approximately 20.4 degrees, with bench angles (repose) of approximately 35.0 degrees.

It is planned that this WRD will be rehabilitated to a slope of 18 degrees. The final rehabilitation height at the highest point of the facility will remain at 94m. The rehabilitation activities will result in an increase in the footprint to 170ha, an overall increase of about 26ha.

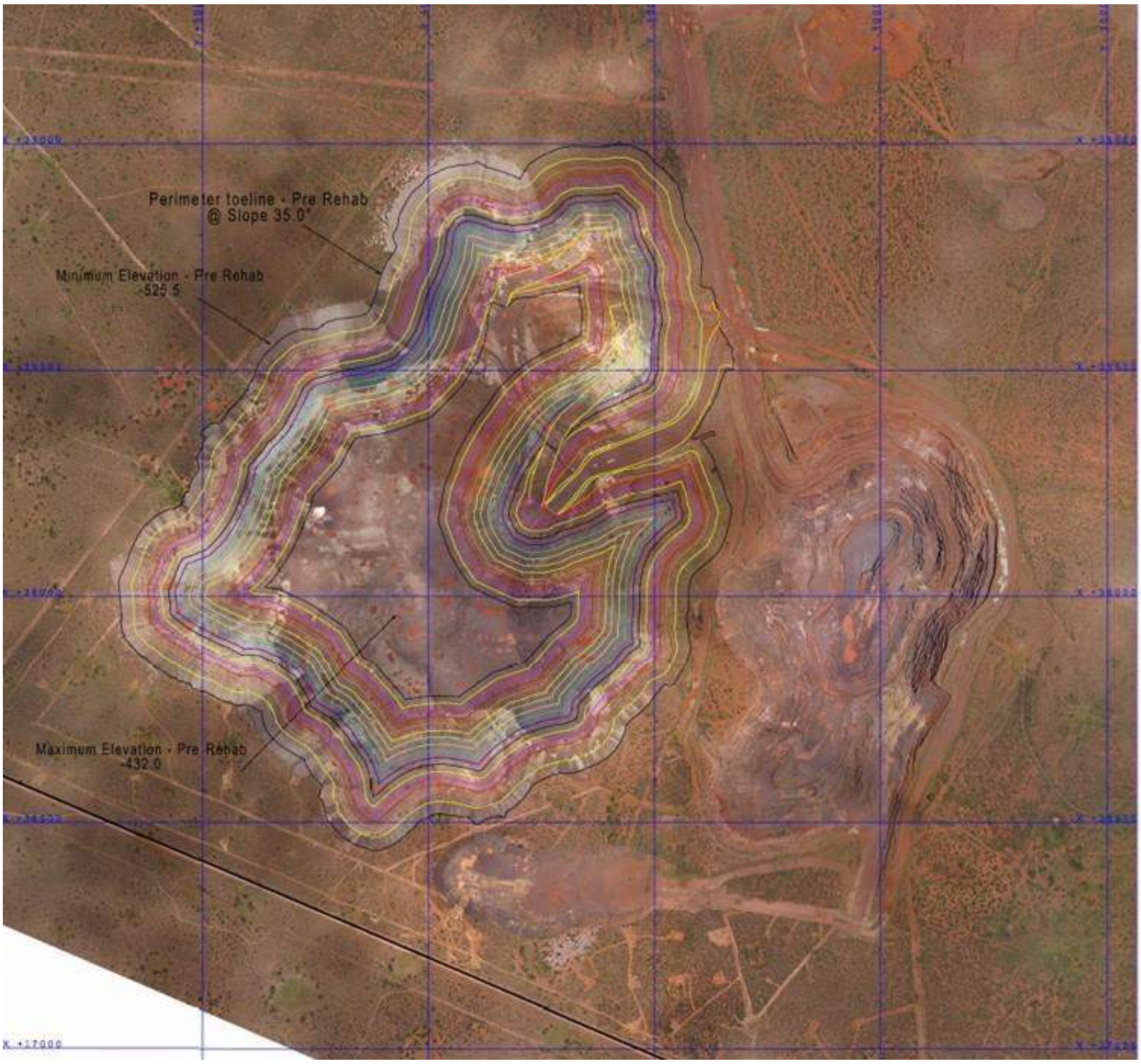


Figure 16: East Pit WRD Pre-Rehabilitation (ABGM, 2020)

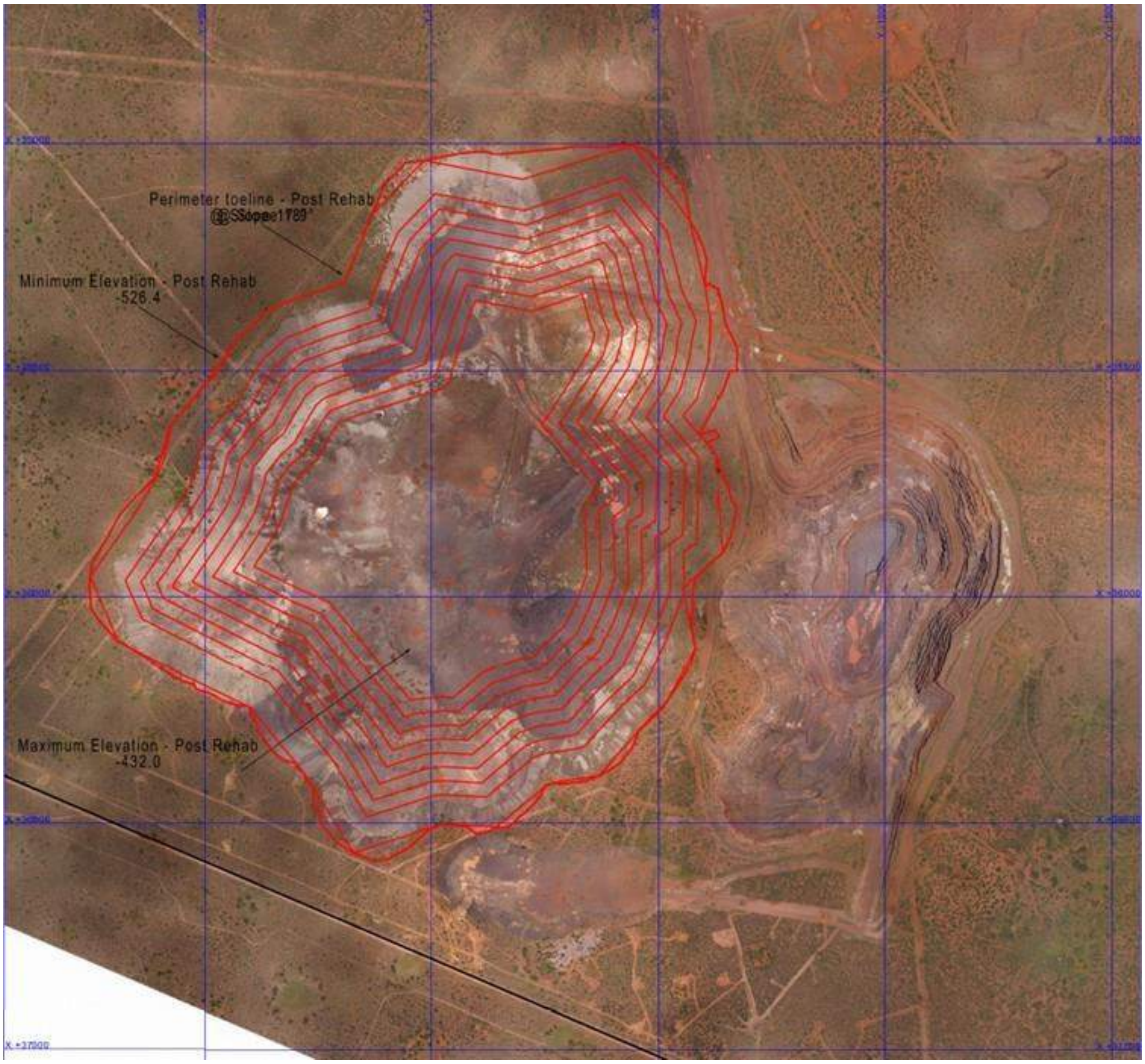


Figure 17: East Pit WRD Post-Rehabilitation (ABGM, 2020)

Table 21: East Pit Waste Rock Dump WRD

Current Height (m)	Current Slope	Operational Height (m)	Planned Rehabilitation Height (m)	Planned Rehabilitation Slope
40	20	94	94	18

2.c.ii.7 West Pit WRD (now referred to as the Village Pit South WRD)

The Village Pit South WRD, previously the West Pit WRD, is a partly rehabilitated facility that will be reinstated with very reasonable criteria and within the expected design criteria for rock dumps.

The Village Pit South WRD has a maximum height of approximately 97.6m. The design criteria are in-line with typical WRD designs and the angle of repose seems very reasonable.

The average total slope on design angle is approximately 26.5 degrees for the WRD. The average bench angles (repose) of approximately 35.4 degrees.

It is planned that this WRD will be rehabilitated to a slope of 18 degrees. The final rehabilitation height at the highest point of the facility will be 106m. The rehabilitation activities will result in an increase in the footprint to 135ha, an overall increase of about 55ha.

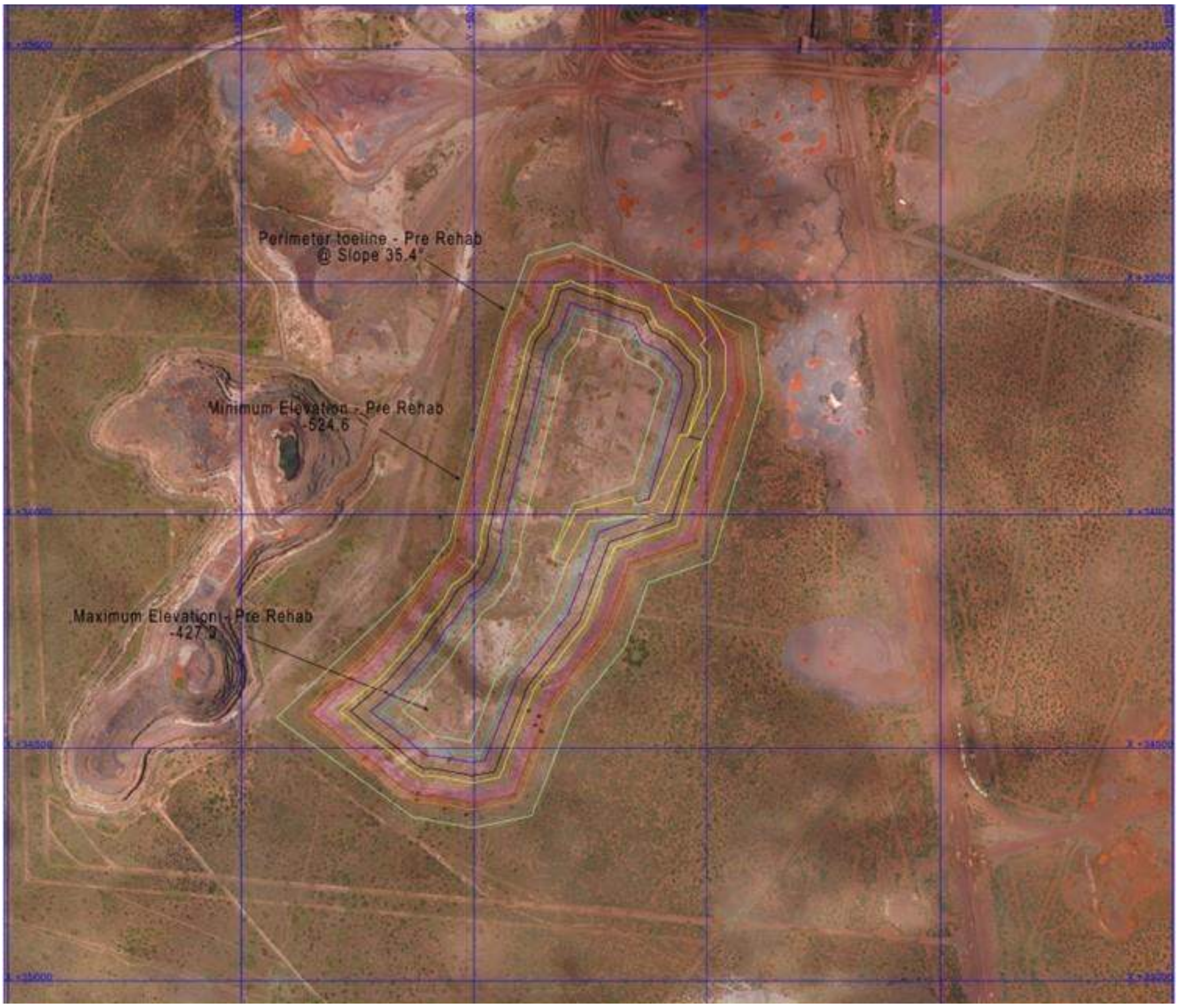


Figure 18: Village South WRD Pre Rehabilitation (ABGM, 2020)

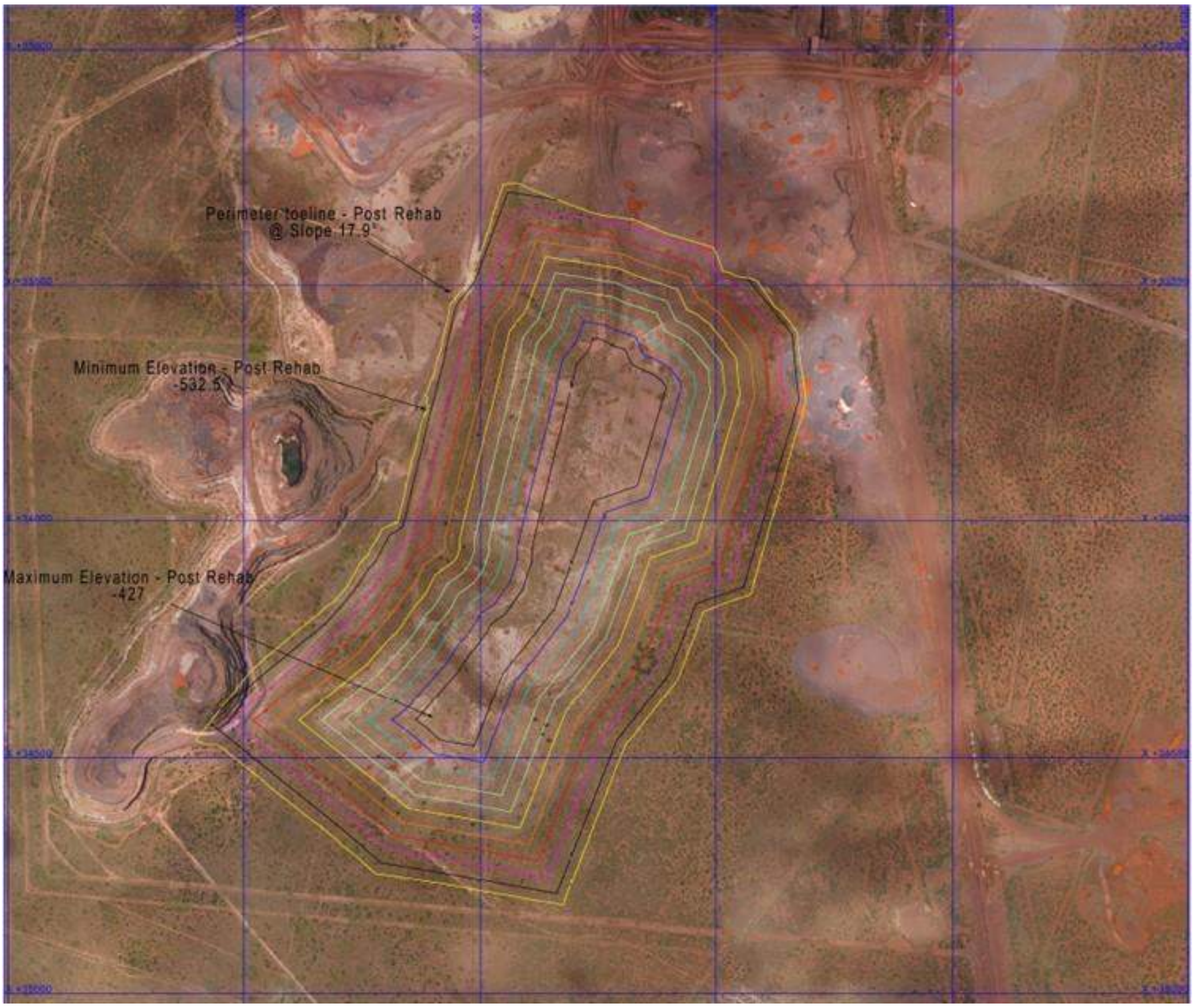


Figure 19: Village South WRD Post Rehabilitation (ABGM, 2020)

Table 22: West Pit Waste Rock Dump WRD

Current Height (m)	Current Slope	Operational Height (m)	Planned Rehabilitation Height (m)	Planned Rehabilitation Slope
Rehabilitated: The area for the Village South WRD has been rehabilitated, however the topography varies and results in a 0-1m height as provided from the mine planning department.	27	98	106	18

2.c.ii.8 HF WRD

The HF WRD has a current heigh of about 26m, with a maximum height available of approximately 40m with the average dump height of approximately 38.37m. The design criteria are in line with typical WRD design criteria and the angle of repose seems very reasonable.

The average total slope angle is approximately 26.8 degrees, with bench angles (repose) of approximately 34.5 degrees. There seems to be potential for more waste to be placed on another lift on this WRD and the berm width and top lift face angle could be optimised to add more rock onto this dump if needed. For this reason, the planned operational height has increased.

It is planned that this WRD will be rehabilitated to a slope of 18 degrees. The final rehabilitation height at the highest point of the facility will be 63m. The footprint of the facility will remain within 20ha.

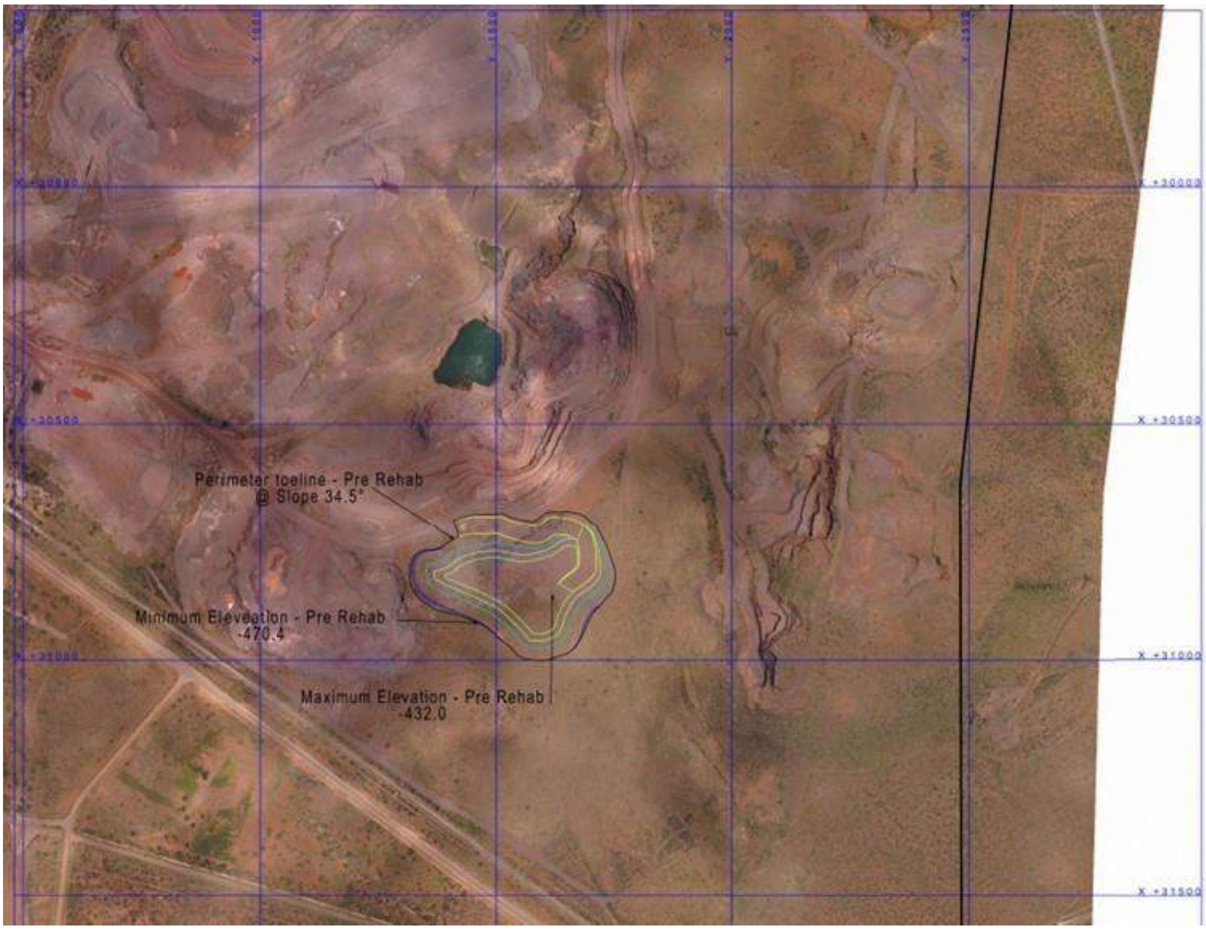


Figure 20: HF Pit WRD Pre Rehabilitation (ABGM, 2020)

Table 23: HF Waste Rock Dump WRD

Current Height (m)	Current Slope	Operational Height (m)	Planned Rehabilitation Height (m)	Planned Rehabilitation Slope
26	27	39	63	18

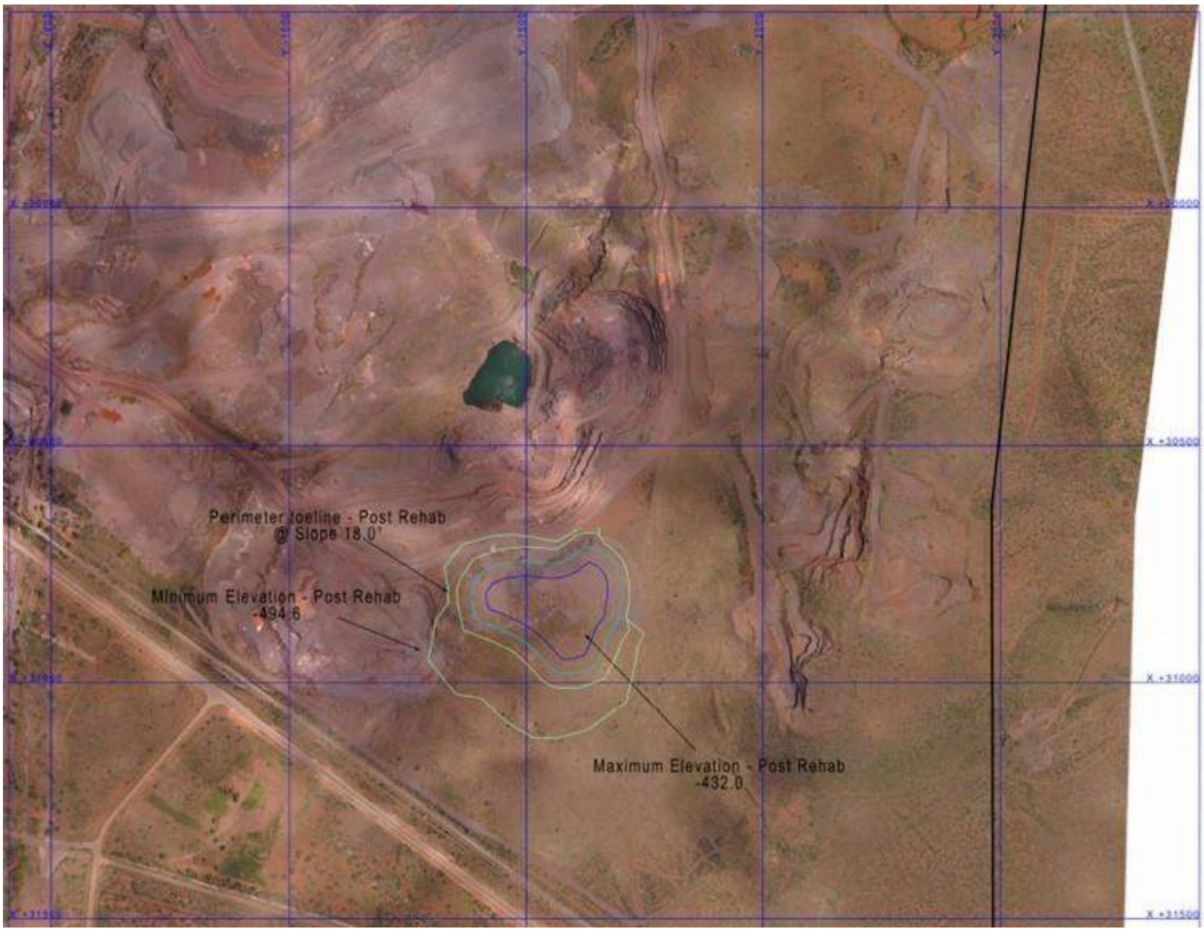


Figure 21: HF Pit WRD Post Rehabilitation (ABGM, 2020)

2.c.ii.9 Discard Dump

Material from the current Jig Plant is sent to the "Discard Stockpile", which is in fact considered a low-grade stockpile with sufficient iron ore grade for reworking. This facility is an approved facility for reworking based on the existing EMPr, as well as the fact that reworking has commenced prior to the enactment of the NEMWA activities for such purpose.

The Discard Dump will not only play a strategic role for the stockpiling of material from the existing Jig Plant, but will be the source stockpile to the new Jig Plant (please refer to Section 2.c.iv).

The current Discard Dump area is approximately 28ha, which is intended to be increased to about 60ha. This area is located within the mining area, between WRDs, Slimes Dam and Opencast Pits, and no clearance will be required. The height of the facility is planned to be up to 60m, where currently it is at approximately 30m.

2.c.iii Project 3: Increase of Opencast Footprint Areas, as well as the undertaking of detrital mining

2.c.iii.1 Current Status

Opencast Pits

The iron ore at Beeshoek Mine is exploited by means of conventional opencast mining techniques (drilling-blasting-load-haul). The drill-blast activities are contracted out, whereas load-haul is done by a combination of owner and contractors' fleets.

The vegetated soil overlying the planned mining area is stripped prior to mining and stockpiled on a dedicated dump to be used for rehabilitation purposes at a later stage. Then bench blocks of 10m height are drilled using drill rigs, which drill 165mm diameter blast holes. Drill patterns can be a staggered or square pattern, with burden and spacing varying from 4m x 5m in waste to 3m x 3m in difficult ore. Blast holes are charged with emulsion explosives and different down-hole charge configurations are used depending on the different rock types to be blasted. This, together with the necessary blasting accessories will achieve optimal fragmentation.

The blasted rock is loaded with front-end loaders and excavators into rigid haul trucks and Articulated Dump Trucks (ADTs). Ore is hauled to the primary crusher and ore stockpiles. Based on the Iron (Fe)-grade and destined metallurgical processes numerous ore stockpiles exist on Beeshoek.

As an integral part of the mining processes, backfilling of numerous existing pits is employed, where possible, in order to minimise both the final voids left at the end of mining as well as the size of waste dumps. Waste with a potential future use is stockpiled separately in order to be accessible and ready to be processed by the future user.

The opencast pits on site comprise of the following:

- North Mine:
  - BN Opencast Pit (active);
  - HL Opencast Pit;
  - HH Opencast Pit;
  - GF Opencast Pit; and
  - HF Opencast Pit (active).
- South Mine:
  - GK Opencast Pit;
  - Village Opencast Pit (active);
  - BF Opencast Pit (active);
  - West Opencast Pit; and
  - East Opencast Pit (active).

The current active Opencast Pits are therefore:

- Village Opencast Pit;
- East Opencast Pit;
- BN Opencast Pit;
- BF Opencast Pit; and
- HF Opencast Pit.

The Mining Work Programme is updated annually to ensure that the DMRE is aware of the annual plans.

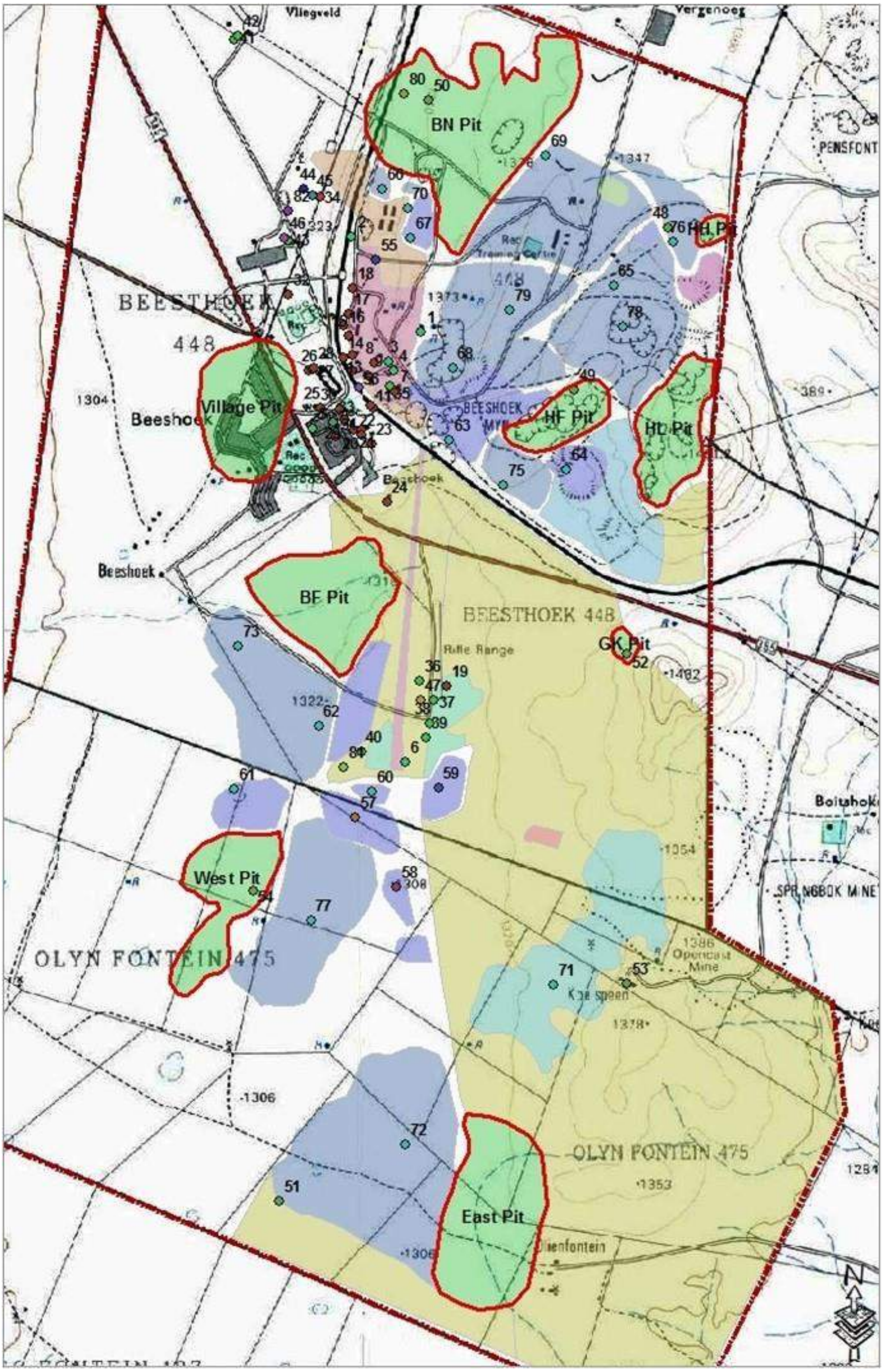


Figure 22: Approved layout in terms of the WUL, 2018 and as combined from past drawings (light green indicates opencast pit areas; light blue - north indicate rehabilitated waste rock dumps)

Although other opencast pits are currently not being mined, these are continuously assessed in terms of their economic value for intended remaining. The current resources of the Mine are approximately 87 million tonnes with a reserve of about 26 million tonnes (Neveling, 2020).

Detrital Mining

Another mining method utilised on the Mine is the mining of detrital ore, where the deposits of ore are shallow enough to be scooped out of the ground for processing as opposed to employing more extensive opencast mining methods. There are a few of these detrital zones on the mine area which still need to be exploited. According to the 2009 EMP Alignment Report, the Mine will mine detrital ore that are available in small pockets that are easy to mine. Detrital mining entails the excavating of loose sedimentary deposited iron ore gravel material with other rock types present due to the sedimentary deposition process within dolomite karsts. The loose material is excavated and loaded and hauled and tipped into a feed bin and the separated into sizing to be fed as contaminated material to the Jig Beneficiation Plant. The fine material on the Screening Plant is used as rehabilitation material back into the detrital mining area.

Backfilling of Opencast Pits

The 2004 EMP clearly states that mine waste produced in the northern mining area will be used for the infilling of available opencast pits areas. The Mine will backfill as far as practically possible as part of the ongoing development of the annual and long-term rehabilitation plans, but voids may remain where enviroberms will be established for safety. The Mine has obtained a WUL following for backfilling in terms of the following:

Table 24: Backfilling of Opencast Pits

Name	Disposal Volume (m^3)	Farm Name	Farm Portion	South	East
HH Pit Backfill	459 860 tons	Beesthoek 448	1	28° 16' 43.7" S	23° 1' 20.2" E
HL pit area Backfill	2 212 010 tons	Beesthoek 448	1	28° 17' 21.6" S	23° 00' 55.6" E
BN N Pit Backfill	1 625 221 tons	Beesthoek 448	1	28° 16' 13.9" S	23° 0' 17.2" E
East Pit Backfill	2 119 897tons	Olynfontein 475	4	28° 20' 31.2" S	22° 59' 37.7" E
GK Pit Backfill	1 468 839 tons	Beesthoek 448	1	28° 18' 23.4" S	23° 1' 9.6" E
Detrital Area	1 224 840 tons	Olynfontein 475	4	28° 19' 40.3" S	23° 1' 9.6" E
West Pit Backfilling	10 536 114 tons	Olynfontein 475	4	28° 19' 18.6" S	22° 59' 30.8" E

2.c.iii.2 Proposed Project

2.c.iii.2.a Opencast Pit Optimisation

The Mine would like to make use of the opportunity to optimise active pits, by either increasing the footprints or by increasing the depth of mining. The pits in question include:

- BN Pit Expansion;
- Village North Pit Expansion;
- BF Pit Expansion;
- East Pit depth expansion;
- Detrital area.

Two (2) new satellite pits of the Village North Pit are proposed:

- New Village East Pit;
- New Village South Pit;

In addition to the opencast pit optimisation the Mine will further investigate large scale strategic exploration activities on the South Mine:

- Village Pit West Expansion Area; and
- South Mine Strategic Expansion Area.

The earlier approved EMPr's of the Mine did not demarcate the required detrital mining areas, or stipulate required management measures. For this reason, the dolomite karst areas will be explored and where possible mined. The depth can vary from 4m to 25m deep. The detrital mining strategy and the depth is only determined once excavation starts and the quality of iron ore is inspected within a karst deposition area.

The current mining methodology will continue for the opencast optimisation project. This will comprise of conventional opencast mining techniques (drilling-blasting-load-haul).

Then bench blocks of 10m height are drilled using drill rigs, which drill 165mm diameter blast holes. Drill patterns can be a staggered or square pattern, with burden and spacing varying from 4m x 5m in waste to 3m x 3m in difficult ore. Blast holes are charged with emulsion explosives and different down-hole charge configurations are used depending on the different rock types to be blasted. This, together with the necessary blasting accessories will achieve optimal fragmentation.

The blasted rock is loaded with front-end loaders and excavators into rigid haul trucks and Articulated Dump Trucks (ADTs). Ore is hauled to the primary crusher and ore stockpiles. Based on the Fe-grade and destined metallurgical processes numerous ore stockpiles exist on Beeshoek.

One additional haul road will be required:

- Village Haul Road: 1,100m (about 3.3ha)

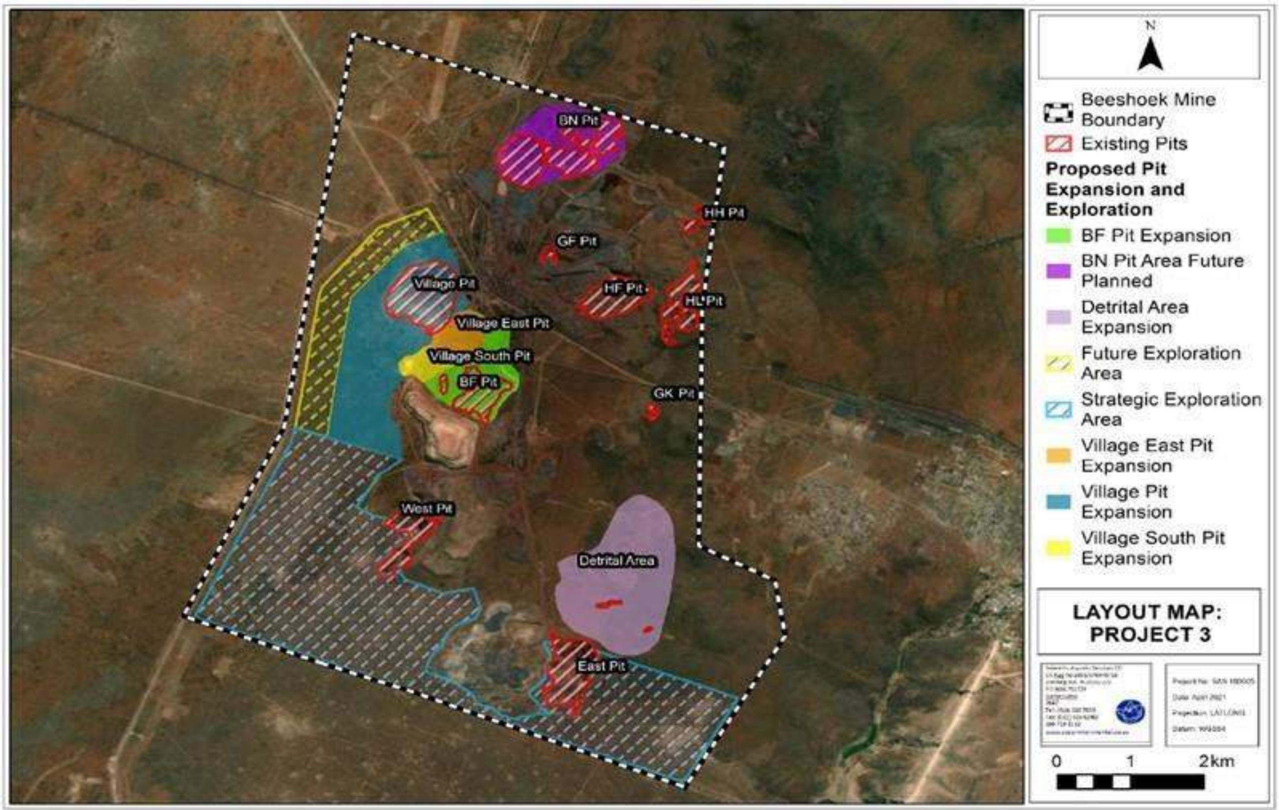


Figure 23: Opencast Pits

The following table summarises this part of the project.

Table 25: Opencast Project

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
Project 3: Increase of Opencast Footprint Areas, as well as the undertaking of detrital mining for shallow iron ore reserves, including transportation routes (Haul roads)	Village Pit (VP North), will be expanded by 203ha in the future to 269ha and will further include two satellite pits: Pit East and Pit South, each with and area of about 37ha and 22ha respectively. Clearance of vegetation will be required. The depth of the VP North is planned at 180m, with VP East and VP South 160m and 60m respectively. A 500m buffer will remain between the Village Pit and the Kolomela Mine main access road. To the west of the proposed Village Pit expansion area, an area for	Village North Pit: Depth – 180m Area – 436ha New Village Pit East: Depth – 160m Area – 37ha New Village Pit South: Depth – 60m Area – 22ha Exploration Area: 170ha	Village North Pit: 28°17'36.05"S; 22°58'49.05"E New Village Pit East: 28°17'48.18"S; 22°59'36.79"E New Village Pit South: 28°18'4.44"S; 22°59'24.86"E	**Listing Notice 1, Activity 12:** The development of—dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or 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. **Listing Notice 1, Activity 19**: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging,

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
	specific target exploration drilling has been demarcated. This area is about 170ha in extent. BN Pit area is planned to be expanded by 66ha to approximately 137ha. The depth of the opencast pit will be 162m from surface. Approximately 25ha will require vegetation clearance. East Opencast Pit will not result in an increase in the footprint but rather in the depth of mining within the mining shell. The depth of East Pit is planned at approximately 220m. Around the East Pit potential strategic iron ore resources have been identified. The area in question is about 976ha. Various wetland systems are present within this area, as well as a potential recharge zone. Due to the presence of these sensitive ecosystems, strategic exploration drilling will be undertaken to determine the potential resources within this area. The drilling will be undertaken in terms of a management plan to ensure the least amount of disturbance to these wetland systems. The BF Pit will be expanded from about 30ha (comprising of 3 pits) to about 86ha. Approximately 25ha may require clearance. The dept of the BF Pit is planned at 180m. A Detrital Mining area of about 238ha will be established – it should be noted that entire area will not be utilised, only where minerals are found economically viable. Clearance of vegetation will be required. Mining in the detrital area is planned between 20-40m in depth. One new haul road is proposed: - Village Haul Road: 1,100m at a width of 30m (about 3.3ha) The road will be located in areas mostly disturbed with existing mining activities or along existing roads.	BN Pit: Depth – 162m Area – 137ha East Pit: Depth – 200-220m Area – 976ha Future Strategic Exploration Block Area: 976ha BF Pit: Depth – 180m Area – 86ha Detrital Area: Depth – 20-40m Area – 238ha Village Haul Road: 1,100m at width of 30m (about 3.3ha)	Village Exploration Block Area: 28°17'27.81"S; 22°58'48.89"E BN Pit: 28°16'9.03"S; 23° 0'21.67"E East Pit: 28°20'36.27"S; 23° 0'29.94"E Future Strategic Exploration Block Area: South: 28°19'56.30"S; 22°58'48.61"E East: 28°20'55.06"S; 23° 0'58.56" BF Pit: 28°18'17.10"S; 22°59'37.99"E Detrital Area: 28°19'44.55"S; 23° 0'30.61"E Village Haul Road: Start - 28°17'40.18"S 22°59'14.08"E End - 28°18'3.84"S 22°59'21.98"E	excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than cubic metres from watercourse. **<u>Listing Notice 1, Activity 24</u>**: The development of a road—with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road—which is 1 kilometre or shorter. **<u>Listing Notice 1, Activity 31</u>**: The decommissioning of existing facilities, structures or infrastructure for— (i) any development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (ii) any expansion and related operation activity or activities listed in this Notice. **<u>Listing Notice 2, Activity 15</u>**: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity. **<u>Water Uses</u>**: Section 21 (c)&(i) for the presence of various dry pans in the area. Section 21 (j) for the abstraction of water for safe mining conditions, and the use thereof as Section 21(a) water uses. Section 21(g) for an additional dewatering tank at the Village Pit and inclusion of a balancing tank at the Dam D300 (potentially 100m^3) as identified in the preliminary water balance assessment.

2.c.iii.2.b Exploration Drilling Activities

The purpose of the exploration programme is two fold: to give effect to the requirements of the MPRDA and associated Mining Work Programme and to ensure a better understanding of the underlying deep dolomitic characteristics

2.c.iii.2.b.1 MPRDA Considerations

As mentioned before Regulation 23 of the MPRDA states in Section 1(a), that subject to subsection (4), the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. The mine has been awarded a Mining Right by the DMR and therefore has an obligation to give effect to the following:

- The ongoing development and improvement of the Mining Work Programme which details the planned mining activities to be followed in order to mine the mineral resource optimally; and
- Optimal mining of minerals must be undertaken, as the Minerals and Petroleum Board may recommend to the Minister to direct the holder of a mining right to take corrective measures if the Board establishes that the minerals are not being mined optimally in accordance with the Mining Work Programme. The Minister may, on the recommendation of the Board, suspend or cancel a mining right if the Minister is convinced that any act or omission by the holder justifies the suspension or cancellation of the right.

Based on the results from the exploration studies, the inferred resources may be re-classified into indicated/ measured resources. Another important outcome of the drilling programme will be to verify the presence of anomalous geological conditions interpreted from studies conducted throughout the mine, in this event specifically the deep dolomitic characteristic. The ore body model, as well as the production plans of the mine will be updated based on the exploration project, year on year. This will feed into the annual update of the Mining Works Programme. The Mining schedule will be compiled using the ore body model updated from the information sourced from the exploration activities.

The reserve statement issued as part of the final product annual will give an indication of the expected feed grade to the plant.

2.c.iii.2.b.2 Deep Dolomitic Study

SRK Consulting (SRK) was appointed by the Mine to conduct a deep dolomite study during 2020. The Ghaap Plateau dolomite formations occur at depth and into the northeast of the mine property where it outcrops in the Maremane Anticline. The dolomite formation in general and the Ghaap dolomites in the case in particular, are a primary aquifer and an important groundwater reserve especially in the arid western regions of South Africa where the mine is located. The effects of groundwater abstraction on the stability of karst terrane (or dolomite) are well documented. SANS 1936 provides standards for development on dolomite ground where dolomite formations occur within 100m of surface. In these instances, a dolomite stability assessment is required to be conducted to assess the probability of dolomite hazards affecting surface infrastructure and casing risks to the public, personnel, or property of affected parties.

The SRK study focused on the following:

- Exposed karst cave in the vicinity to the BN Pit – In 2016 a large cavity manifested in a pit adjacent to the BN Pit in the mining area north of the property.
- Current operational and disused pits – the variable depth to bedrock is evidence where pinnacles of dolomite as exposed in the pit face showing recent infill between successive pinnacles.
- Detrital mining area – in the lower lying areas detrital iron ore deposits are blanketed under a horizon of windblown Kalahari sand.
- Subsidence in the south-eastern area of the mine property: A doline was inspected which as occurred in the south-eastern area of the site. This area has been fenced off to make it safe and prevent unauthorised entry. The report states that it is probable that this incident is related to groundwater lowering from dewatering from the neighbouring mine.
- The current Slimes Dam in the north of the mine site was inspected at the embankment wall against which supernatant water has ponded on the norther side of the facility.

Surface deformations, both naturally occurring and induced by mining activities, pose as a risk to assets, health and the environment in a karst environment. The mine is underlain by dolomite both near surface and at depth. The buried karst terrane is notorious for the development of subsidences and sinkholes.

<u>Dolomite impact on pits</u>

The presence of cavities below the base of Wolhaarkop breccia has been shown to occur on the site. One such large cavern is present as exposed in the BN Pit annex. While this may be a once off occurrence, tis cannot be assumed to be the case with any certainty. The occurrence of this is difficult to predict as they occur within the bedrock at the base of the Wolhaarkop chert breccia where solution cavities may be present. Although they are likely to be rare occurrences, the do pose a significant risk to mining activities.

Dolomite impact on infrastructure

The impact of dolomite related instability on infrastructure is likely to be the highest risk where dolomite bedrock is shallow or underlies a blanketing layer or layers of unconsolidated soils and deposits. This is particularly relevant where water-bearing services are involved, and the risk of leakage is always possible. Concentrations of surface water such as from stormwater or from unlined impoundments such as tailings storge facilities that are unlined pose a risk.

Infrastructure such as roads, bridges and pipelines will be a risk due to the presence of a blanketing layer of recent soils which overlie buried karst ground at depth. Leaking services and other concertation of water in the vicinity of infrastructure such as stormwater ponding result in water ingress into the ground causing subsurface erosion into receiving cavities in the dolomite bedrock.

The potential of the Exploration Programme to also indicate areas of potential concern

There is evidence that dewatering has had some effect on surface instability on the property. It is recommended that a study be conducted to explore techniques that will aid the identification of potential problem areas. Such techniques include inter alia a geophysical methods such as a gravity survey to identify low gravity anomalies that will aid identifying voids in bedrock. There is a suggestion from a dewatering borehole near the western pit that a similar cavity may exist at depth in this area too. Investigation of known or suspected features will give a good opportunity to test if such geophysical methods will indicate cavernous conditions and can be used in future to identify these ground conditions in advance so that they can be mitigated. The eastern doline can be investigated in a similar fashion to confirm ground conditions that lead to the surface deformation events.

The following commitments have been made by the Mine for the next financial year:

- Gravimetric Geophysical surveys - Known and/or suspected sub-surface features will be covered by the Geophysical survey currently underway. This will provide a good opportunity to confirm the efficacy of the gravimetric geophysical method to indicate cavernous conditions and reaffirm its continued future use to identify these ground conditions in advance;
- West Pit Exploration drilling; and
- Small scale surface mapping of which areas of the mine site are underlain or have inferred underlying dolomite is being undertaken - water accumulation and ponding will also be monitored as part of this procedure.

2.c.iii.2.b.3 Exploration Programme Description

Beeshoek conducts an annual exploration project, which mostly comprise of drilling, sampling, assay analysis, modelling and reporting of Mineral Resources and Reserve. For this purpose, the mine is planning on expanding the exploration programme at the mine to assess the available reserves within their approved Mining Right Area. The objective of the exploration project is to improve the confidence level/ quality of the data that has been collected from previous exploration phases via drilling, sampling and assay analysis.

This area is planned over Portion 0, and 1, of the farm Beeshoek, as well as Portion 4 of the farm Olynfontein over which the mine already holds mining rights. The activity will involve:

- construction of temporary access roads (approximately 6m wide) (no listing notices triggered);
- construction of 'drilling pads' (20m x 20m) and related temporary infrastructure. Note in this instance all drilling sites will be rehabilitated once activities have been completed;
- Where boreholes could be used for further groundwater monitoring, these will be suitably equipped; and
- Only environmentally friendly drilling muds will be utilised.

As mentioned before, exploration is undertaken on the farms Beesthoek portion RE and portion 1. However, for the purpose of this project, the drilling will also be strategically focussed on the western and southern portion of the Mining Rights area, this is specifically noted as a project in this application document as the activities will be taking place where numerous cryptic wetlands are present, which leads to the triggering of specific listing notices and also the necessity of more specific environmental and water related management plans.

The exploration activities in specific will include the following:

Table 26: Exploration Activities

	Village Exploration Area	Future Strategic Exploration Area
Overall Exploration Area	170ha	976ha
Number of drill sites	300-400	400-500
Area of drill sites	About 16ha (9% of the area)	20ha (2% of the area)
Key considerations	All protected species will be protected.	All protected species will be protected.

Figure 24: Exploration Map

2.c.iv Project 4: Optimisation of Beneficiation and implementation of the Waste Management Hierarchy

2.c.iv.1 Current Status

2.c.iv.1.a Current Beneficiation Plant

The facility to process iron ore is designed to process ROM ores from opencast pits located on South and North Mines. The Plant is located on the North Mine. See Figure 25 for a diagram of the iron ore beneficiation process at Beeshoek.

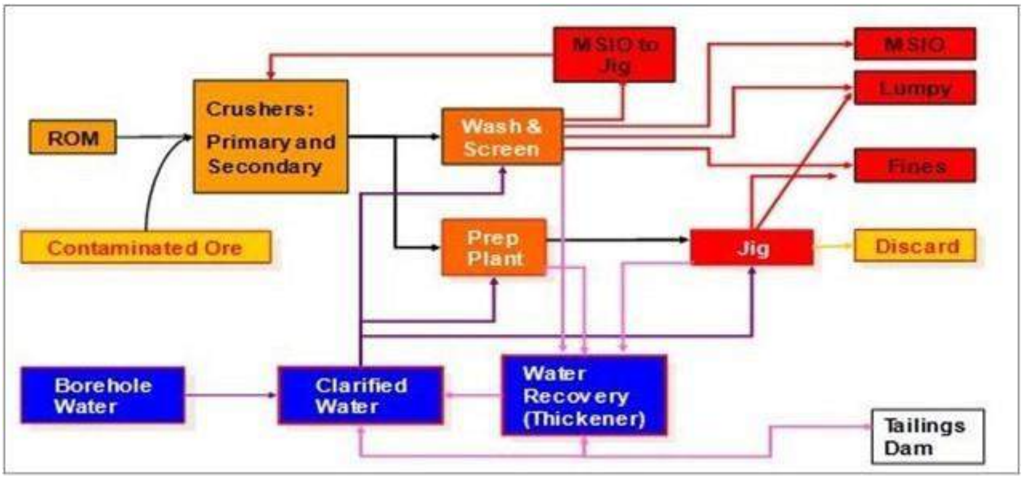


Figure 25: Iron Ore Beneficiation Process

The process is described in the sections below.

ROM Stockpiles

Iron ore rich material removed from the opencast operations are stored on ROM Stockpiles (both on-grade and off-grade) on site. ROM Stockpiles (please refer to the following table for a list of these) are processed through the Plant process. The on-grade and off-grade material are blended when required to meet the specific market requirements.

Table 27: ROM Stockpiles

Name	Description	Farm Name	Farm Portion	South	East
Off-grade Waste Dump 1, 2 and 3	South Contaminated ROM 1	Olynfontein 475	4	28° 19' 1.487" S	22° 59' 57.711" E
	South Contaminated ROM 2 (including BIS)	Olynfontein 475	4	28° 19' 17.636" S	23° 0' 8.749" E
	South Off-grade ROM 1	Beesthoek 448	RE 0	28° 18' 54.499" S	23° 0' 19.721" E
ROM Stockpile	South ROM Stockpile 1	Beesthoek 448	RE 0	28° 18' 55.383" S	23° 0' 2.324" E
South ROM Stockpile 2	Village ROM Stockpile	Beesthoek 448	RE 0	28° 18' 54.90" S	22° 59' 25.88" E
South Off-grade ROM 2	Village ROM Stockpile	Beesthoek 448	RE 0	28° 18' 40.23" S	22° 59' 48.08" E
North Off-grade ROM 1	ROM Stockpiles	Beesthoek 448	1	28° 17' 33.46" S	23° 0'22.67" E
BIS ROM North 1	ROM Stockpiles	Beesthoek 448	1	28° 17' 40.35" S	23° 0' 53.51" E
BIS ROM North 2	ROM Stockpiles	Beesthoek 448	1	28° 16' 57.23" S	23° 1' 5.97" E
North ROM Stockpile	Stockpiles	Beesthoek 448	1	28° 16' 39.3" S	23° 0' 11.6" E

Primary Crushing

At Beeshoek, there are two primary processing areas, consisting of one primary and one secondary crusher, namely South Mine Crushing and North Mine Crushing, where two stages of crushing take place.

At the Primary Crusher ore is crushed down to -200mm and at the Secondary Crusher it is further reduced to -80mm. In case of on-grade (ROM) ore feed, the secondary product is fed to the Washing and Screening Plant and contaminated ore or off-grade ore feeds, where beneficiation is needed, to the Jig Plant.

From the South Mine Crushing, ore is conveyed via an overland conveyor system to stockpiles at the Plant area on North Mine.

Washing and Screening Plant

The ROM feed is washed and sized into a lumpy fraction (+6mm – 32mm), MS product (+6mm – 18mm) and a fines fraction (+0.5mm – 6mm). The primary screens oversize (+32mm) is conveyed to three tertiary crushers in closed circuit with the primary screens.

Preparation Plant

The contaminated/ off-grade ore feed is washed and sized into a lumpy fraction (+8mm – 25/32mm) and a fines fraction (+0.5mm – 8mm) prior to being conveyed to the Jig Plant. The screen oversize is conveyed to a tertiary crusher in closed circuit with the screens.

Current Jig Plant

The lumpy and fines fractions from the preparation plant are beneficiated in two separate streams by gravity separation utilising Jigs. The sinks products are recovered and de-watered via bucket elevators and conveyed to the lumpy (+8mm – 25/32mm) and fines (+0.5mm – 8mm) product stockpiles.

The floats products (discard/ rejects) are de-watered over vibrating screens and conveyed to the GF Opencast Pit for disposal by spreader conveyor.

Product Stockpiles

Once the ROM has been processed, the final product is stockpiled within a designated footprint around the Plant area. Please refer to the following table for a list of stockpiles.

Table 28: Product Stockpiles

Name	Definition	Centre Coordinate	Commencement of Reworking
North Mine			
In-Plant Stockpiles	Product – not a Waste Product	28° 17' 20.9" S; 22° 59' 58.6" E	Ongoing, part of process, not a waste
Plant Stockpiles	Product – not a Waste Product	28° 16' 51.18" S; 23° 0' 3.31" E	Ongoing, part of process, not a waste

Water Recovery/ Slimes Disposal

The water recovery consists of a Jig De-grit Cyclone Facility, a 90m diameter Traction Thickener, a plant water reticulation system, the existing Washing and Screening Plant de-grit circuit (upgraded) and the tailings disposal and water recovery facility.

Existing Washing and Screening Plant wash water and the Jig Plant wash water is de-gritted by their respective cyclone facilities. Cyclone underflow is pumped to the Thickener for water recovery and overflow is utilised in the process again.

The Thickener has been sized such that the clarified overflow water solids content shall not exceed 25g/L which is within the required specification for the Humboldt Jig Plant.

The underflow tailings slurry is pumped to the Slimes Dam where further water recovery will take place.

Tailings water is again pumped back to the Thickener. Provision has been made to dilute the underflow tailings slurry to the correct design density for pumping.

Clarified Water (Clarifier)

The Clarified Water Reservoir of 2 000m^3 provides surge capacity for all incoming make up water and the clarified water from the Thickener. This installation replaced the previous ground dam and therefore reduced the water loss attributed to the leaks from this facility. This reservoir is the source of all process wash water for the Pant area.

2.c.iv.1.b Legalities in terms of Mine Residue Remining

Additional iron ore is available in the contaminated dumps on the mine site and these will be reworked to meet the mine's remaining planned life of mine. The 2004 EMP states clearly that the mine residue present on site or produced by the mine can be categorised as follows:

- Waste material: products that cannot be sold and which are deposited separately as such or used as backfill;
- Non-saleable material: Product which cannot be marketed in its present form but which through treatment could become saleable;
- Contaminated material: "impure" product stockpiled separate for beneficiation to render it marketable; and
- Discard: Waste material from the on-site iron ore beneficiation plant is discarded on a designated Discard Dump for reuse.

The 2004 EMP further explained the Mine's intention to rework all contaminated iron ore stockpiles present on the mine site in order to optimise iron ore resource utilisation. Reworking relates to the following dumps: Dumps labelled on Drawings 5540-001 and 5540-002 as CD-N1 (this is the current Waste Rock Dump North Area) and CD-S1 (this is the current Contaminated ROM Dump on south mine) respectively (see attached).

In Section 1.7.3 of the new order (aligned) EIA/EMP, 2009 the Estimated Reserves are discussed. It states that: Additional iron ore is available in the contaminated dumps on the mine site and these will be reworked to meet the Mine's remaining planned life of mine. The specific contaminated dumps are not stipulated in this EMP, and therefore when referring to the definition of contaminated material in the 2004 EMP as presented above, this will depend on the nature of the material and grade which will render it marketable. The EMP further commits in Section 7.3.2 to "Rework all the contaminated iron ore stockpiles present on the mine site in order to optimise iron ore resource utilisation."

In terms of the NEMWA, and associated regulations which came into effect on 24 July 2015, which included Mine Residue Stockpiles as listed Waste Management Activities, all such activities that commenced prior to 24 July 2015, may be regarded as lawful and need not be authorised (regulation 7(1) of GN 921 contains the relevant transitional requirements). Prior to the NEMWA Regulations of 2015, the reclamation of residue for re-use did not require EMP amendments, as it fell within the definition of mining (as defined in the MPRDA), especially in this instance where no separate infrastructure (e.g. crushing plants) was constructed that had to be reflected in the EMPs.

The Mine Residue Stockpiles directly listed in the EMPs (2004) for reworking includes:

- Waste Rock Dump North Area; and
- Contaminated ROM Dump South Mine.

The Mine Residue Stockpiles which have been earmarked for rework as Contaminated Stockpiles (when considering the 2009 EMP Definition) are:

- Contaminated ROM Dump North Mine; and
- All off-grade ROM Stockpiles.

The Mine Residue Stockpiles, which have been reworked prior to the inclusion of Mine Residue Stockpiles into the NEMWA on 24 July 2015, include:

- Discard Dump, North Mine (need information on commencement of reworking) – commenced during 2005 at which time the reworking started at 2106 tons/annum. In 2013, this volume increased to 69 107tons per annum. As of 30 May 2017, 12 769 tons has been reworked; and
- Slimes Dam, North Mine – reworking of this material commenced during 2012 (please refer to figures provided by the Licence Holder).

Figure 26: Mining of the Slimes Dam

According to a legal enquiry submitted to the DMRE on 26 July 2017 the following is noted:

Firstly, regarding the remining of residue deposits and stockpiles, the following must be noted. Section 1 of NEM:WA defines residue deposits and stockpiles in relation to the definition provided for in the MPRDA.

The MPRDA defines residue stockpile as ***"any debris, <u>discard</u>, tailings, <u>slimes</u>, screening, slurry, waste rock, foundry sand, beneficiation plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated for potential re-use, or which is disposed of, by the holder of a mining right, mining permit, production right or an old order right"***.

(own emphasis)

In addition to the above, please note that Schedule 3 of the NEM:WA expanded the definition of residue stockpile to – ***"any… discard… waste rock,… <u>including historic mines and dumps created before the implementation of this Act</u>"***.

(own emphasis)

It is also paramount to note the applicable transitional arrangements. Regulation 4 of the *NEM:WA: Amendments to the List of Waste Management Activities that Have, or are Likely to Have, a Detrimental Effect on the Environment* (GN R633 in GG 39020 of 24 July 2015) states that ***"an environmental management programme or plan approved in terms of the Mineral and Petroleum Resources Development Act, 2002 <u>shall be deemed to have been approved and issued in terms of this Act</u>."***

Furthermore, Regulation 7(1) of the new NEM:WA Listing Notice states that ***"a person <u>who lawfully conducts a waste management activity</u> listed in this Schedule <u>on the date of the coming into effect of this Notice</u> <u>may continue with the waste management activity</u>…"***.

Accordingly, activities which were/are approved in terms of the EMP must be deemed to be approved in terms of the NEM:WA.

The response by the DMRE was positive in this regard and the activities are considered lawful (please refer to Annexure 2) for the correspondence in this regard.

The following table presents the Mine Residue Stockpiles being reworked which are considered lawful:

Table 29: Reworking of Mine Residue Deposits

Name	Centre Coordinate
Waste Rock Dump North Area (including BIS)	28° 17' 34.2" S; 23° 0' 32.7" E
South Contaminated ROM 1 South Contaminated ROM 2 (including BIS) South Off-Grade ROM 1	28° 19' 1.48" S; 22° 59' 57.711" E 28° 19' 17.63" S; 23° 0' 8.74" E 28° 18' 54.49" S; 23° 0' 19.72" E
Contaminated ROM Dump North Mine	28°17'33.46"S; 23° 0'22.67"E
Village Off-Grade ROM 2	28°18'40.23"S; 22°59'48.08"E
Discard Dump, North Mine	28° 17' 12.7" S; 23° 0' 21.5" E

Depending on the economies of scale the tests on mine residue may proof viable for the reworking of such activities. In order to determine the lawfulness for the reworking of Mine Residue on site, especially considering the NEMWA regulation of the reworking of Mine Waste. It should be made clear that any reclamation of residue stockpiles (as defined in the MPRDA), after 24 July 2015 must be licensed in terms of the NEMWA Regulations.

2.c.iv.2 Proposed Project

Beeshoek has identified the opportunity to formalise the recovery and economically beneficiation of existing and arising low-grade resources.

The intent being the construction, commissioning and bringing into production two (2) additional beneficiation sections (new Jig Plant and WHIMS Plant) capable of processing ≈ 520tph of material to produce ≈ 1.5Mtpa of export quality product.

The proposed Beeshoek Low-Grade Beneficiation Optimisation Project is planned to allow Beeshoek Mine to optimise the mining process and reduce mineral waste on site (in line with the National Waste Management Hierarchy), by implementing two (2) additional Beneficiation Projects>

The two plants will involve a new Jig Plant to rework the existing low-grade stockpile (Discard Dump and low-grade material derived from the current Jig Plant) and a new WHIMS Plant to rework the existing slimes from the Slimes Dam. This project can be regarded as an ongoing rehabilitation project in terms of the National Waste Management Strategy of the reduction of waste production and the reuse of waste (note that this is an approved activities – refer to the preceding section). This project will have numerous economic and environmental benefits.

The Mine Residue Stockpiles directly listed in the EMP (2004) for reworking includes:

- WRD North Area; and
- Contaminated ROM Dump South Mine.

The Mine Residue Stockpiles which have been earmarked for rework as Contaminated Stockpiles (when considering the 2009 EMP definition) are:

- Contaminated ROM Dump North Mine; and
- All off-grade ROM Stockpiles.

The Mine Residue Stockpiles which have been reworked prior to the inclusion of Mine Residue Stockpiles into the NEMWA on 24 July 2015 include:

- Discard Dump, North Mine – commenced during 2005; and
- Slimes Dam, North Mine – reworking of this material commenced during 2012.

It is important to reiterate that according to a legal enquiry submitted to the DMR (now DMRE) on 26 July 2017 the following is noted: The response by the DMR, Kimberley was positive in this regard and the activities are considered lawful (please refer to Annexure 4 for the correspondence in this regard). This also is in line with the transitional arrangements associated with the MPRDA, NEMA and NEMWA.

The primary objective is to reclaim the low-grade ore from the existing Discard Dump, low grade derived from the current Jig Plant, and Slimes Dam through a dry mining process and haul the material to the allocated beneficiation plant's staging areas.

The beneficiation plants will then process the material to produce a fines product at ≥ 63.5%Fe quality within the fine product requirements.

Process Description

The aim is to liberate (crush), wash, screen, and beneficiate the available -32mm +1mm and -1mm LG size fractions from the Discard Dump and the Slimes Dam, as well as similar material arising from the existing processing plant to produce a ≥ 63.5%Fe, thus maximising the available resource utilisation and recovery.

The product will be blended with the current fines product (-8mm +1mm) from the existing Jig plant and on-grade washing screening sections.

The project is for two (2) new processing plants that will support maximizing the life of mine (LOM) for Beeshoek within current product contract specifications thereby keeping operations at a sustainable 2,8 Mtpa total product with the new low grade beneficiation sections contributing 1.5Mtpa of product to the 2.8 Mtpa total product stream.

The Jig Plant will include making use of known beneficiation solutions and technologies, which will include jigging technology, and High Pressure Grinding Rolls (HPGR) for crushing lumpy material. The WHIMS plant will involve Wet High Intensity Magnetic Separation (WHIMS) for the recovery of the super fines product, and making use of optimal in-process water recovery technology to maximise the existing Slimes Dam operational life.

There is a high level of confidence in the technologies being considered to beneficiate the low-grade resources identified at Beeshoek. Test work using these technologies has confirmed a yield expectation of ≥ 40%.

Combined, the sections can process low grade feed at 520tph with a minimum yield of 40% and 62% effective operating utilisation; i.e. operating up to 5400 hours per annum, providing an annual production output of 1.5Mtpa.

Table 30: WHIMS and Jig Plant Production Schedule

	New Jig Plant (t/a)	WHIMS Plant (t/a)
Design feed	1 859 945	1 435 703
Design production	1 055 638	428 652
Design residue (low grade)	630 367	43 071
Design residue (slimes)	173 940	963 980

2.c.iv.2.a WHIMS Plant

The dimensions of the WHIMS Plant footprint will be:

- WHIMS Construction Laydown Area: approx. 1.5ha.
- WHIMS Plant footprint, including access road of 160m, no wider than 30m: approximately. 4ha.

The WHIMS Plant which will beneficiate slimes from the Slimes Dam and arising material (slimes) from the existing Beeshoek Plant. The slimes will be transported via pipelines from the various sources. Tailings Pipeline HDPE: 315mm diameter at 750m^3/hr (208.3l/s):

- 1.1km (new WHIMS Plant clarifier to northern perimeter of Slimes Dam);
- 1.4km (new WHIMS Plant clarifier to southern perimeter of Slimes Dam); and
- existing pipeline of 1.3km to be rerouted from existing thickener directly to the new WHIMS Plant.

Within the laydown area, a 2 500m^2 Staging Reclaim Stockpile comprising low grade feed material will be located. Dry tailings from the existing tailings facility will be hauled to the WHIMS plant area with Cat 777 dump trucks and stockpiled on an engineered terrace. After which, the tailings are loaded onto the plant feed conveyor for re-processing (Re-Claim stockpile). The tailings will be stockpiled to a maximum height of 3,5m. Leachate from the tailings is considered hazardous (type 3 effluent) as defined in the NEMWA regulations of 2013. In accordance with NEMWA, Type 3 waste may be disposed where a Class C barrier system has been provided. The sub-soil drainage system consists of the following material:

- Tri-Planar Geonet placed above;
- 1.5mm HDPE Dual Textured Geomembrane, placed above; and
- 3700g/m^2 Geosynthetic Clay Liner (Sodium Bentonite Prehydrated layer), linked to a 110mm diameter subsoil pipe, surrounded by 19mm washed stone.

Please refer to Annexure 15 for the designs.

To ensure planning for emergency shutdown conditions the plant will also be equipped with a WHIMS Plant Emergency Product Stockpile (21m^2) within WHIMS Plant footprint.

The WHIMS Plant will be designed to optimise water reuse in the process circuit, as the materials to be received from the Slimes Dam have a high water content. For this reason, the Plant will comprise of main Central Process Water Dam

(0.4ha, capacity planned at 5 000m^3). Water will be recirculated between the plant, like to Plant Clarifier tank (diameter 56m, capacity 9 700m^3), the Process water tank (1000m^3) adjacent to new WHIMS Plant Clarifier and this Process Water Dam. Pipelines which will be provided for the reticulation of water within the system will include:

- Return Water Pipeline HDPE, 280mm diameter at 400m^3/hr (111l/s): - 1.1km (re-routing of existing pipeline from Tailings Storage Facility (Slimes Dam) to WHIMS Plant clarifier).
- Process Water Pipelines: 350mm diameter - 1.3km (replacement of existing pipeline with new pipeline from Central Water Dam to new Process Water Tank (2 000m^3) adjacent to existing Clarifier).
- Water from Central Process Dam to Existing Beeshoek Plant: 200mm mild steel – 1.3km at 400m^3/hr (111l/s).

The Central Process Dam will be the key water management infrastructure for this Plant. Run-off from the re-claim tailings stockpile was classified as type 3 effluent. The surface run-off from the stockpile terrace is captured along concrete lined drains and discharged into a silt trap where the silt can settle. The overflow from the silt trap will then enter the Central Water Dam and circulated back into the process plant. The dam design includes the following:

- sized to contain 5000m3 of process water and the 1 in 50 year 24hr storm water runoff from the re-claim stockpile terrace.
- The dam is predominantly in cut with a short wall fill height of less than 2m above natural ground level.
- The overall depth within the pond is 4.0m and consists of the following:
    - 2.7m depth to the operating water level (process water)
    - 200mm depth to accommodate the 1 in 50 year 24hr storm event from the re-claim stockpile
    - 800mm freeboard to the spillway invert, and
    - 300mm spillway top of the dam wall.
- The spillway was sized to accommodate overflow if the 100-year flow is exceeded, and any overflow water channelled along a concrete lined drain and discharged into the existing stormwater drainage system downstream.
- The embankment walls of the dam were shaped with internal and external side slopes of 1:3.

Please refer to Annexure 15 for the designs.

Potable water will be sourced from the existing supply system. A new potable water pipeline 140mm diameter - 1.6km 100 m^3/hr (28l/s) from steel potable water tank (100m^3) will be constructed at the new Jigs Plant to a combined steel potable water/fire water tank (approximately 1 000m^3) at WHIMS Plant.

All waste from this process will be disposed of onto the existing Slimes Dam and no new mine residue Stockpile will be developed.

Electricity will be sourced from the existing substation on site, via an overland powerline: 22kV powerline, approximately 700m in length.

Product from the Plant will be stockpiled on a WHIMS 1mm Product Stockpile, with a footprint of 300m^2 within the WHIMS Plant footprint area.

2.c.iv.2.b Jig Plant

The dimensions of the Jig Plant footprint will be:

- New Jig Plant footprint: approx. 2.6ha.
- New Jig Plant Construction Laydown Area: 2ha on existing Discard Stockpile footprint.

Materials will be sourced from the existing Jig Plant, as well as the exiting Discard Dump. For supply, additional feed stockpiles will be placed within the existing Discard and previous ROM stockpile footprints. These will include Stockpiles [comprising of both material from the Discard Dump (also referred to as a Low-Grade Stockpile] and arising low grade material from the existing Jig Beneficiation Plant). The stockpiles created from material reclaimed from the existing Low-Grade Stockpile (Discard Dump) and the stockpile created with the arising material (low grade) from the existing Jig Beneficiation Plant are intermediate stockpiles created within the footprint of the existing Discard Dump (the Low Grade Intermediate Stockpile and the Arising Stockpile). Material from these intermediate stockpiles is transported to and fed into the new Jig Plant loading bin located south of the existing Low-Grade Stockpile. Low low grade material from the new Jig Plant is then conveyed back to the Low Grade Stockpile footprint, deposited onto the ground and then moved back towards the existing Discard Dump. The three (3) stockpiles associated with the new Jig Plant includes the following:

- Low Grade -32+1mm Stockpile (Intermediate) (0,5ha) located between the existing Low Grade Stockpile (Discard Dump) and the new Jig Plant loading bin on the existing Low Grade Stockpile foot print. Low grade material transported to and from the intermediate stockpile by means of front end loaders.
- Arising -32+1mm Stockpile (Intermediate) (0.6ha) located between the to be constructed arisings conveyor discharge position and the new Jig Plant loading bin and within the existing Low Grade Stockpile footprint. Low grade material transported from the Arising -32+1mm Stockpile by means of front end loaders.
- Low low grade material from the new Jig Plant will be conveyed by means of earth moving equipment to positions adjoining the existing Discard Dump within the existing footprint (i.e. waste from the new Jig Plant to return to the approved Discard Dump footprint). No new stockpiles will be constructed outside of the demarcated Discard Dump or other Type 3 Stockpile footprints, these will however be demarcated as part of the EMPr and WUL processes. The area of the Low Low Grade Dump (stockpile) (115m^2).

Feed from the stockpiles will be fed into a loading bin by means of front end loaders and conveyed to the crusher building containing a high pressure grind roll (HPGR) crusher and the Washing and Screening Plant. The Jig will be located in the Jig building. Conveyors will also be constructed within the plant circuit which will comprise of the following to transport material from the existing plant and waste to the existing Discard Dump:

- Approx. 25m conveyor from existing plant conveyor system to feed Jig Plant with low grade arising material;
- Approx. 330m conveyer to feed the new Jig Plant from Discard Dump to feed Discard feed bin.

There will be limited pipeline requirements with the rerouting of the existing water pipelines (buried, internal diameter 450mm).

The Jig Plant will comprise of one 100m^3 Potable Water Tank to supply potable water to this system. Process water will be sources from the current Clarifier and Process Water Tank (2 000m^3), which will be placed next to the existing Clarifier.

Discard from this Plant will be redeposited onto the Discard Dump and any potential slurry from the new Jig Plant will be pumped to the existing Jig Plant Thickener.

As this plant is constructed within a very active processing area of the mine, the rerouting of various haul roads is required. For this reason, the following will be required:

- Road 1: 240m with a width of 30m.
- New Jig Plant Road 2: 700m with a width of 30m.
- Road 3: 280m with a width of 30m.
- Road 4: 135m with a width of about 30m
- Decommissioning of existing plant haul road: approximately 1000m in length and 30m wide.

Electricity will be sourced from the existing substation on the mine via an overhead Powerline: 22kV powerline of approximately 620m in length and the rerouting of underground electrical cable: 22kV of approximately 380m in length.

Table 31: Beneficiation Project

Description	Footprint Size	Dimensions	Coordinates of activities triggering listing notices or WMLs	Listed Activities triggered

Project 4: Development of the Beneficiation Project which will comprise of a WHIMS Plant and Jig Plant at Beeshoek	- WHIMS Plant
	  o WHIMS Construction Laydown Area: approximately 1.5ha.
	  o Within the laydown area, a 2 500m^2 Staging Stockpile comprising low grade feed material will be located. This material will be processed material (i.e. raw material) derived from the Slimes Dam. All waste (oversize and slimes) will be disposed of onto the existing Slimes Dam and no new Mine Residue Stockpile will be developed.
	  o WHIMS Plant Clarifier with a capacity of 9 700m^3.
	  o WHIMS Plant footprint, including access road of 160m in length (approximately 4ha).
	  o WHIMS Plant Central Process Dam: 0.4ha, with capacity <u>of 5 000m^3</u>.
		WHIMS Plant: 13.2ha
		
		1 000m^3 Process Water Tank
		
		9 700m^3 Clarifier
		
		5000m^3 Central Process Water Dam
			WHIMS Plant: 28°16'44.91"S; 23° 0'28.04"E
			
			Process Water Tank 28°16'41.88"S; 23° 0'24.32"E
			
			Clarifier 28°16'42.41"S; 23° 0'23.05"E
			
			Central Water Dam 28°16'37.00"S; 23° 0'23.00"E
				<u>Listing Notice 1, Activity 10:</u> 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—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.
				
				<u>Listing Notice 1, Activity 14:</u> The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80

Description	Footprint Size	Dimensions	Coordinates of activities triggering listing notices or WMLs	Listed Activities triggered
	o WHIMS Plant Emergency Product Stockpile: $21m^2$ within WHIMS Plant footprint area. o WHIMS 1mm Product stockpile: $300m^2$ within the WHIMS Plant footprint area. o Tailings Pipeline HDPE: 315mm diameter at $750m^3$/hr (208.3l/s): ▪ 1.1km pipeline from the WHIMS Plant Clarifier to the northern perimeter of Slimes Dam; ▪ 1.4km from the WHIMS Plant Clarifier to the southern perimeter of the Slimes Dam; and ▪ existing pipeline of 1.3km to be rerouted from the existing Beneficiation Plant Thickener directly to the WHIMS Plant. o Return Water Pipeline HDPE, 280mm diameter at $400m^3$/hr (111l/s): 1.1km (rerouting of existing pipeline from Slimes Dam to WHIMS Plant Clarifier). o Process Water Pipelines (throughput below 120l/s): 350mm diameter - 1.3km [replacement of existing pipeline with new pipeline from Central Water Dam to new Process Water Tank (2 $000m^3$ – see project 5 below) adjacent to exiting Beneficiation Plant Clarifier]. o Water from Central Water Dam to existing Beeshoek Plant: 200mm mild steel – 1.3km at $400m^3$/hr (111l/s). o New potable water pipeline 140mm diameter – 1.6km in length with a throughput of 28l/s from the steel potable water tank ($100m^3$) at the new Jig Plant to combined steel potable water/fire water tanks (approximately $1000m^3$) at the WHIMS Plant. o Overland Powerline: 22kV powerline of approximately 700m in length.	$1000m^3$ Potable/fire Water Tank Emergency Plant Stockpile (20m3 at any given time) Staging Stockpile (capacity 6 $000m^3$) 1mm Product Stockpile (capacity 1 $000m^3$) Sewage Conservancy Tank of $6m^3$ Tailings Pipeline HDPE: 315mm diameter at $750m^3$/hr (208.3l/s): ▪ 1.1km northern perimeter to Slimes Dam; ▪ 1.4km southern perimeter to Slimes Dam; and ▪ existing pipeline of 1.3km to be rerouted directly to the WHIMS Plant.	Potable/Fire Water Tank 28°16'41.50"S 23° 0'24.67"E Emergency Plant Stockpile 28°16'40.96"S; 23° 0'26.54"E Staging Stockpile: 28°16'38.53"S; 23° 0'26.85"E 1mm Product Stockpile 28°16'43.40"S; 23° 0'21.04"E Sewage Conservancy Tank 28°16'45.69"S; 23° 0'25.11"E Tailings Pipeline: 28°17'16.91"S; 23° 0'6.77"E 28°16'44.52"S; 23° 0'21.25"E 28°17'2.28"S; 23° 1'4.94"E	cubic metres or more but not exceeding 500 cubic metres. **Listing Notice 1, Activity 24**: The development of a road—with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road—which is 1 kilometre or shorter. **Listing Notice 1, Activity 27**: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous **vegetation** is required for— except for the undertaking of a linear activity. **Listing Notice 1, Activity 34**: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding— (i) where the facility, infrastructure, process or activity is 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; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day. **Listing Notice 1, Activity 56**: The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre—where the existing reserve is wider than 13,5 meters; or where no reserve exists, where the existing road is wider than 8 metres. **Listing Notice 2, Activity 6**: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This will be specific to new dirty water tanks and new Process Water Dam.
	▪ New Jig Plant o New Jig Plant footprint: approximately 2.6ha on already disturbed areas. o New Jig Plant Construction Laydown Area: 2ha on existing Discard Dump footprint. o Feed from the existing Discard Dump (low-grade material fed into a loading bin by means of front end loaders and conveyed to the Washing and Screening Plant); o Washing and Screening Plant; o Crusher building containing a high pressure grind roll (HPGR) crusher; o Jig located in the Jig building; o MCC and transformer bay; o Re-routed existing water pipelines (buried, internal diameter 450mm); o Slurry from the new Jig Plant will be pumped to the existing Plant Thickener (no new activities triggered);	New JIG Plant: 20.6ha Plant Potable Water Tank 100m3 New Jig Plant Intermediate Low Grade Stockpile 0.4ha (5 $500m^3$) Jig Plant Arising Stockpile 0.3ha (6 $000m^3$)	New JIG Plant: 28°17'25.89"S; 23° 0'25.15"E Potable Water Tank 28°17'23.76"S 23° 0'17.57"E New Jig Plant Intermediate Low Grade stockpile 28°17'18.70"S; 23° 0'35.48"E Jig Plant Arising Stockpile 28°17'17.17"S; 23° 0'31.32"E	**Waste Management Activities: Category A, Activity 15**: Category B, Activity 15: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which requires a prospecting right or mining right in terms of the MPRDA. This will be applicable at the WHIMS Plant for the new transfer and feed stockpiles (specifically the Staging Stockpile, which will be a designed facility), this will also be applicable to the Jig Arising and Low Low Grade Stockpile. The reworking of the discard, low grade material and slimes are existing approved activities on site in terms of the approved EMPr, 2009. However for the purposes of the application, these activities will be clearly described and listed. Note that the Jig Feed Stockpile (intermediate stockpile) will not trigger new WMLs as these will be placed on existing approved WRD footprints and are regarded

Description	Footprint Size	Dimensions	Coordinates of activities triggering listing notices or WMLs	Listed Activities triggered
	o New process water tank (located near existing Plant Thickener) – 2,000m³ (this forms part of Project 5). o Stockpiles [comprising of both material from the Discard Dump (also referred to as a Low Grade Stockpile] and arising low grade material from the existing Jig Beneficiation Plant). The stockpiles created from material reclaimed from the existing Low Grade Stockpile (Discard Dump) and the stockpile created with the arising material (low grade) from the existing Jig Beneficiation Plant are intermediate stockpiles created within the footprint of the existing Discard Dump (the Low Grade Intermediate Stockpile and the Arising Stockpile). Material from these intermediate stockpiles is transported to and fed into the new Jig Plant loading bin located south of the existing Low Grade Stockpile. Low low grade material from the new Jig Plant is then conveyed back to the Low Grade Stockpile footprint, deposited onto the ground and then moved back towards the existing Discard Dump. The three (3) stockpiles associated with the new Jig Plant includes the following: ▪ Low Grade -32+1mm Stockpile (Intermediate) (0,5ha) located between the existing Low Grade Stockpile (Discard Dump) and the new Jig Plant loading bin on the existing Low Grade Stockpile foot print. Low grade material transported to and from the intermediate stockpile by means of front end loaders. ▪ Arising -32+1mm Stockpile (Intermediate) (0.6ha) located between the to be constructed arisings conveyor discharge position and the new Jig Plant loading bin and within the existing Low Grade Stockpile footprint. Low grade material transported from the Arising -32+1mm Stockpile by means of front end loaders. ▪ Low low grade material from the new Jig Plant will be conveyed by means of earth moving equipment to positions adjoining the existing Discard Dump within the existing footprint (i.e. waste from the new Jig Plant to return to the approved Discard Dump footprint). No new stockpiles will be constructed outside of the demarcated Discard Dump or other Type 3 Stockpile footprints, these will however be demarcated as part of the EMPr and WUL processes. The area of the Low low Grade Dump (stockpile) (115m²). o Jig Plant Conveyors: ▪ Approximately 25m conveyor from existing plant conveyor system to feed Jig Plant to transport arising low grade material and discard (not considered dangerous goods);	Jig Plant Low Low Grade Stockpile 2ha (38m³) Sewage Conservancy Tank of 6m³ Jig Plant Road System: • Road 1: 240m with a width of approx. 30m. • Jig Plant Road 2: 700m with a width of approx. 30m. • Road 3: 280m with a width of 30m. • Road 4: 135m with a width of about 30m	Jig Plant Low Low Grade Stockpile 28°17'20.21"S; 23° 0'18.30"E Sewage Conservancy Tank 28°17'24.69"S; 23° 0'17.49"E Road 1: 28°17'34.48"S; 23° 0'14.63"E 28°17'30.73"S; 23° 0'20.79"E Road 2: 28°17'26.71"S; 23° 0'17.52"E 28°17'37.24"S; 23° 0'37.02"E Road 3: 28°17'29.92"S; 23° 0'28.81"E 28°17'26.47"S; 23° 0'29.18"E Road 4: 28°17'31.76"S; 23° 0'34.55"E 28°17'24.44"S 23° 0'39.12"E	as ROM feed stockpiles. All final discard will be deposited back onto the Discard Dump. However the Arising Stockpile and Low low grade stockpile will be regarded as new WMLs as these will be derived from the current Discard Dump. All final discard will be deposited back onto the Discard Dump. **<u>Water Uses:</u>** Section 21 (g) and (b) water uses WHIMS Plant: 1000m³ Process Water Tank; 9 700m³ Clarifier; 5000m³ Central Process Water Dam; 1000m³ Potable/fire Water Tank; Emergency Plant Stockpile (20m3 at any given time), Staging Stockpile (capacity 6 000m³) and 1mm Product Stockpile (capacity 1 000m³), Sewage Conservancy Tank of 6m³. Jig Plant: 100m³ Potable Water Tank, Intermediate Stockpile (capacity 5 500m³), Arising Stockpile (capacity 6 000m³) and Low low grade Stockpile (capacity 118m³), Sewage Conservancy Tank of 6m³.

Description	Footprint Size	Dimensions	Coordinates of activities triggering listing notices or WMLs	Listed Activities triggered
	▪ Approx. 330m conveyer to feed the new Jig Plant from Discard Dump feed bin. ▪ This excludes in plant conveyors). ○ New Jig Plant Roads interlinked: ▪ Road 1: 240m with a width of 30m. ▪ New Jig Plant Road 2: 700m with a width of 30m. ▪ Road 3: 280m with a width of 30m. ▪ Road 4: 135m with a width of about 30m ▪ Decommissioning of existing haul road: approximately 1000m in length and 30m wide. ▪ (this excludes roads to be constructed on the Plant terraces). ○ Overhead Powerline: 22kV powerline of approx. 620m. ○ Rerouting of underground electrical cable: 22kV of approx. 380m. Power supply will comprise of 22kV powerlines. Electricity will be sourced from the existing Beeshoek Substation. Minor upgrades will be undertaken within the footprint area of this substation and the feeding Eskom Substation, but no listed activities will be triggered in this regard. • Clearance (potentially 5.6ha), note that the clearance associated with the road does not contribute to the listing activity for clearance.: ○ Road 1 – potential clearance of 0.1ha (considered disturbed area). ○ WHIMS Laydown Area: approximately 1.5ha. ○ WHIMS Plant footprint, including access road of 160m: approximately 4ha. • WHIMS Plant Central Process Water Dam: 0.4ha, capacity less than 50 000m^3.			

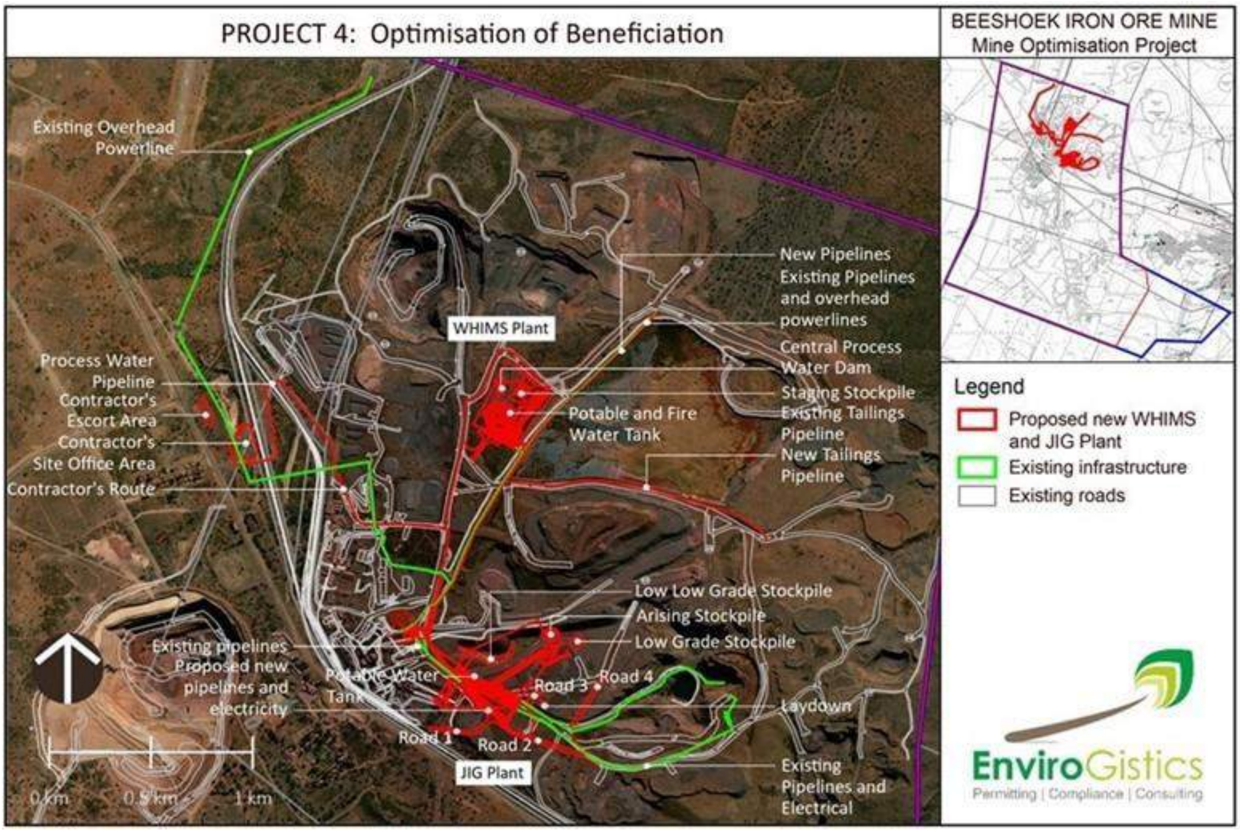


Figure 27: WHIMS and JIG Plant

The following picture provides a more summarised illustration:

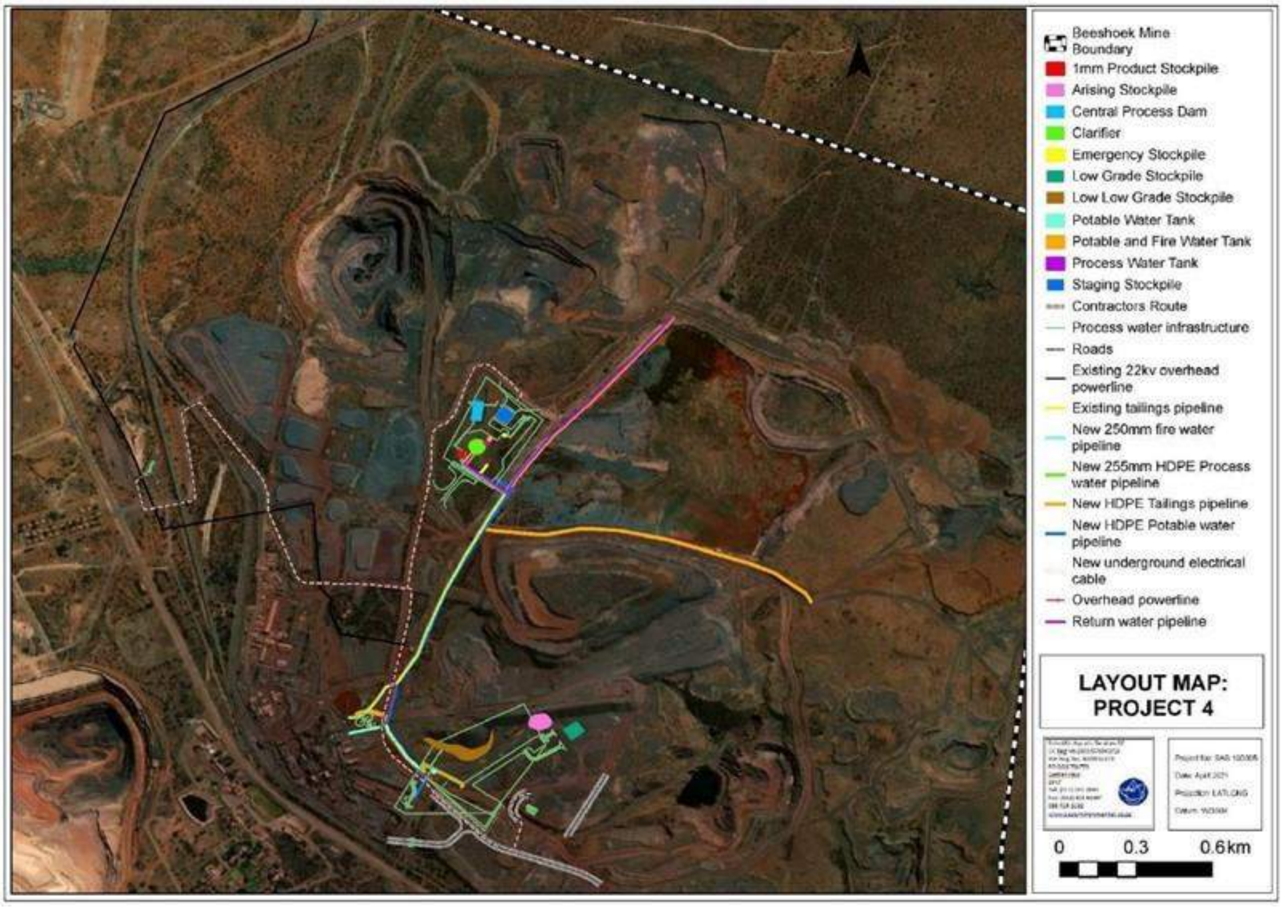


Figure 28: WHIMS and JIG Plant (summarised illustration)

2.c.v Project 5: Water Management

2.c.v.1 Current Status

2.c.v.1.a Potable and Process Water

Potable water for use by the Mine is obtained from various boreholes on site. Boreholes are licensed for domestic supply and others for both domestic and process water supply, as well as for the purposes of dewatering for safe mining conditions.

Twelve boreholes are licensed in the WUL, 2018 to abstract a total volume of 5 655 371m^3/a. Of these boreholes, five are licensed for dewatering specifically (of which two are in-pit dewatering). The mine plans to add the HF Pit Borehole (WG74) currently licensed for potable water supply as a dewatering borehole for the HF Opencast Pit in the near future. This intercepted groundwater forms part of the mine's clean water circuit.

The potable water is collected in two concrete reservoirs at the entrance to the South Mine where the water is disinfected for further distribution on the mine site. With the addition of the new water balance components, there are 11 clean water dams included in the WUL (this excludes the two fire water tanks). Most of these dams are not used to store water on a daily basis, but only to transfer water from where groundwater is abstracted to where it is required for use.

Clean water is considered to be all other groundwater abstracted as well as the water sourced from the Sedibeng pipeline; and process water is all in-pit dewatering, stormwater runoff and water contained in dirty water dams.

A bulk water supply scheme from the Vaal River to the arid areas of the Gamagara valley near Postmasburg and north thereof was implemented by the then DWA (now DWS) to supply potable water to these areas and thus to enable the development of the large scale mining operations in areas such as Beeshoek, Lime Acres, Sishen, Mamatwane, Hotazel and Black Rock. Beeshoek is not currently using potable water from the Vaal Gamagara Water Supply Scheme, but rather sourced from Kolomela Mine directly. All potable water is sourced from boreholes drilled on the mine property. Beeshoek however receives extraneous mine water from the Sedibeng Pipeline that originates from Kolomela Mine. This water is made available to Beeshoek according to an agreement reached with Anglo American dated 28 November 2012 in lieu of groundwater loss at Beeshoek due to the impact of dewatering at Kolomela Mine. The agreement allows the use of 320m^3/hr, of water from the pipeline which is equivalent to a maximum rate of 2,8 million m^3/a. Kolomela Mine is responsible for the cost of abstracting this water from the Sedibeng Pipeline. The Sedibeng Pipeline agreement contributes 32% of the available water resources.

Groundwater from boreholes is the main source of potable water at the Beeshoek Iron Ore Mine complex for usage at the Plant, and workshop and office areas. However, the mine has an allocation available from the groundwater resources, as well as water from the Vaal Gamagara Water Supply Scheme, which is used as top-up water when required. There are several boreholes in the area that supply water to the plant. The WUL allows for the seven (7) boreholes to be used as supply boreholes:

- Boreholes WG28, WG34 (replaced by OW024), WG35 (replaced by OW023), WG37, SG62, WG74 and WG27.

2.c.v.1.b Water Storage Areas

<u>Clean Water Storage</u>

Clean water resources at the Mine include:

- Water dewatered directly from groundwater; and
- Water obtained from the Vaal Gamagara Water Supply Scheme (only utilised when the need arises).

The Mine is operating within a closed internal water circuit.

Beeshoek is authorised to store water in various tanks (steel and plastic) on site. The water is sourced from the main water supply systems (either the supply boreholes or the pipeline scheme). Dams currently approved for clean water storage include the:

- Airfield Tank;
- Dam D94 and Dam D92 (previously known as the Golf course dam)
- Dam D96 (also known as the Tommy's Field Tank),
- Dam 301A and 301B (also known as Midsouth 3 Tanks);
- Dam D300 (also known as Mid-South 1 Tanks);

- Dam D90 (also known as Main Reservoir);
- Dam D91 (also known as Main Reservoir);
- Dam D97 (also known as the Uitsig Tank); and
- Tank 25KT02A &B.

Dirty Water Storage

Dirty water on site includes:

- Water runoff from Plant and workshop areas;
- Water circulated through the Plant, Thickener, Clarifier and Slimes Dam process; and
- In-pit water dewatering.

Limited dams are used to manage water on the Mine and include:

- Blou Dam (Dam D86);
- South Evaporation Ponds;
- Tank 26TK01A & B (also known as the BN Dam);
- Clarifier and Thickener System; and
- Storm Water Dam North.

Beeshoek operates on the strategy of maximising the utilisation of "dirty water" in the mining area and has a policy of zero discharge of contaminated water to the environment.

2.c.v.2 Proposed Project

The project will result in the minor changes to the location of borehole positions to optimise dewatering for safe mining conditions.

The intent of this project is not to increase water abstraction from the groundwater resources, but to rather improve water management on site. This is specifically relating to utilising available water allocations and agreements. In terms of the WUL, 2018, the mine has a total of 5 655 371m^3/a approved as Section 21(a) – groundwater abstraction and use. This has been reduced in the amended Water Use Licence Application (WULA), 2021 to 5 652 724m^3/a. A large portion (70%) of this allocation is to allow dewatering for safe mining practices. Due to the reduction in groundwater levels to south of the Mine, dewatering volumes have been reduced for Village Pit. However, an increase volume has been included for the re-mining of the HF Pit. Note that overall water abstraction is still in line with the WUL, 2018. The Mine is dependent on water supply from external sources to ensure sustainable supply. A bulk water supply scheme from the Vaal River to the arid areas of the Gamagara valley near Postmasburg and north thereof was implemented by the then DWA (now DWS) to supply potable water to these areas and thus to enable the development of the large-scale mining operations in areas such as Beeshoek, Lime Acres, Sishen, Mamatwane, Hotazel and Black Rock. Beeshoek is not currently using potable water from the Vaal Gamagara Water Supply Scheme, but rather sourced from Kolomela Mine directly. All potable water is sourced from boreholes drilled on the mine property. Beeshoek receives extraneous mine water from the Sedibeng Pipeline that originates from Kolomela Mine. This water is made available to Beeshoek according to an agreement reached with Anglo American dated 28 November 2012 in lieu of groundwater loss at Beeshoek due to the impact of dewatering at Kolomela Mine. The agreement allows the use of 320m^3/hr, of water from the pipeline which is equivalent to a maximum rate of 2,8 million m^3/a. Kolomela Mine is responsible for the cost of abstracting this water from the Sedibeng Pipeline. The Sedibeng Pipeline agreement contributes 32% of the available water resources.

In addition to this the project allows for the storage and distribution of water within the mine area to protect water losses and improve storage capacity. The mine will therefore establish additional water storage tanks on site which will include:

- A new storage tank near the exiting BN Tank of 500m^3. The purpose is to provide sufficient storage space for water from the approved in-pit dewatering activities. This will likely be a concrete type of facility;
- 4x 10m^3 plastic tanks at the current Beneficiation Plant, to assist with day to day operational water transfer and use;
- 1 x 2 000m^3 process water steel fabricated tank adjacent to the existing Clarifier connected with a “balancing pipe”. To allow for the storage of water in the water balance system of the mine to capacitate the plant process to start up without delay;
- Existing Dam: Steel Dam - 250m^3 capacity to store process water and allow for the storage of top-up water;
- Existing Dam: Zinc Dam - 90m^3 capacity to store input water where required; and

- A new dewatering tank at the Village Opencast Pit.

Table 32: Water Management Project

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
Project 5: Water Management	- A new storage tank near the existing BN Tank of 500m^3. The purpose is to provide sufficient storage space for water from the approved in-pit dewatering activities. - 4x 10m^3 plastic tanks at the existing clarifier, thickener area. To allow for the storage of water in the water balance system of the mine to capacitate the plant process to start up without delay; - 1 x 2 000 m^3 process water tank adjacent to the existing process water tank and is connected to it with a "balancing pipe" to allow for the storage of water in the water balance system of the mine to enable the new plant process to start up without delay. - Existing Dam: Steel Dam with 250m^3 capacity to store process water and allow for the storage of top-up water. - Existing Dam: Zinc Dam: with 90m^3 capacity to store input water where required. - A new dewatering tank at the Village Opencast Pit. - A Balancing Tank for D 300 to transfer groundwater sourced from South Mine.	- Steel or Cement above ground tank of 500m^3. - 4 x 10m^3 plastic tanks at the current Beneficiation Plant. - 1 x 2000 m^3 at the existing Clarifier and Thickener area. - Existing Dam: Steel Dam - 250m^3 capacity. - Existing Dam: Zinc Dam - 90m^3 capacity to store input water where required. - Tank to contain the dewatering from Village Opencast Pit for reuse in the mining processes: capacity 250m^3. Tank to contain the drinking water.	BN Storage Dam: 28°16'45.25"S; 22°59'56.60"E 4x 10m^3 plastic tanks: 28°17'17.67"S 23° 0'7.22"E 2000m^3 Process Water Tank: 28°17'17.34"S 23° 0'9.11"E Steel Dam: 28°17'42.61"S; 23° 0'15.78"E Zinc Dam: 28°17'22.94"S; 23° 0'5.33"E Village Dewatering Tank: 28°17'32"S; 22° 59'46"E Dam 300: 28° 19' 11.216" S; 22° 59' 1.885" E	**Listing Notice 1, Activity 9**: The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water—with an internal diameter of 0,36 metres or more; or with a peak throughput of 120 litres per second or more. **Listing Notice 1, Activity 10**: The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more. **Listing Notice 2, Activity 6**: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. **Water Uses:** Section 21(g) for the storage tanks and 2000m^3 Process Water Tank. Section 21(b) for the D300 balancing tank.

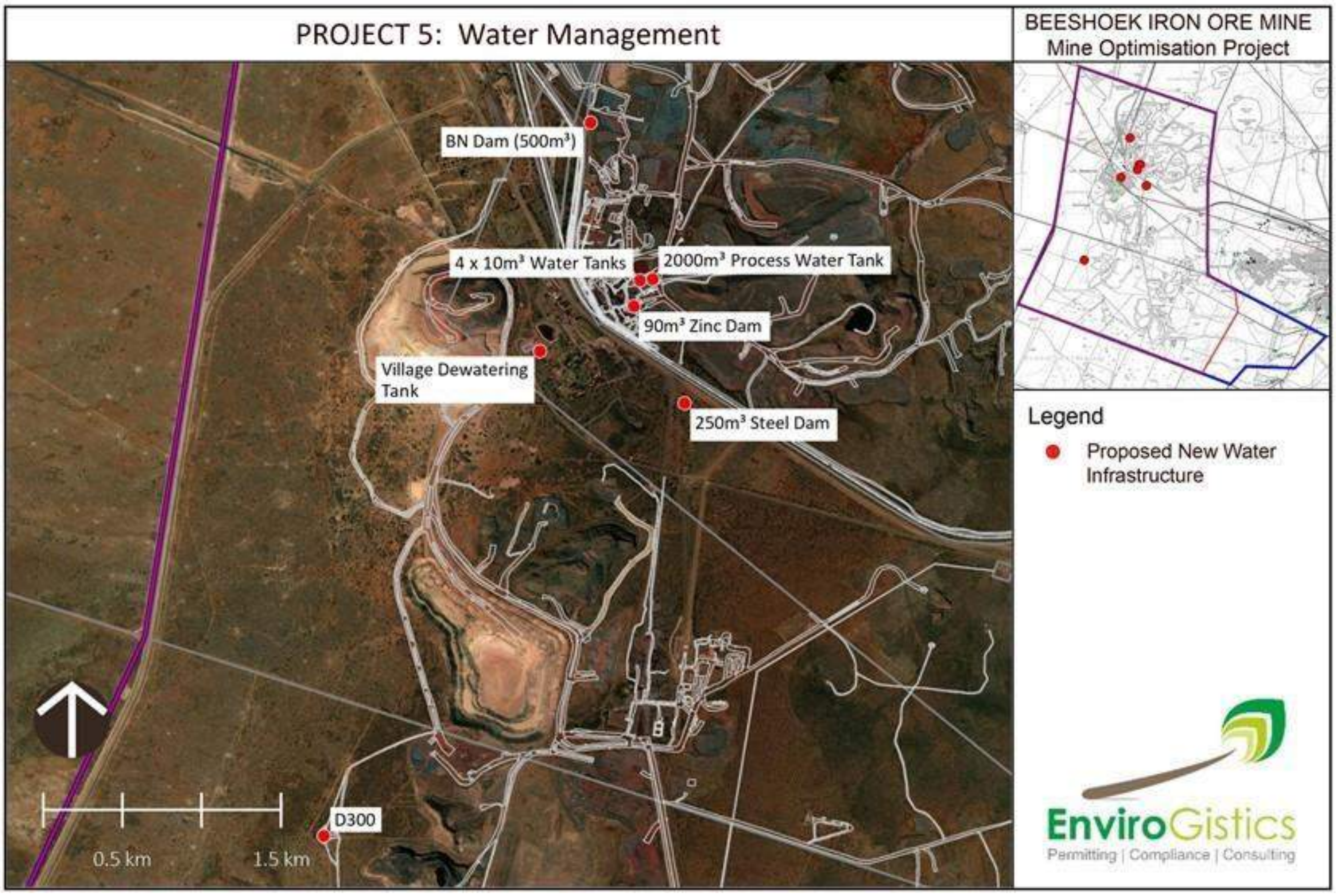


Figure 29: New Water Infrastructure

2.c.vi Project 6: Railway Line Link (TFR and Beeshoek Siding)

2.c.vi.1 Current Status

Beeshoek currently provides to external and internal markets via their rail load out facilities at Beeshoek. There are two rail load-out facilities at Beeshoek, with one handling Lumpy and DR, and one handling Fines. The railway siding is operated at a 24 hour, seven day a week process.

The Lumpy and DR stockpiles are reclaimed using feeders situated below the stockpile bed, which place the product on a reclaim conveyor, which then feeds the Lumpy/DR load-out conveyor system. Front-end loaders are utilized to draw material from the fines product stockpile and feed a hopper for the conveyance system feeding the Fines load-out.

The current siding allows for the following:

- 11 – 13 local trains per week, consisting out of 105 wagons loaded on average 63.5 tons per wagon
- 1 export train per week, consisting out of 114 wagons loaded on average 68.5 tons per wagon.

In 2010/2011 the rail facilities for Kolomela Mine and the corresponding direct link to the TFR Ore line were designed and constructed. The line was constructed to 30t axle load standards with an operational design allowing 342 wagon trains (3 rakes of 114 wagons) to be operated by Kolomela Mine via the use of a swingset rake (114 wagons).

The swingset principle allowed for a 4th rake to be preloaded and staged prior to the arrival of a train. With the arrival of an empty 342 wagon (3 rake) train, this meant that only 2 rakes (of 114 wagons) would have to be loaded before a recompiled 342 wagon (3 rake) train could depart thereby shortening the turnaround time of the train within the siding.

An option within the operational design was an allowance for Beeshoek Mine to make use of the swingset concept within the consist makeup. This would mean that Beeshoek could load one rake while Kolomela Mine was loading the other 2 rakes and the required turnaround time could be met. It would also give Beeshoek mine direct access to the TFR Ore Line and export customers via Saldanha.

2.c.vi.2 Proposed Project

The Beeshoek Link Line Feasibility Study aims to realise the above option and therefore the mine has investigated the options of linking Beeshoek to the TFR Ore line, via the existing Kolomela Direct Link. This in turn would allow Beeshoek Mine greater flexibility to also export ore through Saldanha port.

Negotiations with Transnet have not as of yet been concluded in terms of allocations, and for this reason the project is presented in this application as the best practical outcome. is important to note that various discussions are being undertaken between Transnet and the Applicant. These discussions would define the direction the project moves in, i.e. immediate commissioning upon authorisation, potential delay in commissioning, or not commissioning the project. However, for the purposes of this EIA report, the assumption is made that this project will proceed, and for this reason should the project proceed the following is considered:

The line (main western line) will comprise a 2.8km main link line of approximately 5.5m in width with a 5m bulk fill (varies along the alignment). The line will tie from the existing TFR Postmasburg line at the Beeshoek Iron Ore Mine, crossing over the road accessing Tommysfield Airport. The existing R385 road will be lifted into the road over rail system to allow for the railway line to cross under the R385 regional tar road before linking to the existing TFR Yard that services Kolomela Mine. Considering that one 4m access road will be constructed along the alignment with an 8m buffer on either side of the railway line, the approximate extent of the development is 9ha (85 400m^2). A second line will be constructed (the northern link line), which will tie into the existing OREX line between Beeshoek and Khumani Iron Ore Mine. This line is approximately 1.3km in length with similar dimensions as the main western line. This latter line is about 2ha is extent.

The revised approach of TFR is to run trains with 3 rakes of 116 wagons, giving trains a total length of 348 wagons. For this reason, the current operational concept is for Beeshoek to load a single train rake (116 wagons) to form part of a 3 rake train (348 wagons) which would be transported to Saldanha. The other 2 rakes of the train will be loaded by Kolomela Mine. This concept is to be explored further as part of the study.

The project requirements will include:

- Overall Design:
  - Railway formation – 5.5m
  - Bulk fill – 5m
  - One service road – 4m
  - Buffer – 8m on each side
- TFR train design
  - 348 wagons (3 x 116 rakes)
  - 30t axle load
- Beeshoek Traffic
  - 1 x 116 rake (Saldanha traffic)
  - 30t axle loads

One of two access road options will be constructed linking the R385 to Tommys Field Airport. These will have a width less than 8m and respectively lengths of 550m and 420m.

A Rail Contractor Laydown area will be required (Laydown 1). This will be located in an existing disturbed area to the south of the Mine's landfill site.

Two laydown areas will be required for the bridge construction, which will require clearance. The South laydown area is located to the east of the remands of the decommissioned R385 road, at an area of 0.8ha. The North laydown areas is located just north of this area, north of the existing R385 road, at an area of 1ha.

Borrow material will be required for the construction of the railway line. The borrow material will be sources from within the mine boundary, at existing opencast pits, such as from the Village opencast pit, the existing quartzite stockpile and the existing manganese stockpiles. Two (2) other borrow pit areas have also been identified next to the bridge laydown areas (north and south). These two areas will require clearance of 1.1ha each. A last borrow pit area will be considered, which will not require clearance as this is an existing borrow pit area, previously utilised in the construction of the R385 deviation.

During the construction phase, currently planned for about 14 months, a temporary two-way deviation road (of less than 1km, will be provided for vehicles travelling on the R385 during the construction of the road bridge.

Table 33: Railway Line Project

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
Project 6: Development of a railway line and associated service road.	15ha	Western link line: 2.8km main link line of approximately 5.5m in width with a 5m bulk fill (varies along the alignment). An 8m buffer on either side of the line will be allowed. Northern link line: 1.3km with the same dimensions as the western link line. Two access roads width less than 8m and respectively lengths of 550m and 420m. A Rail Contractor Laydown area will be required (Laydown 1), located in an existing disturbed area to the south of the mines' landfill site. Two laydown areas will be required at areas of 0.8ha and 1ha, respectively. The borrow material will be sourced from within the Mine boundary, at existing opencast pits, such as from the Village Opencast Pit, the existing quartzite stockpile and the existing manganese stockpiles. Two (2) other borrow pit areas have also been identified next to the bridge laydown areas (north and south). These two areas will require clearance of 1.1ha each. A last borrow pit area will be considered, which will not require clearance as this is an existing borrow pit area, previously utilized in the construction of the R385 deviation.	**Western Link Line** Start: 28°16'24.26"S; 22°59'39.27"E Mid: 28°16'2.90"S; 22°59'12.17"E End: 28°16'43.96"S; 22°58'42.98"E **Northern Link Line** Start: 28°15'50.00"S; 23° 0'6.74"E Mid: 28°15'59.50"S; 22°59'49.44"E End: 28°16'6.69"S; 22°59'27.41"E **Tommys Field Access Road** Start: 28°16'8.04"S; 22°59'20.38"E Mid: 28°15'58.91"S; 22°59'18.45"E End: 28°16'0.50"S; 22°59'26.01"E **Rail Access Road** Start: 28°16'7.97"S; 22°59'20.46"E Mid: 28°16'5.99"S; 22°59'28.10"E End: 28°16'1.62"S; 22°59'26.20"E **Rail contractor laydown area** 28°16'46.80"S; 22°59'41.73"E **Bridge Laydown area (S)** 28°16'10.45"S; 22°58'58.62"E **Bridge Laydown area (N)** 28°15'59.53"S; 22°58'57.94"E **Bridge Borrow Pit (S)** 28°16'9.21"S; 22°59'1.39"E **Bridge Borrow Pit (N)** 28°15'55.85"S; 22°58'57.36"E **Existing borrow pit area** 28°15'56.68"S; 22°59'7.73"E **Existing manganese stockpile borrow material**	**Listing Notice 1, Activity 27**: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan (likely only around the area of the bridge construction – although this could also be regarded infrastructure as part of the railway line system however in the event that it is required, this will not change the project scope). **Listing Notice 2: Activity 12**: The development of railway lines, stations or shunting yards excluding — (i) railway lines, shunting yards and railway stations in industrial complexes or zones; (ii) underground railway lines in a mining area; or (iii) additional railway lines within the railway line reserve.

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
			28°16'42.67"S; 23° 0'13.29"E **Existing quartzite stockpile borrow material** 28°16'36.83"S; 23° 0'1.98"E **Village Pit calcrete material** 28°17'47.31"S; 22°59'14.71"E **Temporary Construction water tank**	

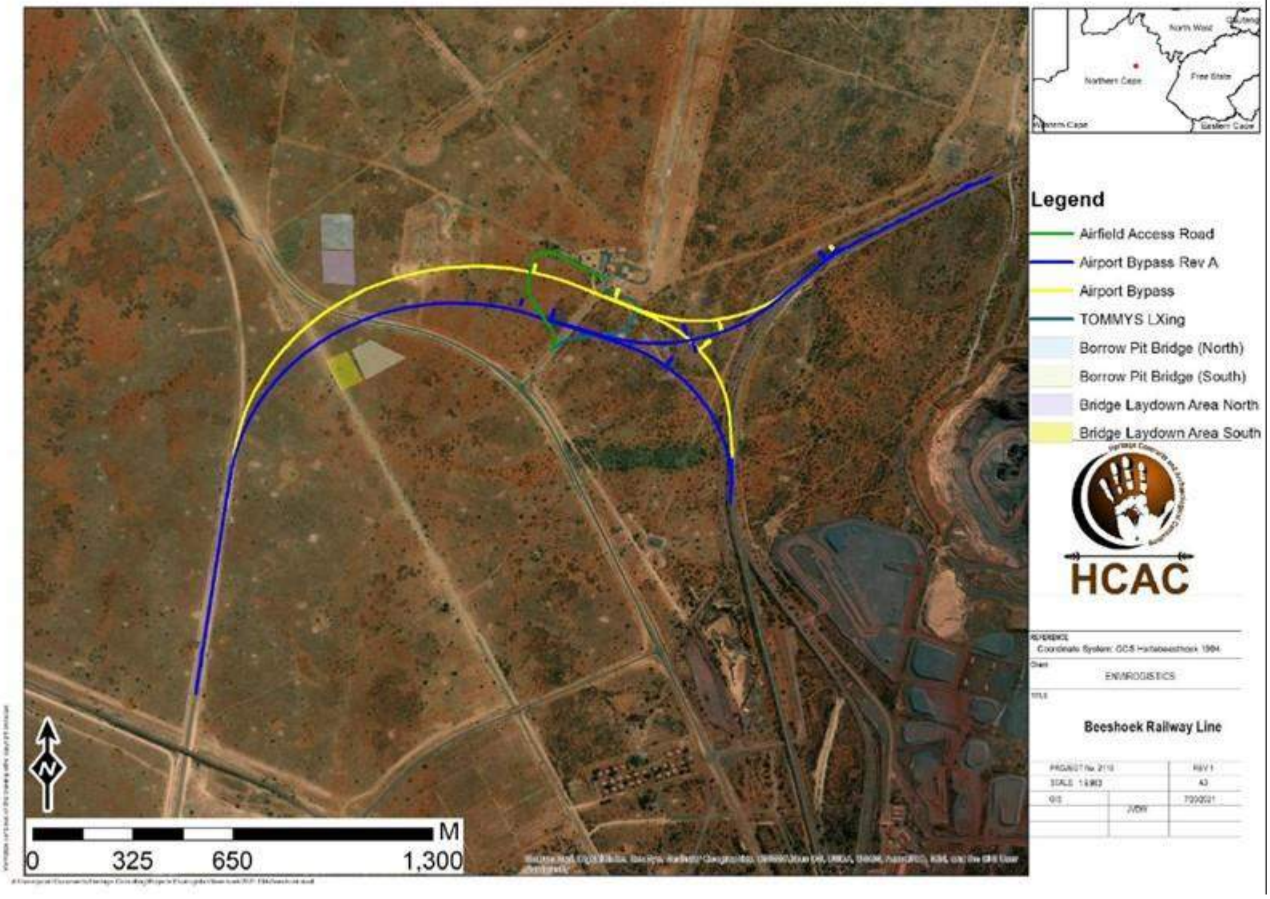


Figure 30: Railway Line (blue preferred option)

2.c.vii Description of the Activities to be undertaken

The infrastructure and activities that will form part of the proposed project will include the following:

- Planning Phase:
  - Ensure the implementation of Legal Requirements (Environmental Permits and Authorisations);
  - Drafting of contracts and protocols;
  - Training of contractors on environmental requirements;
  - Walkover to identify all protected plants, mark all species and apply for the necessary removal permits; and
  - Develop a clear and safe traffic management plan for the duration of the railway line construction specifically relating to the temporary traffic rerouting during bridge construction.
- Construction Phase:
  - Demarcation of laydown areas;
  - Demarcation of borrow pit areas;
  - Implementation of traffic management plan;
  - Land and footprint clearance;

  - Topsoil stripping and stockpiling;
  - Establishment of surface infrastructure (foundation preparation and liner implementation; infrastructure establishment, laydown areas, temporary water supply points, roads, etc.); and
  - Waste Management
- Operational Phase:
  - Opencast mining operations;
  - Beneficiation;
  - Implementation of Drilling Programme and concurrent rehabilitation;
  - Transportation (roads);
  - Mine Residue disposal;
  - Water reticulation management; and
  - Waste management (mineral waste, domestic waste and hazardous waste)
- Closure Phase:
  - Ensure the implementation of Legal Requirements (Environmental Permits);
  - Rehabilitation of Exploration Sites;
  - Backfilling or safe-making of opencast pits;
  - Rehabilitation and shaping of Mine Residue Deposits;
  - Dismantling and decommissioning of infrastructure and buildings, including product stockpiles;
  - Earth moving, shaping and ripping of ground;
  - Cessation of Labour Contracts; and
  - Waste Management.

2.d Need and Desirability of the Proposed Activities

To allow Beeshoek to optimise the mining process and reduce mineral waste on site (in line with the National Waste Management Hierarchy), the mine wishes to implement two additional Beneficiation Projects, namely a new WHIMS Plant to rework the existing slimes from the Slimes Dam and Jig Plant to rework the low-grade material from the mining operations, as well as from the existing Low-Grade Stockpile (Discard Dump). This project will have numerous economic and environmental benefits. The overall aim of the project is to optimise mining of the existing resources and the associated supply thereof.

Economic Benefit:

Section 23(1)(a) of the MPRDA states in Section 1(a), that subject to subsection (4), the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. The Mine has been awarded a Mining Right by the DMR (now DMRE) and therefore has an obligation to give effect to the following:

- The ongoing development and improvement of the Mining Work Programme which details the planned mining activities to be followed in order to mine the mineral resource optimally; and
- Optimal mining of minerals must be undertaken, as the Minerals and Petroleum Board may recommend to the Minister to direct the holder of a mining right to take corrective measures if the Board establishes that the minerals are not being mined optimally in accordance with the Mining Work Programme. The Minister may, on the recommendation of the Board, suspend or cancel a mining right if the Minister is convinced that any act or omission by the holder justifies the suspension or cancellation of the right.

The project will ensure that low-grade minerals in the existing Low-Grade Residue Stockpiles (Slimes Dam and Discard Dump) can be reworked, thereby also reducing the volumes of waste stored on site, and reducing the associated financial rehabilitation requirements and potential, although found limited, potential environmental impacts.

Social Benefit

It is important to understand that the optimisation project is a strategic project, specifically to ensure the sustainable life of mine for Beeshoek.

The project is not a capital investment to increase production, but rather to ensure an opportunity for the continuation of current opencast pit operations, as well as to implement opportunities for the reworking of low-grade stockpiles. This last-mentioned reworking is to supplement production to meet the annual production commitments. The project will thus not result in an increase of employment numbers, but rather the sustainability of the continuation of the mining operations supporting the current work force.

In conclusion to this point, the benefit specifically to the Local Municipality and community in terms of this project, is the fact that Beeshoek Mine’s life of mine will increase from the current disclosed 5 years to a possibility of 15-20 years. This will ensure the continuation of the existing commitments made in the Social and Labour Plan (SLP). Should this project be successful it will further continue in the revision of the SLP once the current 5 year period has passed, allowing for a continuation of Beeshoek's involvement in the Socio-Economic Development of the Tsantsabane Local Municipality.

As this project is purely an optimisation project limited additional job creation opportunities will be available during the construction phase. However, for the operational phase, the staff compliment will likely revert back to the current staff compliment, with limited new positions required. This project is to ensure a sustainable increase in the life of mine, not increase in production. This project will in fact allow for the continuation of mining activities, which will rather secure the employment of the current staff compliment. It is anticipated that between 4 to 18 skilled individuals and approximately 23 to 72 unskilled personnel would be required on a monthly basis during the construction/start-up period of approximately 8 months. Approximately 18 to 34 existing employees within management positions would also be involved. Overall, the construction phase (initial and early works) of approximately 8 months would, during its peak periods, result in 122 positions of which 70 would fall in the unskilled category, 18 in the skilled and 34 in management positions[2]. The construction of the railway link line and bridge at the R385 would add to the total job opportunities and could increase the construction staff complement. It should, however, be noted that a portion of these would still consist of the existing permanent employees.

A temporary increase in the concentration of workers will thus occur e.g., during the construction of the haul roads and decommissioning of the existing sections of haul roads, construction of the railway link line as well as the service relocations. New opportunities for short-term contract work could thus be generated for some periods of time as there would be around 20-70 unskilled personnel required at certain stages for the new mining infrastructure. This figure could increase with the construction of the railway link line and bridge at the R385. Locals could be part of the specialist contractor teams involved in the short-term contracts. The construction of the railway link line could change these figures. The existing employment profile and staff compliment will be sustained during the operational period. No significant additional inflow of workers is thus expected. Beeshoek will function in a way as to continue the constant positive impact in terms of employment through their procurement and Human Resources department, who manages the employment in line with the relevant Score Cards.

The Mine has a dedicated procurement and Human Resources (HR) department, who manages the employment in line with the relevant Score Cards. Strong emphasis is place on the involvement of local labour. The mine will further ensure that local labour is sourced where possible during the construction phase. It is highly unlikely that this project will result in an influx of job seekers as not new areas will be opened for construction and no new substantial opencast pts are being developed. The new plants are regarded as an addition to the existing North Mine beneficiation plant. In terms of the SLP (2019-2024) the mine sets out targets to reach the Mining Charter (2018) procurement target of mining goods of 70% from South African companies with 21% spent on majority HDI owned companies (current contribution 6%); 5% on women and or youth owned companies (current contribution 1%) and 44% to be spent on Broad Based Black Economic Empowerment (B-BBEE) compliant companies (current contribution 13%). In terms of procurement of services ,the SLP sets a target of 80% procurement from South African based groups in line with the Mining Charter (2018) of which 50% must be spent on majority HDI owned companies; 15% on women owned companies; 5% youth owned companies and 10% to be spent on Broad Based Black Economic Empowerment (B-BBEE) complaint companies.

The Beeshoek Optimisation Project will extend the life of mine and will result in the continuation of the existing operations and will therefore enable the following:

- The continuation of job and income opportunities with subsequent positive economic spin-offs;
- Continuation of central tax revenues;
- Positive impact in terms of the socio-economic development of the area and reducing poverty levels through continued employment; and
- Socio-economic investments targeted at the local community through local economic development projects, as well as through capacity building and training.

Giving effect to Waste Reduction:

The reworking of the mineral waste gives effect to the Waste Management Hierarchy as presented in the National Waste Management Strategy, November 2011 and also the draft Strategy of 2020. This 2011 Strategy states the following:

- A challenge experienced is the lack of a policy and regulatory environment that does not actively promote the Waste Management Hierarchy.

[2] Assmang Iron Ore & DRA (2020) Beeshoek LG Optimisation DFS: Manpower Histogram

- The report states that while the elimination of waste in its entirety may not be feasible, it is possible through the systematic application of the Waste Management Hierarchy to reach a point within the next few decades where re-use, recycling, recovery and treatment overtake landfills as preferred options for waste management.
- The first goal presented in this strategy as a strategic goal is to "promote waste minimisation, reuse, recycling and the recovering of waste" by focusing on implementing the Waste Management Hierarchy, and with the ultimate aim of diverting waste from landfill.

The following is an abstract of Section 2.3 of the National Waste Management Strategy:

The Waste Management Hierarchy in the National Waste Management Strategy is summarised as follows:

- Waste avoidance and reduction;
- Re-use;
- Recycling;
- Recovery; and
- Treatment and disposal.

The foundation of the hierarchy, and the first choice of measures in waste management, is avoidance and reduction. This step aims for goods to be designed in a manner that minimises their waste components. Also, the reduction of the quantity and toxicity of waste generated during the production process is important.

The next stage of the hierarchy is re-using waste. Re-using an article removes it from the waste stream for use in a similar or different purpose without changing its form or properties.

After re-use comes the recycling of waste, which involves separating articles from the waste stream and processing them as products or raw materials.

These first four stages of the Waste Management Hierarchy are the foundation of cradle-to-cradle waste management. This approach seeks to re-use or recycle a product when it reaches the end of its life span. In this way, it becomes input for new products and materials. This cycle repeats itself until as small a portion as possible of the original product eventually enters the next level of the Waste Management Hierarchy: recovery.

As a last resort, waste enters the lowest level of the hierarchy to be treated and/or disposed of, depending on the safest manner for its final disposal.

Taking this strategy further, National Waste Management Strategy of 2020. This strategy also focusses on the Circular Economy. A circular economy redefines economic growth by moving away from a take-make-waste industrial model to one that decouples economic activity from the environment and supports a just transition to renewable energy sources. The three key principles of a circular economy are: design out waste and pollution, <u>keep products and materials in use</u> and regenerate natural systems. The two (2) strategic entry points of the waste sector into waste minimisation and the circular economy is waste prevention and waste as a resource, as briefly explained below.

- Waste Prevention (as highlighted in the 2011 National Waste Management Strategy) – this emphasises avoiding and reducing waste before substances, materials and products are discarded.
- Waste as a Resource (key focus in the draft Strategy) – this focuses on stimulating a secondary resources economy based on recycling and recovery of materials and energy from waste i.e. interventions that take place after a product or material has become waste. Circularity can deliver substantial material savings throughout value chains and production processes, generate extra value, transformation of industry towards climate-neutrality, long-term competitiveness and unlock economic opportunities. In terms of the waste management hierarchy practices, recycling of waste for reuse and recovery of materials is prioritised over recovery of energy from waste. The main economic driver lies in exploiting the full potential value of waste.

As a last resort, waste enters the lowest level of the hierarchy to be treated and/or disposed of, depending on the safest manner for its final disposal.

Giving effect to an approved Environmental Activity as part of Environmental Management and Impact Reduction:

The 2004 Beeshoek EMP clearly states that the mine residue present on site or produced by the Mine can be categorised as follows:

- Waste material: products that cannot be sold and which are deposited separately as such or used as backfill;
- Non-saleable material: product which cannot be marketed in its present form but which through treatment could become saleable;
- Contaminated material: "impure" product stockpiled separate for beneficiation to render it marketable; and

- Discard: waste material from the on-site iron ore beneficiation plant is discarded on a designated Discard Dump for reuse (i.e. reworking).

The 2004 EMP further explains the Mine's intention to rework all contaminated (as from the EMPr – which refers to low grade) iron ore stockpiles present on the mine site in order to optimise iron ore resource utilisation. Reworking relates to the following dumps: Dumps labelled on Drawings 5540-001 and 5540-002 as CD-N1 (this is the current WRD North Area) and CD-S1 (this is the current Contaminated ROM Dump on South Mine), respectively.

In Section 1.7.3 of the new order (aligned) EIA/EMP, 2009 the Estimated Reserves are discussed. It states that: "Additional iron ore is available in the contaminated dumps on the mine site and these will be reworked to meet the mine's remaining planned life of mine." The specific contaminated dumps are not stipulated in this EMP, and therefore when referring to the definition of contaminated material in the 2004 EMP as presented above, this will depend on the nature of the material and grade which will render it marketable. The EMP further commits in Section 7.3.2 to "Rework all the contaminated iron ore stockpiles present on the mine site in order to optimise iron ore resource utilisation."

In terms of NEMWA, and associated regulations which came into effect on 24 July 2015, which included Mine Residue Stockpiles as listed Waste Management Activities, all such activities that commenced prior to 24 July 2015, may be regarded as lawful and need not be authorised (Regulation 7(1) of GN 921 contains the relevant transitional requirements). Prior to the NEMWA Regulations of 2015, the reclamation of residue for re-use did not require EMP amendments, as it fell within the definition of mining (as defined in the MPRDA), especially in this instance where no separate infrastructure (e.g. crushing plants) was constructed that had to be reflected in the EMPs.

Logistics to Improve infrastructure to supply Export Market demands

In terms of the proposed railway line link project, the project will allow Beeshoek greater flexibility to also export ore through Saldanha port. In order to realise this, additional infrastructure links are required, as there is currently no rail connection between Beeshoek and the Kolomela Direct Link Line.

2.e Motivation for the preferred development footprint within the approved side including a full description of the process followed to reach the proposed development footprint within the approved site

2.e.i Details of the Development Footprint Alternatives Considered

2.e.i.1 Details of all alternatives considered

2.e.i.1.a The property on which or location where it is proposed to undertake the activity

The projects presented are all located within the existing Mining Area. The activities considered in this application are linked to approved and established sites and therefore no property alternatives or location alternatives are relevant.

With regards to the selection of the Option for the railway line project, various options were considered, these related mainly to the most effective tie in, into the TFR line. No environmental constraints were identified.

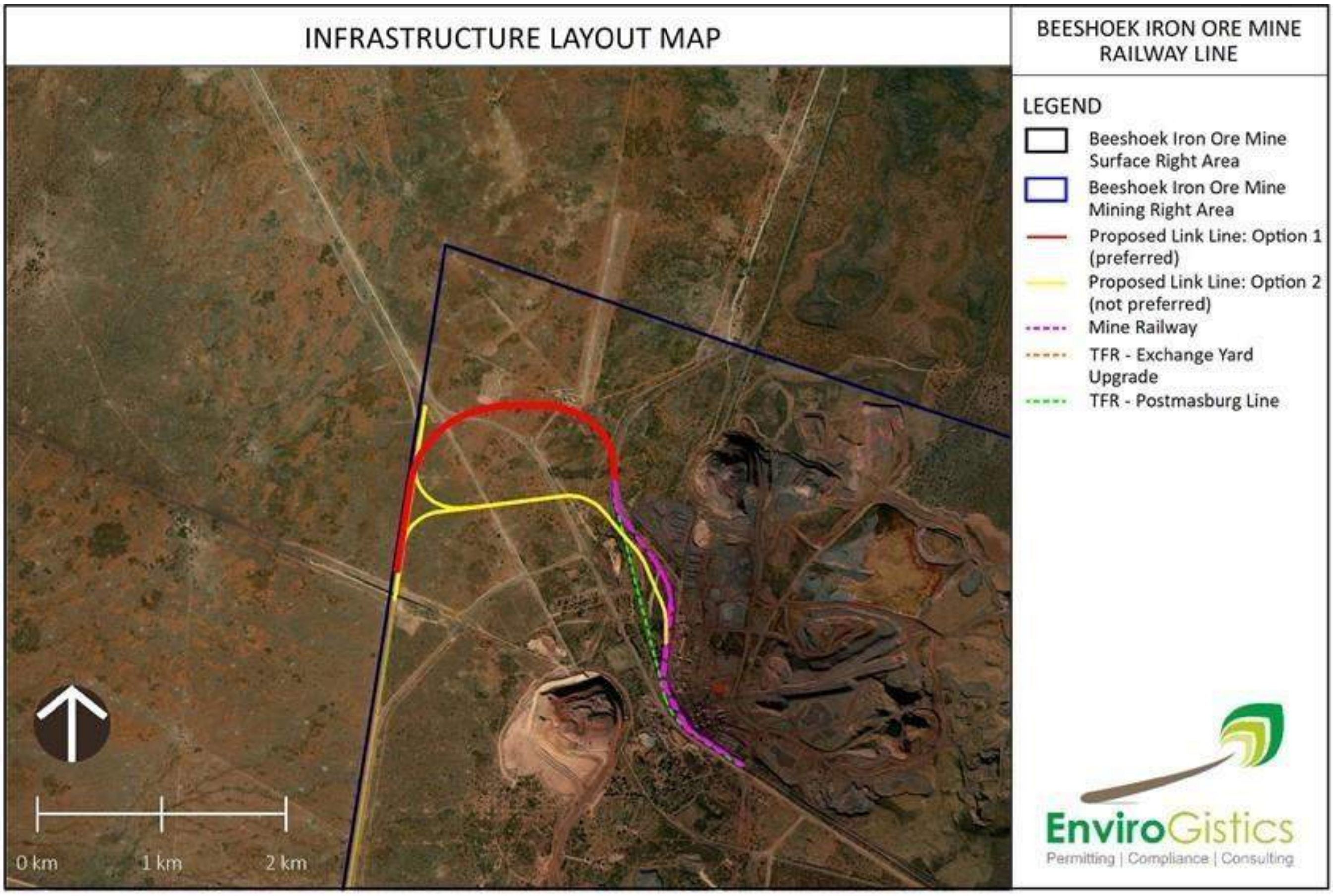


Figure 31: Initial Railway Line Options

The initial two (2) railway line options were primarily developed around operational considerations for handling TFR trains. The initial process included a requirement to reverse the orientation of the wagons for each train which required a triangle layout within the track plan.

In the early Option 1, this is shown in the northern link from the Kolomela Line to the Postmasburg Line and a staging siding to the north of the site on the Kolomela line. The gradient requirements of the staging siding resulted in significant earthworks and may have exceeded the servitude boundaries of the existing line.

In the initial Option 2, the wagon reversal was achieved via a smaller triangle and a different link alignment into Beeshoek Yard. Option 2 would have been operated by Beeshoek in multiple shunt movements.

Following the initial discussions between the mine and the TFR of the two (2) options, TFR indicated that they would do the shunting and that the requirement to reverse the orientation of the wagon could be waived. This resulted in the removal of the northern leg of Option 1 as well as the staging siding – a significant cost and material saving to the project, as well as a far lesser footprint of disturbance required.

After these discussions, a further option was recommended to allow for the tie into the northern TFR link as well and to improve crossings over the R385 regional road and Tommys Field road. This gave rise to the last option, Option 3, the final layout presented in this report.

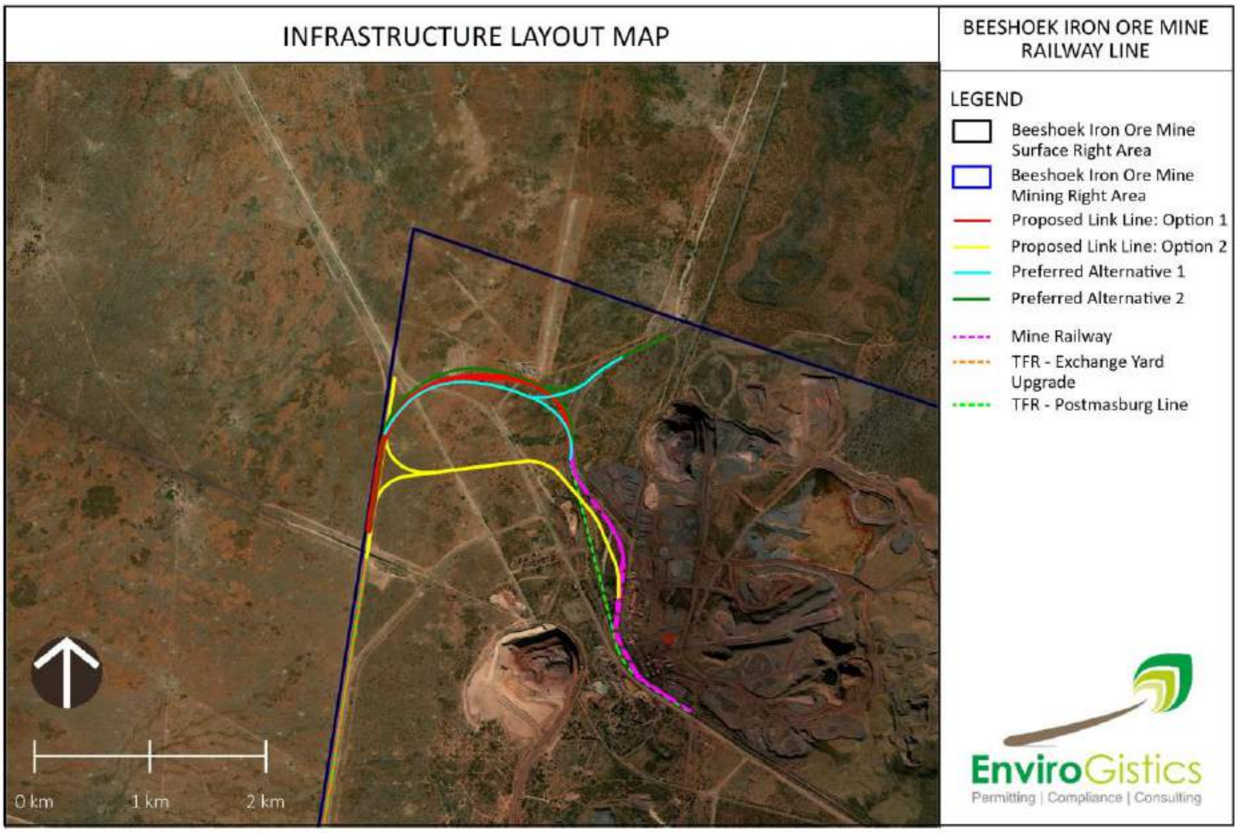


Figure 32: All Railway Line Options

2.e.i.1.b The design or layout of the activity

Activities are planned within the existing mining footprint. Limited design and layout opportunities are present.

For the purpose of the railway line, please refer to the section before (Section 2.f.i.1.a).

The WHIMS and JIG Plant project locations are prescribed by the location of the existing beneficiation infrastructure.

2.e.i.1.c The technology to be used in the activity

No technological alternatives are relevant to this project. The WHIMS and Jig Plant projects will make use of proven technologies utilised within the Assmang mining system.

2.e.i.1.d The operational aspects of the activity

No alternatives are applicable to the Project 1 – Demarcation of ROM stockpiles, as this project is purely for specific demarcation purposes.

No alternatives are applicable to the Project 2 – Design of WRDs, as this project relates to the existing facilities and redesigning of these to allow for further future deposition.

For Project 3, the activities are all located within the existing Mining Area. The alternatives in terms of the operational aspects are merely operating in terms of status quo, or optimising the mining opportunities for both mineral resources and mineral waste resources. The location and extent of the mineral resources only allows for opencast operations at this time. The activities considered in this application are linked to approved and established sites and therefore no property alternatives or location alternatives are relevant.

The expansions and additions of satellite pits (for Village Pit) are important for the continuation of the Beeshoek Mine. By not undertaking this project, the mine plan of five (5) years will remain and the opportunity to continue mining at Beeshoek will be lost. This will result in the loss of all socio-economic benefits the Mine is offering to the Tsantsabane Local Municipality.

Changes have been made to the planned opencast footprints to allow for further strategic exploration due to the presence of various sensitive ecological and water systems (i.e. cryptic wetlands). Large portions of the planned opencast pit footprints on the South Mine have been reduced to allow for more strategic exploration to ensure that opencast operations target very specific areas for future mining opportunities. This does not project that mining will not be conducted in these areas, but that further test work must be completed in order to ensure that the most suitable mine plan is developed considering environmental, economic and social considerations.

Activities are planned within the existing mining footprint. Limited design and layout opportunities are present.

For Project 4 – Optimisation of the Beneficiation Process, no technological alternatives are relevant. The WHIMS and JIG Plant projects will make use of proven technologies utilised within the Assmang mining system. The location of these facilities is also prescribed by the location of the existing beneficiation infrastructure.

Project 5 – Water Management has no alternatives, as these projects are implementing the recommendations by the Water Balance and Water Conservation and Demand Management Plan, developed by Irene Leah Environmental and Hydrology (iLEH), 2021. The project allows for the storage and distribution of water within the mine area to protect water losses and improve storage capacity. The intent of this project is not to increase water abstraction from the groundwater resources, but to rather improve water management on site. This is specifically relating to utilising available water allocations and agreements. In terms of the WUL, 2018, the Mine has a total of 5 655 371m^3/a approved as Section 21(a) – groundwater abstraction and use. This has been reduced in the amended WULA, 2021 to 5 652 724m^3/a. A large portion (70%) of this allocation is to allow dewatering for safe mining practices. Due to the reduction in groundwater levels to south of the mine, dewatering volumes have been reduced for Village Pit. However, an increase in volume has been included for the remining of the HF Pit. Note that overall water abstraction is still in line with the WUL, 2018.

The Mine is dependent on water supply from external sources to ensure sustainable supply. A bulk water supply scheme from the Vaal River to the arid areas of the Gamagara valley near Postmasburg and north thereof was implemented by the then DWA (now DWS) to supply potable water to these areas and thus to enable the development of the large-scale mining operations in areas such as Beeshoek, Lime Acres, Sishen, Mamatwane, Hotazel and Black Rock. Beeshoek is not currently using potable water from the Vaal Gamagara Water Supply Scheme, but rather sourced from Kolomela Mine directly. All potable water is sourced from boreholes drilled on the mine property. Beeshoek receives extraneous mine water from the Sedibeng Pipeline that originates from Kolomela Mine. This water is made available to Beeshoek according to an agreement reached with Anglo American dated 28 November 2012 in lieu of groundwater loss at Beeshoek due to the impact of dewatering at Kolomela Mine. The agreement allows the use of 320m^3/hr, of water from the pipeline which is equivalent to a maximum rate of 2,8 million m^3/a. Kolomela Mine is responsible for the cost of abstracting this water from the Sedibeng Pipeline. The Sedibeng Pipeline agreement contributes 32% of the available water resources.

The Project 6, alternatives are limited and mostly relate to the no-go option. For the purposes of the railway line link, the project will allow Beeshoek greater flexibility to also export ore through Saldanha port. In order to realise this, additional infrastructure links are required, as there is no rail connection currently between Beeshoek and the Kolomela Direct Link Line. The Railway line project is still in planning and feasibility stage. It is important to note that various discussions are being undertaken between Transnet and the Applicant. These discussions would define the direction the project moves in, i.e. immediate commissioning upon authorisation, potential delay in commissioning, or not commissioning the project. However, for the purposes of this EIA report, the assumption is made that this project will proceed. Alternatives in terms of the railway line is subjected to discussions between TFR and the mine. Only one option is available for the link line, and that is the link between the existing Beeshoek Siding and the TFR. The routing of the link line options is fairly similar and only involves minor adjustments to the alignment to improve tie in considerations into the existing railway line systems. No environmental constraints have been identified in this area.

2.e.i.1.e The option of not implementing the activity

Section 23(1)(a) of the MPRDA states in Section 1(a), that subject to subsection (4), the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. This project specifically gives rise to this requirement, and results in the optimisation of mineral waste deposition, beneficiation, water management and the logistical requirements for product transportation.

Various optimisation activities are planned for the Mine as previously discussed. By not allowing this project to proceed, the Mine will lose the opportunity to rework current waste streams and thereby reducing the dirty water footprint.

In addition to this, these projects plan to optimise the exploration of mineral resources to which the mine has the Mineral Rights to. By not allowing the expansion of opencast operations, the mine will not be in a position to optimally work within its allocated Mineral Resource boundaries.

The opportunity to effectively and efficiently export iron ore resources via the Saldanha port will further be lost should the allowance for the railway line link not realise.

The projects in question will have a substantial socio-economic benefit within the local area, but also regionally. No fatal flaws or environmental concerns, which cannot be addressed with sound and proper management have been identified. Should the proposed project not proceed, the status quo in terms of the existing social impacts in the area would therefore remain. The Life of Mine would then not be extended and the mine would cease to operate over a shorter period of time.

The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region.

As the Beeshoek Mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

The 'no-go alternative' should thus not be considered from a social point of view as the negative social impacts anticipated with the Beeshoek optimisation project are deemed low. The negative impacts would further respond to mitigation as proposed. The proposed activities further fall within the mining rights area and the area is already characterised by and surrounded by various mining infrastructure.

The Beeshoek Optimisation project will extend the life of mine and will result in the continuation of the existing operations and by not allowing this project, the following opportunities will be lost:

- The continuation of job and income opportunities with subsequent positive economic spin-offs;
- Continuation of central tax revenues;
- Positive impact in terms of the socio-economic development of the area and reducing poverty levels through continued employment; and
- Socio-economic investments targeted at the local community through local economic development projects, as well as through capacity building and training.

2.e.ii Details of the Public Participation Process Followed

Public participation is understood to be a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the Scoping and Environmental Impact Reporting (S&EIR) process. Effective public participation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts and opportunities of the proposed project.

The objectives of the public participation process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the proposed projects;
- Clearly outline the scope of the proposed projects, including the scale and nature of the existing and proposed activities;
- Identify viable proposed project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the proposed project, issues and solutions.

In accordance with the NEMA GNR 982, Chapter 6, the activities as stipulated in the sections hereafter, have taken place or are proposed to take place as part of the Environmental Authorisation Process.

2.e.ii.1 Stakeholder Identification

The public participation process must include consultation with (1) the competent authority; (2) every state department that administers a law relating to the matter; (3) all organs of state which have jurisdiction in respect of the activity to which the application relates; (4) all potential, or, where relevant, registered Interested and Affected Parties (I&APs). In order to satisfy this requirement, the EAP includes the following consultations in the process:

- Competent Authority - The Department of Mineral Resources and Energy (DMRE) is the competent authority related to this application. This application forms the first of the consultations with the DMRE. The EAP has engaged with the DMRE.
- Departments that administer a law relating to the matter - The Department of Water and Sanitation (DWS): Northern Cape Province has been directly informed of the proposed projects via email and telephonic conversations, as well as a meeting at their offices. Various water use activities will be triggered and a separate WULA will be submitted in to DWS in terms of section 40 of the NWA. The DWS is the competent authority for the WUL application that needs to be submitted for the proposed project.
- All organs of state which have jurisdiction in respect of the activity to which the application relate -
    - National Level: National Department of Forestry, Fisheries and Environment (DFFE) - Under the "One Environmental System" rolled out by Government on 8 December 2014, licensing processes for mining, environmental authorisations and water use have been streamlined. Under the One Environmental System, the Minister of Mineral Resources and Energy (DMRE) will issue environmental authorisations and waste management licences in terms of the NEMA, and the NEMWA respectively, for mining and related activities. However, note that in the new system, the Minister of Forestry, Fisheries and Environment (DFFE) will be the appeal authority for these authorisations to ensure complete independency to the competent authority.
    - Provincial Level: Given that the activity is located within the Northern Cape Province, the Northern Cape Department of Environment and Nature Conservation (NCDENC) will form a primary commenting authority during the process. The provincial Heritage Resource authority will be informed of the project, and the draft scoping report will be submitted to the online portal system for the South African Heritage Resource Agency (SAHRA). The Department of Fisheries and Forestry now fall within the mandate of the DFFE. The regional office and representatives for forestry within the Northern Cape will form part of the stakeholder database. The Northern Cape Department of Agriculture has been informed of the said new EIA application.
    - District and Local Level: The Tsantsabane Local Municipality (NC085), which forms part of the ZF Mgcawu District Municipality (formerly known as the Siyanda District Municipality).
- All potentially registered I&APs - The existing Beeshoek stakeholder database was used as a base starting point. The database was updated following any stakeholder requests to be registered. The use of site notices, notification letters, Short Messaging Systems (SMS), telephonic conversations, email and fax were used as methods in which to reach potential I&APs.
- Affected Adjacent Landowners and Land Owners –
    - As far as possible, all affected adjacent property owners were contacted and informed of the proposed projects at the mine.
    - Property Owners: Beeshoek holds the mining rights and surface rights.

The latest stakeholder database is included within this report as Annexure 4.

All registered I&APs, which have a direct affect/effect on the proposed project or are directly or indirectly impacted by the proposed project, have the right to lodge a comment/question on the project (until such time that the appeals process comes to a close).

2.e.ii.2 DMRE Project Application Meeting

A project application meeting was held with the DMRE on 19 March 2019 at 10h00 via teams.

<u>The attendees included:</u>

Ms. T Bekker (EnviroGistics);

Mr. I Caldwell (ARM – railway line project engineer);

Ms. C Vries (Beeshoek – SHERQ Department);

Mr. K Harding (Beeshoek – Technical Manager);

Mr. J Nematatani (DMRE); and

Mr. M Ramaboea (DMRE – Project Official).

<u>Apologies:</u>

Adv. L van der Westhuizen (ARM Legal Advisor);

Mr. J Schoeman (ARM – Environmental); and

Ms. M Burger (Beeshoek – General Manager).

Purpose of the Meeting:

Pre-application meeting for the proposed Beeshoek TFR Link Line Project. Determination of the Environmental Authorisation Process to be followed.

Beeshoek requested the opportunity to, in line with Regulation 8 and 15 of the National Environmental Management Act, EIA Regulations, 2014 (as amended), submit a Basic Assessment Application, although the project triggers Listing Notice 2, Activity 12 according to consultation with the DFFE.

Outcomes of the Meeting

Lack of resources therefore one application

Mr. Nematatani informed the project team that the DMRE is experiencing staff shortages and therefore requires that the railway line project be included into the existing EIA Process (application submitted in February, and uploaded onto the DMRE system 25 February 2021).

Process required to ensure best application option

Ms. Bekker informed the DMRE that the Scoping Report has been submitted to all stakeholders on 22 February with the consultation phase to be concluded on 26 March 2021. The project team informed the DMRE of the importance of both projects and that delays must be avoided.

The DMRE explained that with the number of applications, should Beeshoek submit more applications, the Mine may face further delays as the officials cannot process the volumes of applications.

Ms. Bekker requested whether the project team can continue with the project and include the railway line into the final Scoping Report, planned for submission 30 March 2021 and also conduct as second round of public participation in the form of advertisements and site notifications.

The DMRE stated that to avoid appeals the project must be included into the Scoping Report and stakeholders must be awarded a period of 30 days to comment.

Request for the EMPr to supersede the previous approved EMPr

The DMRE instructed that any reference to the amendment of change of conditions approved in the previous EMPRs must be excluded from this application as this must be a stand-alone letter submitted to the DMRE for consideration.

Ms. Bekker informed the DMRE that this was the process conducted for Black Rock and that the new EMPr superceded the previous EMPrs.

Mr. Nematatani informed the team that that process was wrong and will not be allowed.

Way forward

- Agreement
    - Mr. Caldwell informed the DMRE that the mines are operating in a changing environment and there will be times where new projects are identified. However, commented that the strain on resources at the DMRE are understood.
- Way Forward
    - Ms. Bekker stated that the amendments to the EMPr as identified in the Regulation 34 audit, will be excluded from this application and that this will be submitted by the mine separately. Ms Bekker will assist the mine in this aspect, but the application will be submitted by the mine.
    - Ms. Bekker stated that to avoid confusion for stakeholders the current Scoping Report review period will be concluded (up until 26 March 2021)
    - After the current review period has lapsed, the consultant will provide the commenting authorities with an updated report – at this time to avoid confusion, the consultant will compile a short addendum report which will be submitted to all registered stakeholders, with an electronic copy of a full updated Scoping Report. Two (2) hard copies of the Scoping Report will still be submitted to the DMRE.
    - Ms Bekker will readvertise the project in the Kathu Gazette (English advert) on 26 March 2021.
    - Ms Bekker will update the information document to the stakeholders and issue this to all registered parties on 26 March 2021.
    - Site notices will be re-erected at the six sites previously placed on 26 March 2021.

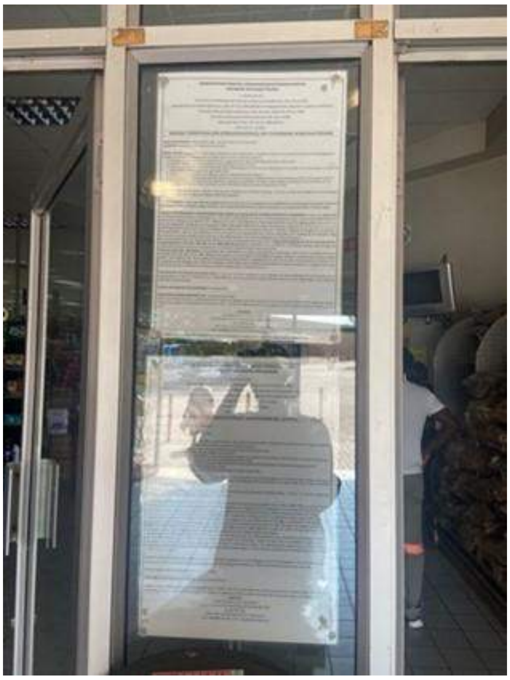
All the commitments undertaken during this meeting was concluded.

2.e.ii.3 Stakeholder Identification and Notification

Please refer to Annexure 4 for copies of these notifications. Proof of email submissions can be requested from the EAP.

2.e.ii.4 Site Notices

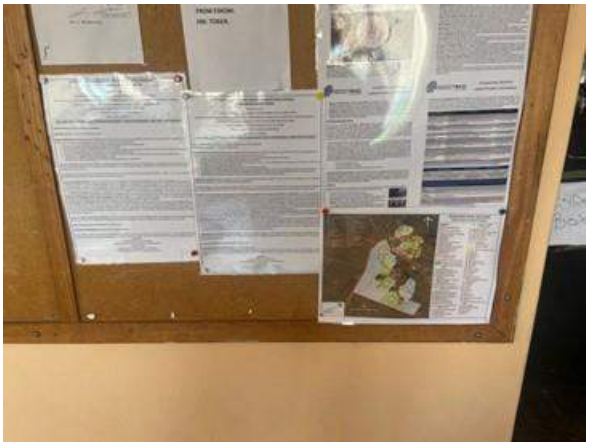
In accordance with GNR 982 Section 41(2)(a-b) a site notice was developed in Setswana, Afrikaans and English and placed at the following locations (see proof of placement below), in order to inform surrounding communities and adjacent landowners of the proposed project. The site notices were placed on 12 February 2021 and at visible locations close to the site. Site Notices were placed at the following locations:



Shoprite Postmasburg

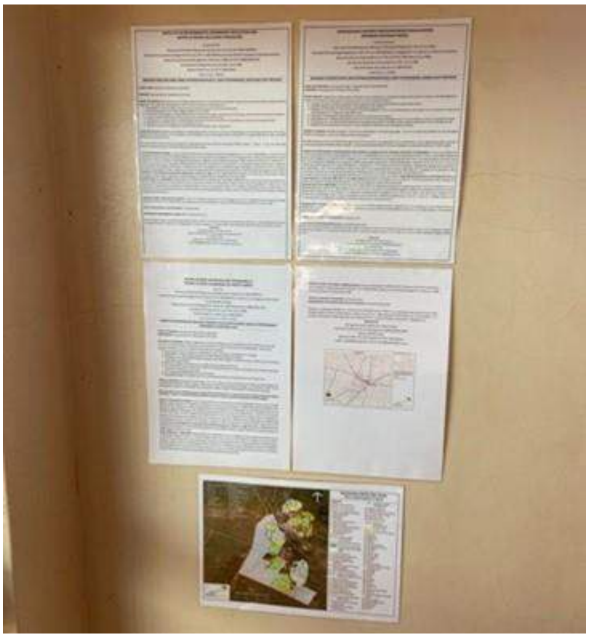
Municipality Postmasburg

Spar



North Mine Entrance

Main Offices Security Entrance

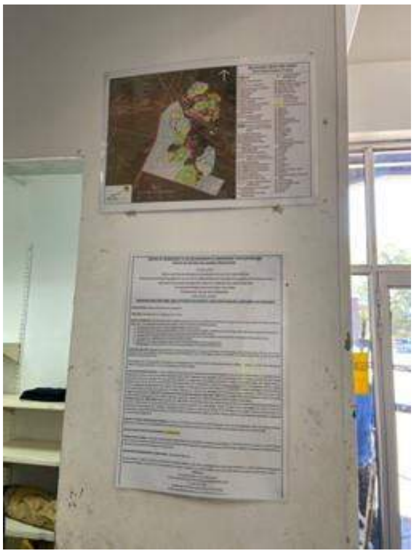


South Mine Entrance

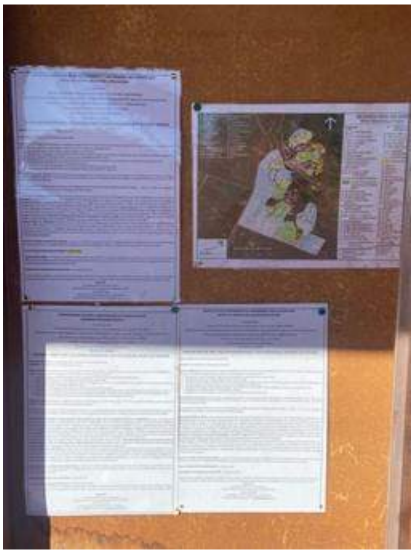
As a result of the Addendum Application and Addendum ESR to include the railway line project, a second round of notices were placed, English, in the same areas as before. These notices were placed on 26 March 2021.

Shoprite Postmasburg

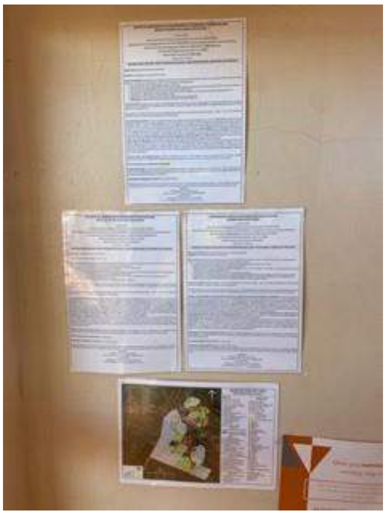
Municipality Postmasburg



Spar



Village Security Entrance



North Mine Security Entrance

South Mine Entrance

2.e.ii.5 Background Information Documents

Key stakeholders, that included the following sectors, were directly informed of the proposed development by e-mail, telephone and SMS/WhatsApp through the submission of the Background Information Document and Registration Sheet:

- Authorities;
- Municipalities;
- Community Representatives;
- Non-Governmental Organisations;
- General Public;
- Parastatals/ Service providers, and
- Adjacent Landowners.

Please refer to Annexure 4 for a copy of the Background Information Document, which was made available to all stakeholders on 12 February 2021, when the notification of the project was emailed to all stakeholders. As a result of the Addendum Application and Addendum ESR, a second round of information documents were distributed to all stakeholders on the database. These notifications were sent on 26 March 2021.

2.e.ii.6 Advertisements

In accordance with NEMA GNR 982, 41(2)(c) of Chapter 6 an advert was placed in:

- The Kathu Gazette.

The advert was place in both Afrikaans and English in the above newspaper on 13 February 2021 (see proof of newspaper adverts in Annexure 4).

Should the EAP note an affected stakeholder and be made aware of his/ her existence by the ward councillor, or traditional leader, efforts will be made to ensure his/ her participation in the stakeholder engagement process (as required by NEMA GNR 982, Section 41(2)(e) of Chapter 6).

Any stakeholder who submits a comment during the course of the process will automatically be registered on the project-specific stakeholder database.

As a result of the Addendum Application and Addendum ESR, a second round of advertisements was place in English, in the same newspaper as before. This advert was placed on 26 March 2021.

2.e.ii.7 Document Review

The Scoping Report was made available on public review for a period of 30 days from **22 February 2021 to 24 March 2021**. Note, that any comments received up until the EIA Phase will be considered for inclusion into the Final EIA Report.

Electronic Copies of the report were made available from:

- Public Participation Office via Dropbox link and via email.

Hard copies of the Draft Scoping Report were couriered to the following authorities:

- Department of Forestry, Fisheries and Environment (DFFE) Northern Cape Division;
- Department of Mineral Resources and Energy (DMRE) – Registry;
- Northern Cape Department of Environment and Nature Conservation (NCDENC) – Ms. Doreen Werth;
- Department of Water and Sanitation (DWS Kimberley) – Mr. Gawie van Dyk (Mr. Philani who was the initial official for Beeshoek is no longer with the DWS. For this reason, a new official will be allocated once the WUL process is initiated.);
- SAHRA – Online system (although no site clearance will take place);
- Tsantsabane Local Municipality – Municipal Manager; and
- ZF Mgcawu District Municipality – Municipal Manager.

As a result of the Addendum Application and Addendum ESR, a second round of ESR review was provided from **30 March 2021 to 29 April 2021**. Hard copies and electronic copies of the report was issued similar than the previous review period.

The final ESR was submitted to the DMRE 3 May 2021. The DMRE Official, Mr Machalla in formed EnviroGistics on 10 June 2021 that comments from the DMRE will be provided by the end of June 2021. To date, comments have not been received.

2.e.ii.8 Stakeholder Meetings

Various stakeholder meetings were conducted during the week of 11 to 12 May 2021. Stakeholders were contacted with regard to their interest in a public meeting. Due to the limited interest in meetings, the stakeholders were provided the options of a virtual meeting vs. a focus group meeting. Please find below the list of stakeholder meetings:

Table 34: Stakeholder Meeting Schedule

Name	Company / Organisation / Farm	Capacity	Position / Details	Meeting date
Jacques De Lange Jaco Lambrecht	Doorn Fontein 446: Portion 1 / Farm No. 476 (Welgevonden) / Beesthoek 488: Portion 0 (RE) / Ploegfontein 487: Portion 0 (RE)	Landowner: Farm adjacent to the application	Sishen Iron Ore Co (Pty) Ltd.	Tuesday 11 May 2021 at 11:00. Soetfontein Guest Farm (Postmasburg area)
Adam Johannes Wahl	Doorn Fontein 446: Portion 2	Landowner: Farm adjacent to the application	Landowner	He does not require a meeting at this stage - telephonic discussion of 14 April 2021.
King Taukobong Chris Nel	Pens Fontein 449: Portion 0 (RE)	Landowner: Farm adjacent to the application	Rahida Investments (Pty) Ltd.	Virtual meeting to be held during week of 24-28 May 2021. Date and time to be confirmed.
Charl Francois Viljoen	Kalkfontein 474: RE and Portion 2; Olynfontein 475: Portion 2	Landowner: Farm adjacent to the application	Landowner	Tuesday 11 May 2021 at 14:00. Soetfontein Guest Farm (Postmasburg area)

Name	Company / Organisation / Farm	Capacity	Position / Details	Meeting date
Maritsa van Wyk & Altus Viljoen	Farm No. 447 Aucampsrus	Landowner: Farm adjacent to the application	Landowner	
Albertus Viljoen / Johan Viljoen	Soetfontein 606	Landowner: Farm adjacent to the application	Viljoen Familie Trust	
G.H. Mathobela	Tsantsabane 476: Farm Postmasburg Erven RE/1 / Olynfontein 475: Portion 6	Landowner: Farm adjacent to the application	Tsantsabane LM: Municipal Manager	Zoom/Teams meeting: 25 May 2021. Time of 10:00 to be confirmed.
Lerato Mokhoantle	DWS	Water Use and Regulation: Northern Cape Region		12 May 2021 at 10:00 at Kimberley: DWS
Gawie van Dyk	DWS			
Johannes Nematatani	DMRE	Mineral Regulation		12 May 2021 at 13:30 at Kimberley: DMRE
Vincent Muila	DMRE			
Machalla Ramaboea	DMRE	Case Officer		
Doreen Werth	Northern Cape Department of Environment and Nature Conservation	Official		Kimberley: 12 May 2021 -14:00 To be confirmed
Jacolene Mans	Department of Agriculture Forestry and Fisheries	Chief Forester: NFA Regulations		Zoom / Teams meeting: Monday 24 May at 10:00
A Viljoen	Tshiping WUA			See A Viljoen Soetfontein above

Minutes of the meetings are included in Annexure 4.

2.e.ii.9 Summary of Issues raised by the I&APs

The Issues and Responses Register includes the comments as received during the Stakeholder Consultation Process undertaken for the proposed project to date. This includes responses to the advertisements, response sheets, individual discussions with key stakeholders, and any other comments received during the project timeframe up to 29 April 2021. Thereafter another commenting period will be allowed as part of the draft EIA process. All comments received during this process will be included into the final EIA Report for the DMRE consideration.

Comments reported within this Issues and Response Register will be updated during the project. This document can therefore be considered as an active document up until the final reports are submitted.

Table 35: Stakeholder Comments received

No.	Theme: General Comments / Issues			
	Issue Raised	**Date and How Issue Was Raised**	**Commentator**	**Response**
Archaeology, Palaeontology				
1	The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit notes the pending assessment of the impact to heritage resources and requests the following: Assessment of the impact to heritage resources must comply with section 38(3) of the NHRA, as required by section 38(8) of the NHRA; The archaeological component of the assessment must include a field-based assessment conducted by a qualified archaeologist; As the project footprint is located in areas of moderate to very sensitive as per the SAHRIS PalaeoSensitivity map, a field-based Palaeontological Impact Assessment must be conducted as part of the EIA phase of the EA application. The report must comply with the 2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessment s and must be compiled by a qualitied palaeontologist.	Letter sent via email. Letter dated 12 March 2021	SAHRA	Based on the SAHRA Paleontological map the area is of moderate to high paleontological sensitivity and a separate study was conducted for this aspect (Bamford 2021). This study concluded that it is extremely unlikely that any fossils would be preserved in the Campbell Rand Subgroup stromatolites or in the loose sands of the Quaternary. There is a very small chance that fossil may occur in palaeopans in the ancient rocks and therefore recommended that a Fossil Chance Find Protocol should be added to the EMPr. Please refer to Section 2.e.iii.11.
Ecology and Rehabilitation				
2	Is additional topsoil added to assist to mitigate against siltation?	11 May 2021 Focus Meeting	Kolomela Mine	Rehabilitation at Beeshoek has proven that a soil and rock mixture has been successful in the establishment of self-vegetation.
3	Fountain grass used as vegetation cover at Beeshoek Mine is a problem for Kolomela Mine.	11 May 2021 Focus Meeting	Kolomela Mine	The mine has further appointed a specialist company to assist with the implementation of a strategic Alien Invasive Species programme to manage the presence of alien species specifically fountain grass.
4	NCDENC has requested the following to be included in the report: • List of Protected Species (nationally and provincial legislation). • Using of the 2020 updated Centre of Endemism – link to be provided. • Number of protected species (or at least some sort of percentage) in order for the department to determine impact extent and potential offset requirements. • Number of protected species (or at least some sort of percentage) in order for the department to determine impact extent and potential offset requirements.	24 May 2021 Focus Meeting	DEFF	All datasheets requested by the DFEE have been considered in the Ecological Studies. The current ecological study has not undertaken the identification of each of the protected species, but has determined whether these are present and where the areas of highest concern are. The specialist has indicated where species were encountered on site, which will provide an indication of which protected species were more common and where these are located. The reason for this, is due to the timeframes of the various activities. Clearance will only be undertaken when specific areas are required. Especially for the opencast and WRD projects, detailed mapping of protected and threatened plant species will be undertaken during various phases and timeframes. Prior to the clearance activities, the mine will ensure that a detailed species identification be conducted for the necessary tree removal permits.
5	Recharge zone to the east of the East Pit is regarded as a sensitive water setting and will be incorporated as an ESA according to DEFF.	24 May 2021 Focus Meeting	DEFF	To be treated as part of sensitive area when exploration is conducted. The 1:100 year floodline will be retained and no activities will be undertaken in this area before further investigations into this area is not undertaken.
6	The specialists must note that the landowners understand how to farm in a desert type climate, even though the specialists indicate that the general setting is not ideal for arable or grazing practices.	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	Noted, please refer to Section 2.e.iii.4.d.
Storm Water Management				
7	Surface water flows from the southern section of the farm Ploegfontein. Kolomela Mine has to protect the pans on their property to the south of the	11 May 2021 Focus Meeting	Kolomela Mine	The Beeshoek Mine is undertaking ongoing rehabilitation of the East Pit WRD slopes. The rehabilitation of East Pit waste rock dump will address any additional siltation concerns. In addition to this the mine will commit to the establishment of enviro-berms down gradient of the footprint up

No.	Theme: General Comments / Issues			
	Issue Raised	Date and How Issue Was Raised	Commentator	Response
	Beeshoek mine boundary. Kolomela Mine is thus concerned about siltation as water drains to the Ploegfontein area			until vegetation has established. Run off has also been determined to be very low due to the arid conditions in this region.
Water Supply				
8	Will the new projects impact on the water supply pipeline, which runs in a northerly direction, west of the East Pit WRD?	11 May 2021 Focus Meeting	Kolomela Mine	The mining activities will not impact on the pipeline. It is important that the East Pit WRD will only increase due to the rehabilitation angle requirements.
Groundwater				
9	Impact & influence on neighbour farm (Aucampsrus) which is close to Beeshoek's current mining activities.	26 February 2021 Completion of BID Registration form and submitted via email.	Surrounding Landowner: Altus Viljoen Aucampsrus farm	A detailed groundwater study, including a numerical model has been undertaken as part of the EIA studies to assess the impact of mine dewatering (for safe mining conditions). Other studies includes the Socio-Economic Assessment and Air Quality Assessment.
10	The preliminary findings of the groundwater study found that drawdown at Village pit is anticipated to be insignificant as the drawdown would be between 5 – 10 metres, 2km to the west. A 2m lowering is not problematic, but the yield is affected. The specialists must do a pump test at his boreholes. There is not enough data on the yield of the boreholes in the area. The groundwater levels are good, but the yield is low. Detailed data on the yield must be captured and assessed. The mines tend to shift the responsibility with regards to the impact elsewhere.	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	Beeshoek Mine has monitoring holes up-gradient of the Village Opencast Pit. The Mine will conduct pump tests of the land owners property.
11	Changes in the locations of boreholes can have impacts and must thus be monitored.	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	It should be noted that dewatering of pits remains within the specific aquifer compartments for such dewatering. No impact is expected on groundwater for the change of boreholes, which are specifically placed to ensure safe mining conditions.
12	What is the depth of the water levels in the boreholes?	24 May 2021	Mine to the North East of Beeshoek	Please refer to Section 2.e.iii.8.d of this report.
13	The TLM is concerned about the impact of mining on the groundwater resources in the TLM. The presentation confirmed that mining in this area does have an impact on the water resources. This thus impacts on the aquifer capacity of the area especially in the area of Boichoko. As a result, the TLM has to source water from Sedibeng Water to fulfill the needs of their communities. This has a negative financial impact on the TLM and puts them in further debt with Sedibeng Water. Water related concerns have been discussed with the Department of Water and Sanitation (DWS). The expansion of Beeshoek Mine will thus impact on the groundwater resources which would indirectly impact on the service delivery ability of the TLM. Compensation measures in this regard must be considered.	25 May 2021	Tsantsabane Local Municipality	It is important to note that the Mine is not expanding, but that the existing pits are further developed. The preliminary studies have considered the impact of Beeshoek Mine on the groundwater levels. The numerical model is considering the current groundwater levels to determine the potential impact of Beeshoek on groundwater levels. During the meeting with the municipality it was made clear what the extent of impacts on groundwater could be, and maps in this regard was also provided. The meeting clearly stated that no impact of groundwater dewatering is expected towards the eastern portion of the mine. The study currently states that no drawdown is expected for future mining of the East Pit, and that drawdown at Village pit is predicted to extent to 2k from the pit but in mostly a westerly direction for a drawdown of 5-10 m. The study further states that HF Pit is predicted to have a minor impact limited to the immediate surroundings of the pit itself. The study currently does not foresee any impact based on this optimisation project on the community. In addition to this, the Mine is not applying for any increase in groundwater abstraction or supply water from groundwater abstraction. There is also no intention of increasing the Sedibeng allocation. The current optimisation project is specifically considering the optimisation of the internal water reticulation circuit to reuse water within the beneficiation project more effectively and for this

No.	Theme: General Comments / Issues			
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				reason the water management projects are also included. A large opportunity to reuse water is from the reworking of the exiting Slimes Dam as well. The groundwater specialist will be available during the second round of consultation to provide further clarification. In addition to this the groundwater reports will also be made available to the Tsantsabane Local Municipality for review.
Air Quality and Vibrations				
14	How will blasting be controlled? Blasting does have dust impacts and could impact on his homestead (cracks). How does Beeshoek Mine notify landowners and other stakeholders when blasting will be undertaken? He is currently not notified by Beeshoek Mine when blasting is undertaken. The blasting activities impact on his travel movements due to traffic congestions and waiting periods on the local road.	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	Communication of blasts are being send out via email to surrounding stakeholders as well Management of blasting will continue as per the current proceudres. The effect of blasting and frequency does not change from the way it is currently managed. All blasting is communicated 24 hours in advance and times of blasting communicated. Blasting times will remain the same as it has been currently and in the past. Village pit blasting, specifically, will be scheduled outside of Anglo fixed flight roster and shift changes and as far as reasonably possible after Assmang office hours. The regional road will be closed and a notice boards with the following information, DANGER BLAST AREA – KEEP OUT / GEVAAR SKIETGEBIED BLY UIT are displayed. An arrangement has been made with Mr. Altus Viljoen to set up a mobile seismograph on his land for the next couple of blasts at Village pit to conduct several tests.
15	Over time, various community members in Boichoko have complained about the impacts of blasting on their health as well as on their homes' structures. The undertaking of a crack survey should be investigated to follow up on the complaints about blasting so that the impacts can be scientifically verified.	25 May 2021	Tsantsabane Local Municipality	Impact unlikely due to location of the Village Pit, and depth of East Pit, as well as location of HF Pit. To mitigate the concern, it is recommended that vibration monitoring be undertaken on the boundary of the mine – The Drill and Blast Supervisor is in the process together with the Technical Services Department to acquire and additional Seismograph for further monitoring. Beeshoek has already set up a seismograph to measure the vibration in this area.
16	What does Beeshoek Mine's dust monitoring programme entail? The landowners haven't had feedback on this issue in quite a while. With regards to the dust pollution in the area, it seems that the main impact is from Beeshoek Mine, but impacts from Kolomela Mine are also noted. He requested that additional dust buckets be placed at specific locations between his property and the Beeshoek mining activities, especially if the Eastern Pit will be used again. He suggested that dust buckets be placed at the southern border of Beeshoek Mine (e.g. southern sections of the farm Olynfontein Portions 2 and 4).	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	Beeshoek Mine has been measuring dust fallout since 2005. Monitoring is currently done at nine sites using the SANS 1929:2005 and ASTM Standard, D1739-98: Standard Test Method for the Collection and Measurement of Dust fall, Koeiespeen bucket has been removed due to vandalism in the area (bucket and station stolen). However, the fall out results for this area is extremely low. The Mine can provide dust fall out results to said farmer should this be required.

No.	Theme: General Comments / Issues			
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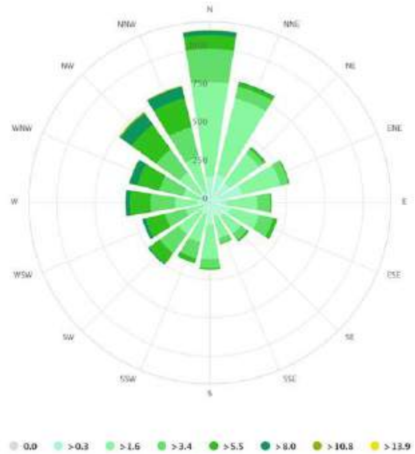
				 Please also refer to Section 2.h.v of Part B (EMPr).
17	It must be noted that the proposed developments at Village Pit and the East Pit are in close proximity to the residential area of Boichoko. Residents of Boichoko have complained about asthma related illnesses and the impact of mining on their overall health.	25 May 2021	Tsantsabane Local Municipality	It should also be noted that the air quality study specifically considers the potential impact in terms of PM10 and 2.5 on sensitive receptors. No impacts in this regard have been found on sensitive receptors. According to the Air Quality Model this is not the case, with dust fall out that is expected to reach areas outside the mine boundary significantly lower than National Ambient Air Quality Stndards (NAAQS) limits.
18	If blasting would take place at Village Pit, it is anticipated that the dust impacts would increase.	11 May 2021 Focus Meeting	Surrounding Landowner: Altus Viljoen Aucampsrus farm	According to the Air Quality Model this is not the case, with dust fall out that is expected to reach areas outside the mine boundary significantly lower than NAAQS limits.

Response table (item 17):

Receptor	Annual PM_{10}	24-hour PM_{10}	Annual $PM_{2.5}$	24-hour $PM_{2.5}$	Dust fallout
Boichoco	2.1	21.1	0.2	2.0	22
Maranteng	1.1	12.3	0.1	1.3	12
Newtown	1.4	14.7	0.2	1.5	15
Postdene	0.9	10.1	0.1	0.9	12
Postmasburg-North	1.1	13.0	0.1	1.3	13
Postmasburg-South	1.2	13.2	0.1	1.4	14
NAAQS	40	75	20	40	600

Response table (item 18):

Receptor	Annual PM_{10}	24-hour PM_{10}	Annual $PM_{2.5}$	24-hour $PM_{2.5}$	Dust fallout
Boichoco	2.1	21.1	0.2	2.0	22
Maranteng	1.1	12.3	0.1	1.3	12

<table>
<tr><th>No.</th><th colspan="4">Theme: General Comments / Issues</th></tr>
<tr><th></th><th>Issue Raised</th><th>Date and How Issue Was Raised</th><th>Commentator</th><th>Response</th></tr>
<tr><td></td><td></td><td></td><td></td><td><table>
<tr><td>Newtown</td><td>1.4</td><td>14.7</td><td>0.2</td><td>1.5</td><td>15</td></tr>
<tr><td>Postdene</td><td>0.9</td><td>10.1</td><td>0.1</td><td>0.9</td><td>12</td></tr>
<tr><td>Postmasburg-North</td><td>1.1</td><td>13.0</td><td>0.1</td><td>1.3</td><td>13</td></tr>
<tr><td>Postmasburg-South</td><td>1.2</td><td>13.2</td><td>0.1</td><td>1.4</td><td>14</td></tr>
<tr><td>NAAQS</td><td>40</td><td>75</td><td>20</td><td>40</td><td>600</td></tr>
</table></td></tr>
<tr><td>19</td><td>Why is the dust impact in a south-westerly direction? This wind direction is queried. The wind carrying dust is a north-westerly wind. The wind during the evenings is less strong which will have less impact to the southwest.</td><td>11 May 2021 Focus Meeting</td><td>Surrounding Landowner: Altus Viljoen Aucampsrus farm</td><td>The wind direction is obtained scientifically from “Köppen-Geiger climate classification system Postmasburg experiences a hot desert climate which is well described by the 30-year historical data record available from the Meteoblue archived weather model data”. This is a scientific model that requires scientific data that can be proven. The predominant wind direction is northwest to north-northeast with winds from other sectors less frequent. Winds are generally light with most of hourly winds less than 3.4 m/s. Stronger winds reaching more than 8 m/s are occur occasionally from the west-northwest to north-northwest sector.

</td></tr>
<tr><td colspan="5">Visual</td></tr>
<tr><td>20</td><td>Concern that the height of the WRD (Village and East) would increase the negative visual impact experienced as a result of the spotlights on top of the WRDs (farmer on the south-eastern boundary). The visual impact is especially of concern for the nearby landowners</td><td>11 May 2021 Focus Meeting</td><td>Surrounding Landowner: Albertus Viljoen</td><td>A Visual Impact Assessment has been undertaken (please refer to Annexure 13). As part of the management measures, the Mine will ensure that lights are placed in such a manner as to be strategically focussed downwards or away from sensitive receptors.</td></tr>
<tr><td colspan="5">Land Claims</td></tr>
<tr><td>21</td><td>We confirm that as at the date of this letter (23-02-2021) no land claims appear on our database in respect of the property.</td><td>23 February 2021</td><td>Commission on the Restitution of Land Rights</td><td>None</td></tr>
</table>

No.	Theme: General Comments / Issues			
	Issue Raised	Date and How Issue Was Raised	Commentator	Response
		Provision of official letter via email.		
Meetings and Consultation				
22	This serves to acknowledge the receipt of your documents on the above matter. We request your availability to present to the Council Committee on Technical and Community Services the contents of the application and implications for the municipal area.	25 February 2021 Submission of an email request.	Municipal Manager, Mr. Mathobela – Tsantsabane Local Municipality	The Stakeholder Consultation Specialist is in engagement with the municipality to arrange a date a time for the requested meeting.
Impact on R385 and Kolomela Mine Access Road				
23	Impact of the railway line on the R385 regional road?	11 May 2021 Focus Meeting	Kolomela Mine	The design and implementation of the railway line will consider the need for continuous movement on the R385. As a result, temporary detour routes will be provided. Clear signage will be implemented in these areas. The road will cross over the proposed railway line, to ensure that during the operational phase no further constraints are place on the road infrastructure.
General				
24	How much stripping will be involved in mining activities?	24 May 2021	Mine to the North East of Beeshoek	Please refer to the volumes of waste to be placed on the WRDs in Section 2.c.ii.2. Stripping ratios in terms of mining strategy is not provided in the EIA,
25	Production of the plants and LoM	11 May 2021 Focus Meeting	Kolomela Mine	The current life of mine reserves are set at five (5) years. The Optimisation Project allows for a further 15 years of operation. The proposed projects are not implemented to increase production, but rather to ensure a sustainable product supply and reduce waste component. The capacity of the two plants is to ensure a sustainable product supply in order to achieve the 2.8Mt/annum production requirement. The two plants have the capacity to provide 1Mt/a to ensure a sustainable supply.
26	What is the financial impact of the project? What is the capital expenditure and investments in total and the projected outputs?	25 May 2021	Tsantsabane Local Municipality	It is important to understand that the optimisation project is a strategic project, specifically to ensure the sustainable life of mine for Beeshoek. This project is still in its planning phase, and has not been finality approved, as this will be pending the outcomes of the design considerations, approval of the Water Use Licence, as well as the approval of the Integrated Environmental Authorisation. The project is not a capital investment to increase production, but rather to ensure an opportunity for the continuation of current opencast pit operations, as well as to implement opportunities for the reworking of low-grade stockpiles. This last mentioned reworking is to supplement production to meet the annual production limits. The project will not result in an increase of employment numbers, but rather the sustainability of the continuation of the mining operations supporting the current work force. In conclusion to this point, the benefit to the municipality and community in terms of this project, is the fact that Beeshoek Mine's Life of Mine will increase from the current disclosed 5 years to a possibility of 15-20 years. This will ensure the continuation of the existing commitments made between the TLM and the mine from the Social and Labour Plan (SLP). Should this project be successful it will further necessitate the revision of the SLP once the current 5 year period has lapsed, allowing for a continuation of Beeshoek's' involvement in the Socio-Economic Development of the Tsantsabane Local Municipality.
27	The TLM would like to know what the capital investment of the projects and subsequent returns would be to understand the economic benefits to the TLM and community.	25 May 2021	Tsantsabane Local Municipality	

No.	Theme: General Comments / Issues			
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28	Block 18 is located close to the tar road that is used as main access road to Kolomela Mine. What will the impact of the activities proposed at Block 18 be on this access road? Will safety become an issue?	11 May 2021 Focus Meeting	Kolomela Mine	A buffer of 500m will be placed around the Village Pit expansion – the Kolomela Mine access road will be outside of this buffer.
29	The main Eskom power supply line is located to the south of the mining area. Will the power line be affected	11 May 2021 Focus Meeting	Kolomela Mine	No activities will be undertaken closer to the Eskom powerlines running between Kolomela Mine and Beeshoek Mine. The only activities on the south of the Mine will be the continuation in depth of the East Pit and operation on the existing East Pit WRD. The exploration activities will not have an impact on the power line.
30	Exploration was concentrated at the Village Pit area. How much ore is located within the southern and eastern sections of the mining area?	11 May 2021 Focus Meeting	Surrounding Landowner: Albertus Viljoen	Exploration activities are planned, however are informed by information obtained from the actual exploration drilling. The focus was not solely on Village pit. Assmang annual reports are publicly available for further information.
Employment and Safety				
31	Will the project result in job creation?	11 May 2021 Focus Meeting	Kolomela Mine	This project is to ensure a sustainable increase in the life of mine, not an increase in production. This project will in fact allow for the continuation of mining activities, which will rather secure the employment of the current staff compliment. During the construction phase limited short-term opportunities will be created. The construction/start-up period is estimated for approximately eight (8) months. During the peak periods of the construction phase approximately 122 positions would be created for a short period of time. Of these, 70 would fall in the unskilled category, 18 in the skilled and 34 in management positions. The construction of the railway link line could change these figures. The mine has a dedicated procurement and HR department, who manages the employment in line with the relevant Score Cards. Strong emphasis is place on the involvement of local labour. The mine will further ensure that local labour is sourced where possible during the construction phase. It is highly unlikely that this project will result in an influx of job seekers as not new areas will be opened for construction and no new substantial opencast pts are being developed. The new plants is regarded as an addition to the existing North Mine beneficiation plant.
32	It is important to assess the social impacts with regards to the proposed Beeshoek Optimisation Project. It is anticipated that the proposed Beeshoek mining activities will result in population increases, even though no additional employment opportunities will be created as part of the project. Contractors usually use outsiders as part of the work force. These outsiders remain in the area resulting in more unemployed people and the rapid development of informal settlements. This is of concern to the TLM as it would again impact on their service delivery ability.	25 May 2021	Tsantsabane Local Municipality	is important to understand the intent of this project. The project is purely an optimisation project. Additional job creation opportunities will be available during the construction phase. However, for the operational phase, the staff compliment will likely revert back to the current staff compliment, with limited new positions required. This project is to ensure a sustainable increase in the life of mine, not increase in production. This project will in fact allow for the continuation of mining activities, which will rather secure the employment of the current staff compliment. The mine has a dedicated procurement and HR department, who manages the employment in line with the relevant Score Cards. Strong emphasis is place on local labour. The mine will further ensure that local labour is sourced where possible during the construction phase. It is highly unlikely that this project will result in an influx of job seekers as not new areas will be opened for construction and no new substantial opencast pts are being developed. The new plants will be regarded as an addition to the existing North Mine beneficiation plant.
33	Who is the landowner of the farm to the south of Koeispeen? He experiences safety problems at the boundary fence (south-eastern section) due to unauthorized access. Can Beeshoek also put up a higher fence and monitoring	11 May 2021 Focus Meeting	Surrounding Landowner	This is municipal land.

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	station similar to what Kolomela Mine has done at the landowner's boundary fence and that of Kolomela Mine?			The Mine has placed fences on its boundaries strategically as well as have a security company patrolling the fences daily.
Water Use Licencing				
34	No activity may occure within 1_100 year floodline of drainage lines without authorisation. No activity may occur within 500m of a pan/wetland (perennial/non-perennial) without authorisation.	Letter dated 16 June 2021	DWS, Ms. Feni Ntombizanele	Noted, where such an activity is considered, the relevant Section 21(c) and (i) water uses will be applied for. Please refer to Section 2.d.viii and Table 9.
35	Note that dewatering of a pit for the continuation of an activity or for the safety of people triggers section 21(j), any storage of waste water triggers section 21(g) and the use of removed water from the pit triggers section 21 (a) of the NWA. The IWWMP, civil designs and geohydrological report must be submitted to support the application.			No additional dewatering volumes are being applied for in the total approved volume. Please refer to Section 2.d.viii and Table 9.
36	The disposal of general waste and that of hazardous waste will be carried out in an environmentally safe way as to prevent and/or minimise the potential for pollution of water resources and collection of which should be done by an accredited waste collector. All applicable sections of the NEM:WA should be strictly adhered to.			Noted, included into the EMPr – refer to Table 85 to Table 88.
37	Section 19 and 20 of the NWA should be adhered to.			Noted, included into the EMPr – refer to Table 85 to Table 88.
38	Appropriate measures should be taken to prevent spillages of material such as oil, grease, and fuel. However, in instances of spillages, immediate steps must be taken to clean up the spilled substance and disposed off in a proper manner or acquire bioremediation substances that will treat the spill and dispose such materials at a permitted hazardous landfill site. The Department should be notified of such spills within 24 hours.			Noted, included into the EMPr – refer to Table 85 to Table 88.
39	All hazardous chemicals should be stored on a bunded area to prevent the contamination of both ground and surface water.			Noted, included into the EMPr – refer to Table 85 to Table 88.
40	Please note that a new WULA must be applied for through the E-WULAAS system and the new WUL will supersede the old WUL.			The WULA will be submitted via the E-WULAAS system when the Final EIA and EMPr is submitted. Noted, where such an activity is considered, the relevant Section 21(c) and (i) water uses will be applied for. Please refer to Section 2.d.viii and Table 9.

Please refer to Annexure 4 for the copies of the received comments and requests.

2.e.iii The Environmental Attributes (Type of Environment Affected by the Proposed Activity)

As no significant changes in the location of infrastructure have been required based on the alternative discussions to date, the environmental attributes associated with the current site locations are presented.

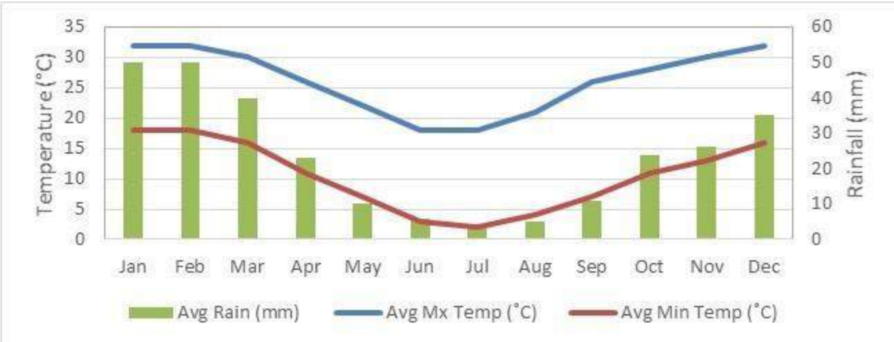
2.e.iii.1 Climate

Postmasburg is the closest town to Beeshoek, situated at approximately 28˚33' S and 23˚07' E, at an elevation of 1 305m. According to the Köppen-Geiger climate classification system it experiences a hot desert climate. The climate at Postmasburg is well described by the 30-year historical data record from the Meteoblue archived weather model data. Meteoblue weather models historical data from 1985 onwards and generated a continuous 30-year global history with hourly weather data at a grid resolution of 30 km.

2.e.iii.1.a Temperature

The average summer maximum temperatures are hot and exceed 30˚C from November to March (please see figure below). The winter temperatures are mild and the average minimum temperature drops below 10˚C from May through to September.

Postmasburg receives an annual average rainfall of only 283 mm with most of the rain falling between December and March (please see figure below).



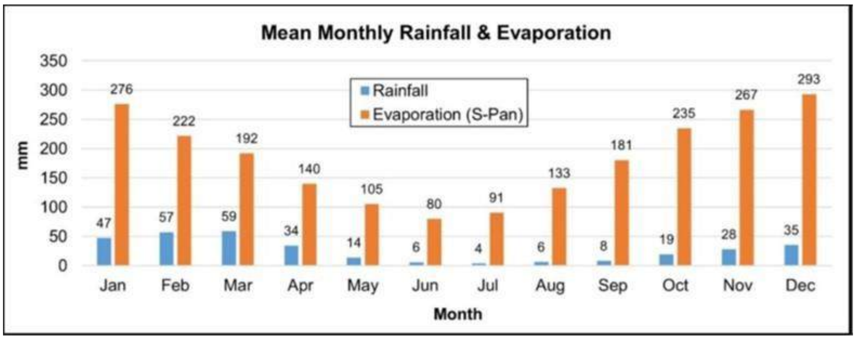
Graph 1: Average monthly maximum and minimum temperatures at Postmasburg and the average monthly rainfall (https://www.meteoblue.com)

2.e.iii.1.b Rainfall and Evaporation

According to statistics from the Weather Bureau Station No. 0321110 (Latitude 28°20' Longitude 23°04', at a height of 1311 metres above mean sea level (mamsl)) at Postmasburg, located approximately 7km from Beeshoek, the Mine is within an area of Mean Annual Precipitation (MAP) that ranges from 315 - 400mm.

The climate of Beeshoek can be described as semi-arid to arid, with evaporation far exceeding rainfall. The Mine is located in an endoreic catchment, and therefore, surface water runoff is limited.

Precipitation (MAP) of the area is 317mm, whilst the Mean Annual Evaporation (MAE) is 2 213mm. The area can be described as having a semi-arid to arid climate, with evaporation far exceeding rainfall.



Graph 2: Mean annual rainfall and evaporation for the area

2.e.iii.1.c Wind

The hourly wind speed and direction at Postmasburg are presented in the annual windrose in the following figure. A windrose illustrates the frequency of hourly wind from the 16 cardinal wind directions, with wind indicated from the direction it blows, i.e. easterly winds blow from the east. It also illustrates the frequency of average hourly wind speed in six wind speed classes in m/s.

In 2020, 76% of all winds were either calm or light with and 76% of all winds were less than 3.6 m/s, i.e. (6 658 hours of the possible 8 760 hours in a year). 24% of winds exceeded 3.6 m/s with just 0.1% of winds reaching more than 8.8 m/s, i.e. for just longer than 8 hours. The predominant wind direction in 2020 was from the sector east-northeast (ENE) to easterly (E), accounting for approximately 36% of all winds.

The predominant wind direction is northwest to north-northeast with winds from other sectors less frequent. Winds are generally light with most of hourly winds less than 3.4 m/s. Stronger winds reaching more than 8 m/s are infrequent and mostly occur from the west-northwest to north-northwest sector.

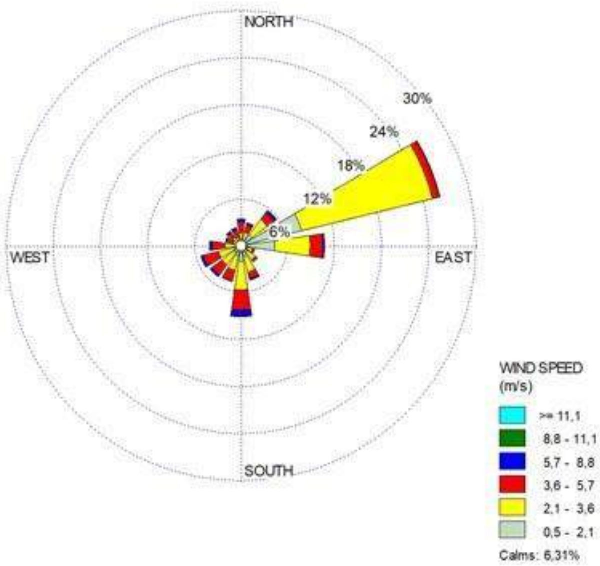


Figure 33: Windrose for 2020 at Postmasburg with wind speed in m/s and frequency bands of 6% (data provided by SAWS)

2.e.iii.2 Topography

The general topography of the study area drops off gradually in a west to south-westerly direction, with the elevation varying from 1 496 metres above mean sea level (mamsl) along a series of koppies in the north-east, to 1 213 mamsl along a drainage line in the south-west (please refer to the following figure). A ridge runs in a north to south direction along the eastern Mine boundary and reaches a maximum height of 1 480 mamsl in the north of the Mine. This ridge conceals the visibility of the current Beeshoek infrastructure from Postmasburg. Steep slopes in excess of 30% occur along the sides of the koppies, ridges and mine dumps, however, the average slope of the study area is less than 3%, indicating the general flat topography of the area.

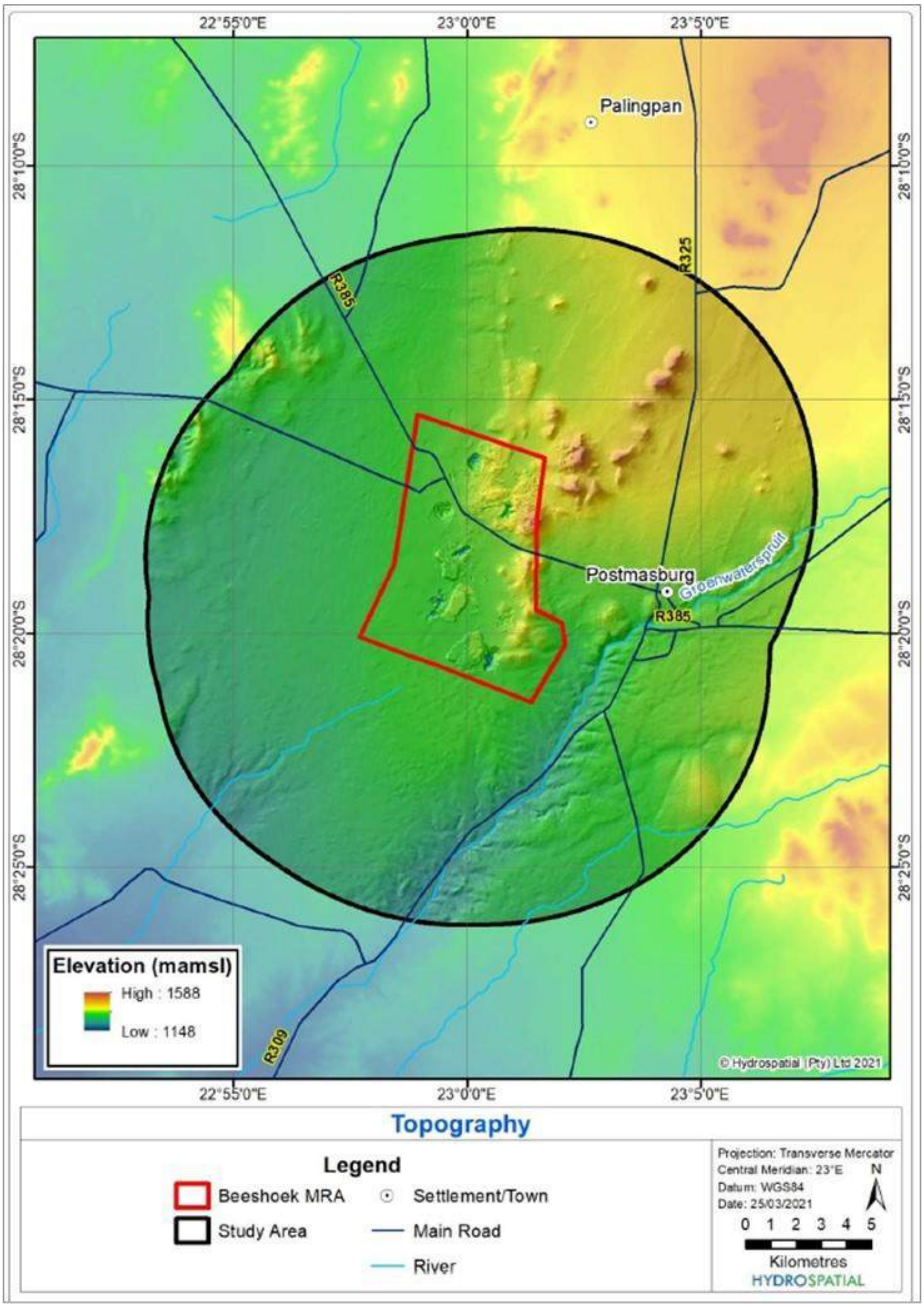


Figure 34: Topography

2.e.iii.3 Geology

SRK was appointed by Beeshoek to conduct a Deep Dolomitic Study during May 2021. The following information has been sourced from this report.

According to the 1:250 000 scale geological map series 2822 Postmasburg, the area is underlain by Manganore Iron Formation within palaeokarst features within dolomite, dolomitic limestone and chert of the Ghaap Plateau dolomite formations of the Campbell Rand Group. The Ghaap Plateau dolomite formations occur at depth and into the north east of the mine property where it outcrops in the Maremane Anticline. The dolomite formation in general and the Ghaap dolomites in the case in particular, are a primary aquifer and an important groundwater reserve especially in the arid western regions of South Arica where the mine is located. The effects of groundwater abstraction on the stability of karst terrane (or dolomite) are well documented. The regional geology of the site is complex and comprises of banded ironstone with amphibolite and crocidolite of the Asbesheuwels Ironstone Formation of the Ghaap Group.

The Beeshoek iron ore deposit is situated on the southern extent of the Maremane dome defined by carbonate rocks of the Campbell Rand Subgroup and iron-formations of the Asbesheuwels Subgroup of the Transvaal Supergroup dipping gently at less than 10' in an arc to the north, east, and south.

A number of iron ore mines are located in the area with the Beeshoek mine producing 3.6 million tons per annum of iron ore The iron ore deposits are described as being contained within a sequence of early Proterozoic sediments of the Transvaal Supergroup deposited 2200-2500 million years ago (SRK, 2014). Two ore types are present within the sequence, namely conglomeratic iron ore (of the Doornfontein Conglomerate Member at the base of the Gamagara Formation) and laminated hematite (which forms part of the Manganore Iron Formation) (Johnson, et al., 2006).

The Manganore Iron Formation is a correlative of the Asbesheuwels iron formation succession of the Transvaal Supergroup and slumped into palaeo-sinkhole structures in the underlying Campbell Rand carbonate formations during the period of erosion that preceded the deposition of the Gamagara Formation. The Makganyene diamictite and Ongeluk lava of the Transvaal Supergroup are thrust over the Gamagara Formation to the west of the mine.

The Manganore Formation in expressed in a range of isolated hills (referred to as Klipfontein Hills) which are thought to represent the infill of former karst sinkholes, now exposed by preferential weathering of the dolostone host rocks. The Beeshoek iron ore deposits constitute large clusters of such former karst sinkholes developed at the southern and northern intersection points of the Klipfontein Hills with the N-S-striking Gamagara Ridge (Schalkwyk, 2005).

The peneplain areas are characterised by a cover of Kalahari Formation Tertiary soil, sand, rubble and calcrete. Detrital ore of recent origin can be found between dolomite pinnacles and as localised slope scree and alluvial outwash.

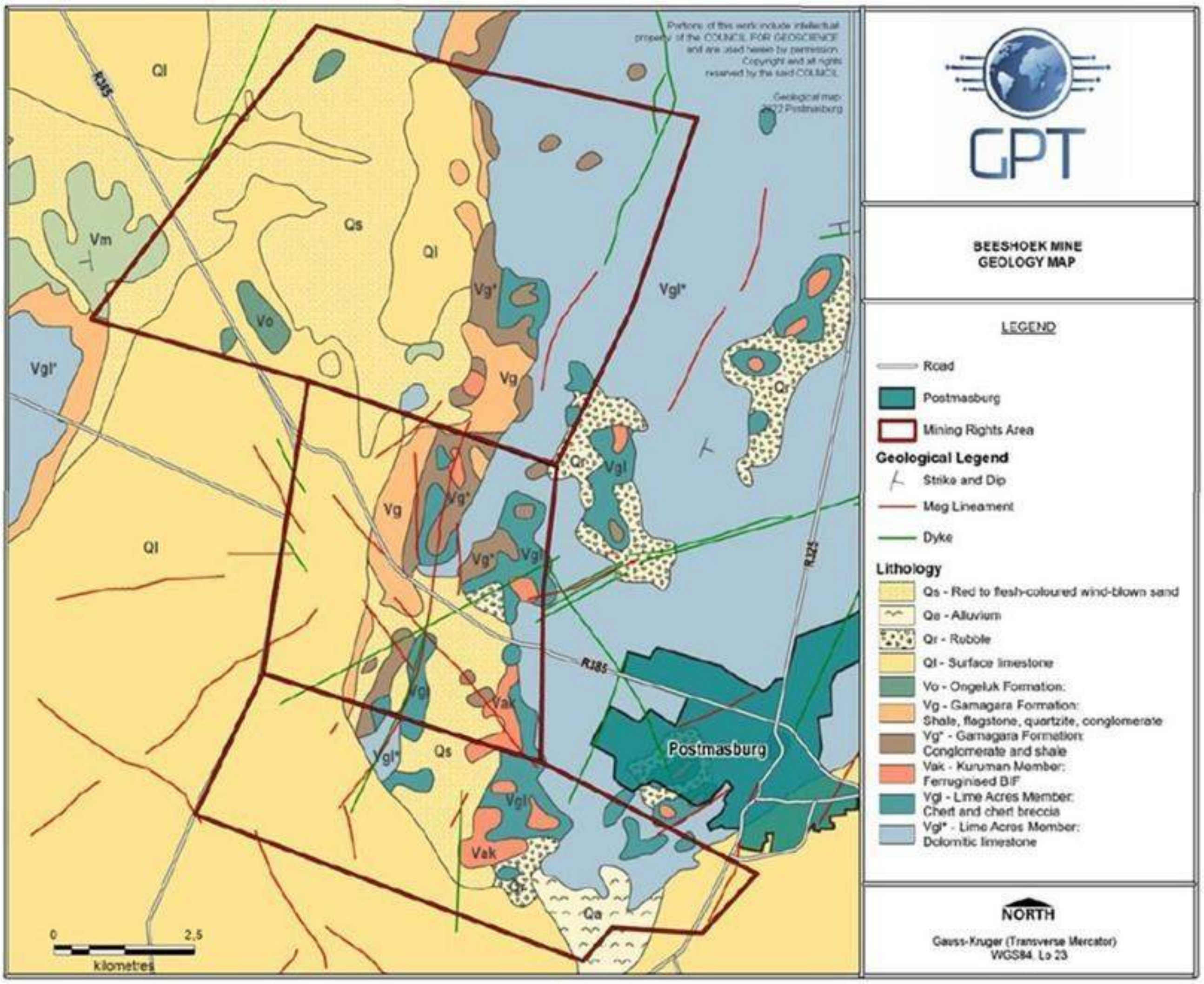


Figure 35: Geology, GPT, 2021

Figure 36: Simplified Geology, STS, 2021

2.e.iii.4 Soils

The Soil, Land Use and Land Capability Assessment was undertaken by Scientific Terrestrial Services cc (STS). Please refer to Annexure 6 for the detailed report.

2.e.iii.4.a Soil Forms

According to the Geology 2001 layer (see Figure 36), the entire focus area is underlain by Sedimentary, Dolomite and Tillite rock formations, while the lithology is comprised of clastic sedimentary rocks, and limestone and carbonate rocks, as depicted in Figure 37.

The project area is largely situated within an area where the soils are classified as red-yellow apedal freely drained soils with a high base status and less than 300mm depth according to the Soils 2001 Layer. The remaining areas comprise rocky areas with miscellaneous soils, as depicted in Figure 38. This implies that most of the soils are not ideal for cultivation for most crops due to limited soil depth.

The mining and railway line area traverse a Calcic and Anthropic catena with Coega/Knersvlakte, Mispah/Glenrosa being the dominant soil forms within the total investigated focus area. The remaining portions over the Mine Optimisation Project are occupied by Plooysburg/Vaalbos/Nkonkoni soil forms which occur in small patches within the focus area. The remaining portions of the railway line are occupied by Plooysburg/Vaalbos and Witbank soil forms which occur in small patches within the study area. Arable soils (i.e. Plooysburg/Vaalbos) constitute of approximately 6.3% (4.2ha) of the investigated study area. These soils are considered ideal for cultivation due to:

- Good drainage characteristics;
- Sufficient depth for root growth;
- Sufficient moisture holding capacity; and
- Nutrient retention capacity to support the optimum growth and production.

Figure 37: Lithology of the area associated with the focus area according to the SOTER Database

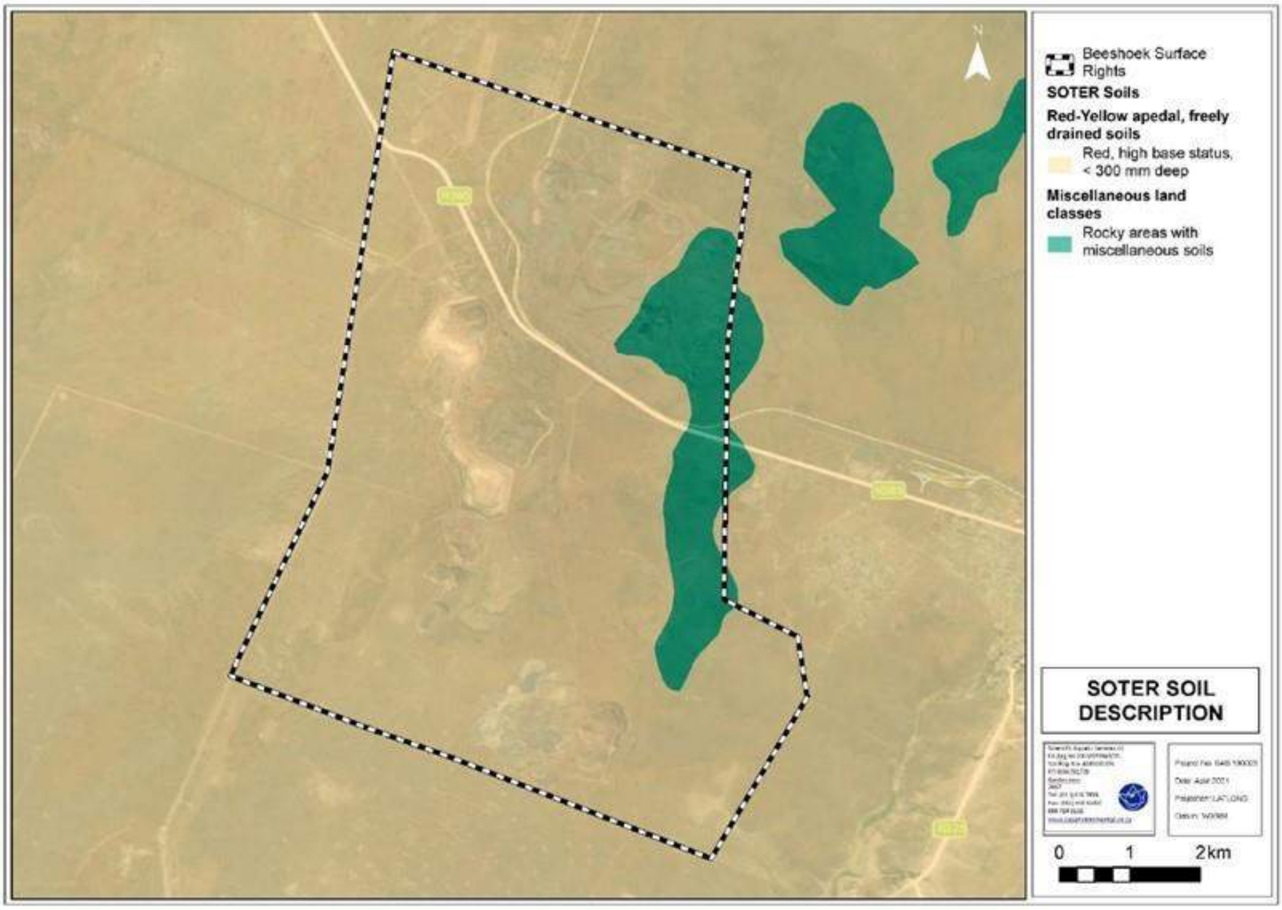


Figure 38: Soil description associated with the focus area according to the SOTER Database

2.e.iii.4.a.1 Mine Optimisation Area

Shallow soils of Coega/Knersvlakte (Cg) and Mispah/Glenrosa (Ms/Gs) formations collectively cover approximately 82.2% of the total investigated focus area and can be considered as having poor physical characteristics ideal in supporting cultivation agricultural practices. This is attributed to the occurrence of Hardrock/Lithic and Hard Carbonate material near and/or at the surface which restricts root growth and development. This creates conditions that are not conducive to the cultivation of most cultivated crops. Some portions of the focus area are comprised of extensively disturbed soils classified as Witbank formation (16.6%). Below is a tabular representation of the dominant soils, with relative description of soil horizons as well as associated land capability. The table below present the dominant soil forms and their respective diagnostic horizon sequence.

Table 36: Dominant soil forms within the Mine Optimisation Area

Soil Forms	Code	Diagnostic Horizon Sequence
Plooysburg	Py	Orthic/Red Apedal/Hard Carbonate or Hard Rock
Vaalbos	Vb	Orthic/Red Apedal/Hard Rock
Nkonkoni	Nk	Orthic/Red Apedal/ Lithic
Kolke	Ko	Orthic/Soft Carbonate/Unconsolidated material with wetness
Lepallane	Lp	Unconsolidated material with wetness
Mispah	Ms	Orthic/Hard Rock
Glenrosa	Gs	Orthic/Lithic
Coega	Cg	Orthic/Hard Carbonate
Knersvlakte	Kn	Orthic/Dorbank
Witbank	Wb	Unspecified

The following figure illustrates the soil forms in the Mine Optimisation Area.

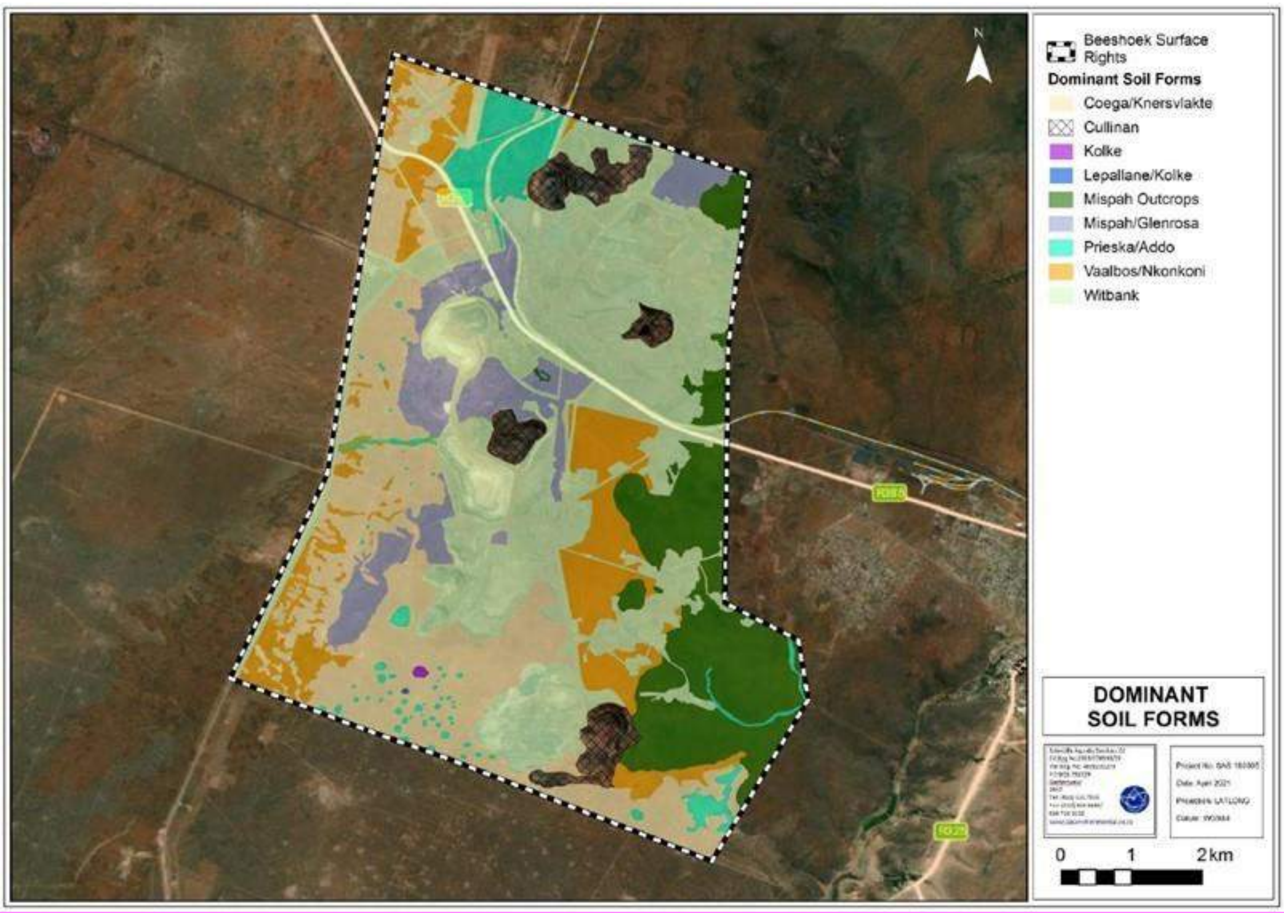


Figure 39: Soil map depicting identified soil forms within the focus area

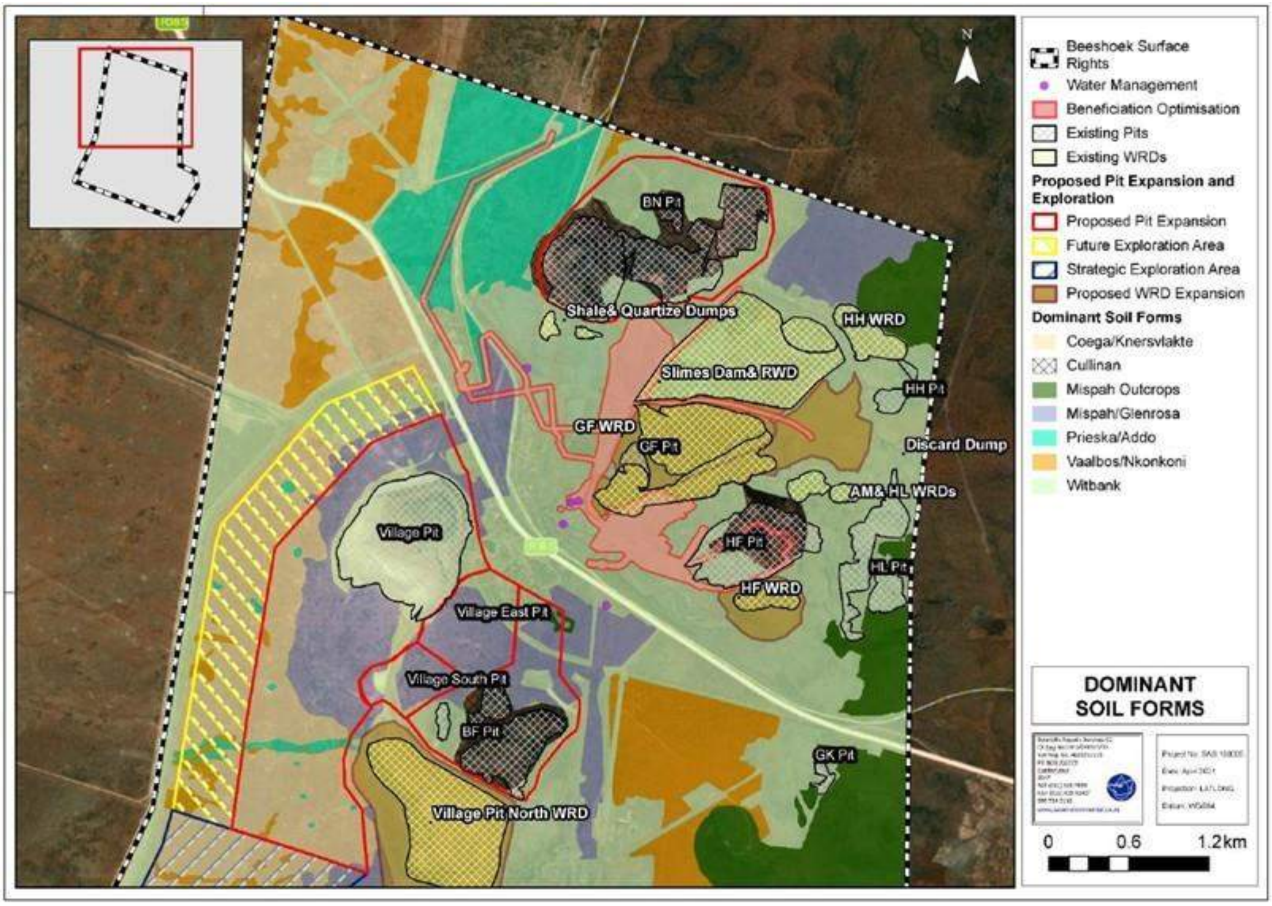


Figure 40: Soil map depicting identified soil forms in the northern overlain by the simplified layout of the proposed projects

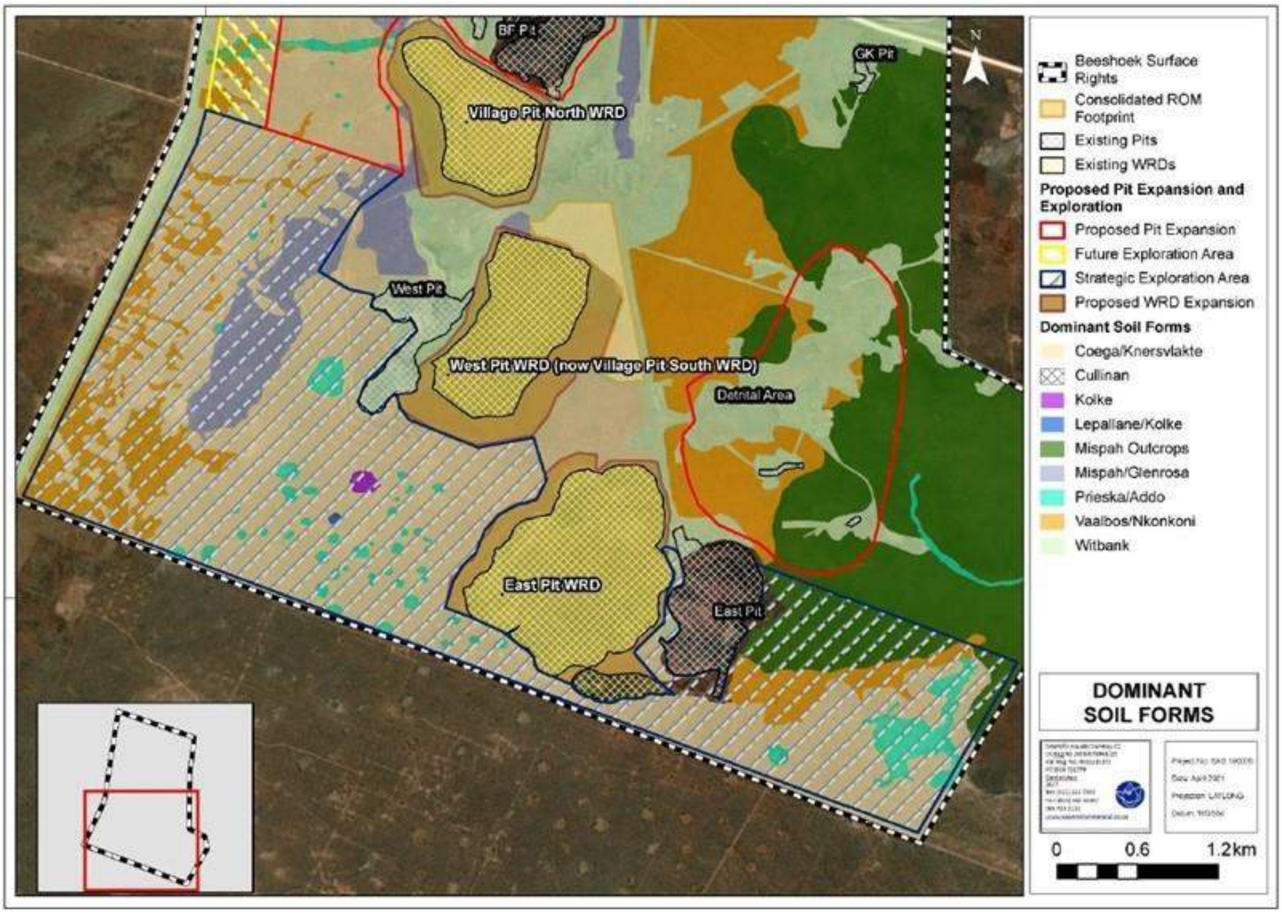


Figure 41: Soil map depicting identified soil forms in the southern portion, overlain by the simplified layout of the proposed projects

2.e.iii.4.a.2 Railway Line Area

Shallow soils of Coega/Knersvlakte (Cg), Prieska/Addo and Mispah/Glenrosa (Ms/Gs) formations collectively cover approximately 51.9% of the total investigated study area and can be considered as having poor physical characteristics ideal in supporting cultivation agricultural practices. This is attributed to the occurrence of Hardrock/Lithic and Hard Carbonate material near and/or at the surface which restricts root growth and development. This creates conditions that are not conducive to the cultivation of most cultivated crops. Some portions of the study area are comprised of extensively disturbed soils classified as Witbank formation (41.8%). Below is a tabular representation of the dominant soils, with relative description of soil horizons as well as associated land capability. The table presents the dominant soils, with their relative description of soil horizons as well as the associated land capability and land potential (see the following figure).

Table 37: Dominant soil forms within the Railway Line Area

Soil Forms	Code	Diagnostic Horizon Sequence
Plooysburg	Py	Orthic/Red Apedal/Hard Carbonate or Hard Rock
Mispah	Ms	Orthic/Hard Rock
Glenrosa	Gs	Orthic/Lithic
Coega/Knersvlakte	Cg	Orthic/Hard Carbonate
Prieska/Addo	Pk/Ad	Orthic/Neocarbonate/ Soft Carbonate/Hard Carbonate
Witbank	Wb	Unspecified

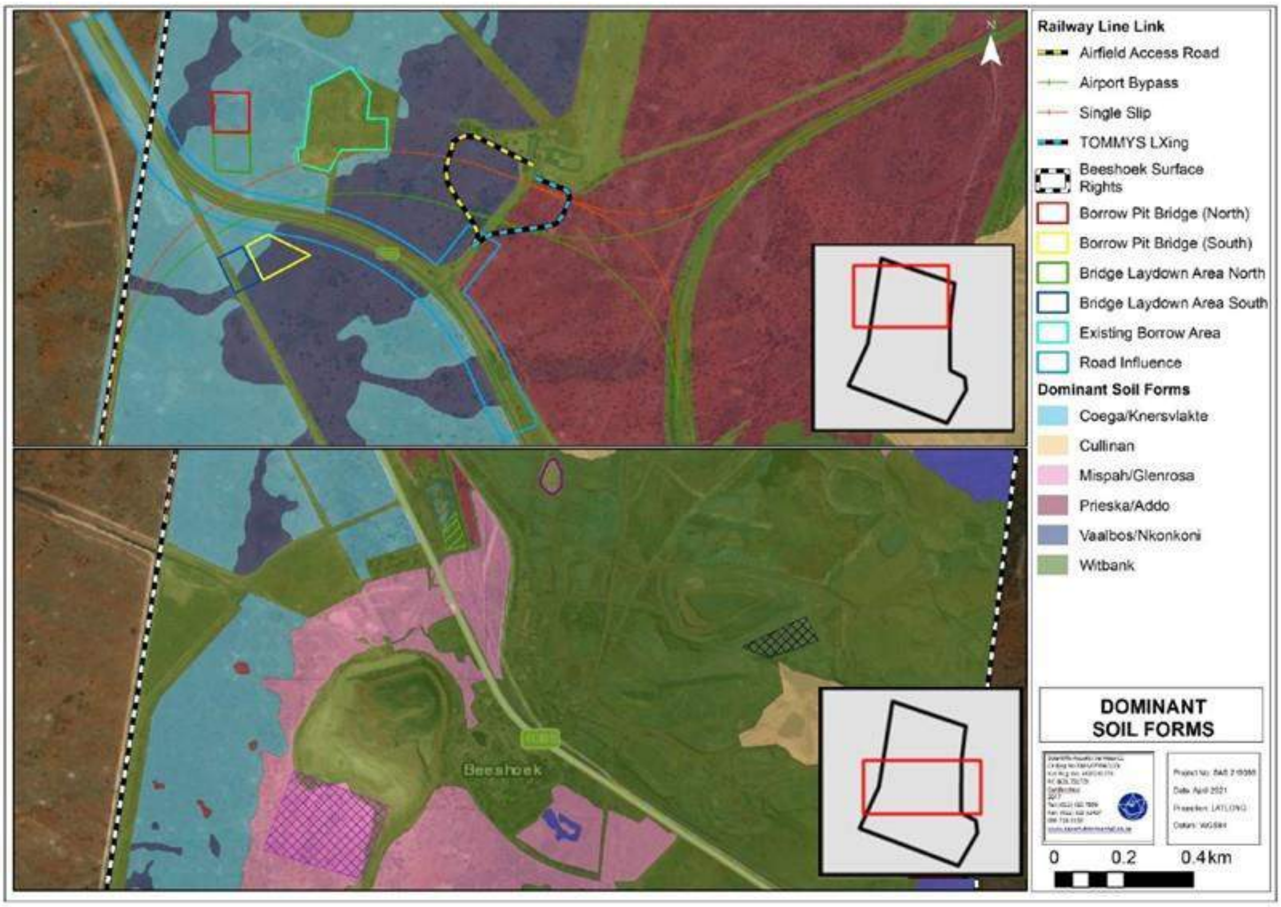


Figure 42: Soil map depicting identified soil forms in the Railway Line, overlain by the simplified layout of the proposed projects

2.e.iii.4.b Agricultural Theme

According to the screening tool (agricultural theme), majority of the focus area has a low agricultural sensitivity, while some patches are deemed to be of medium and high agricultural sensitivity. The latter seem to link to depressions and Groenwaterspruit.

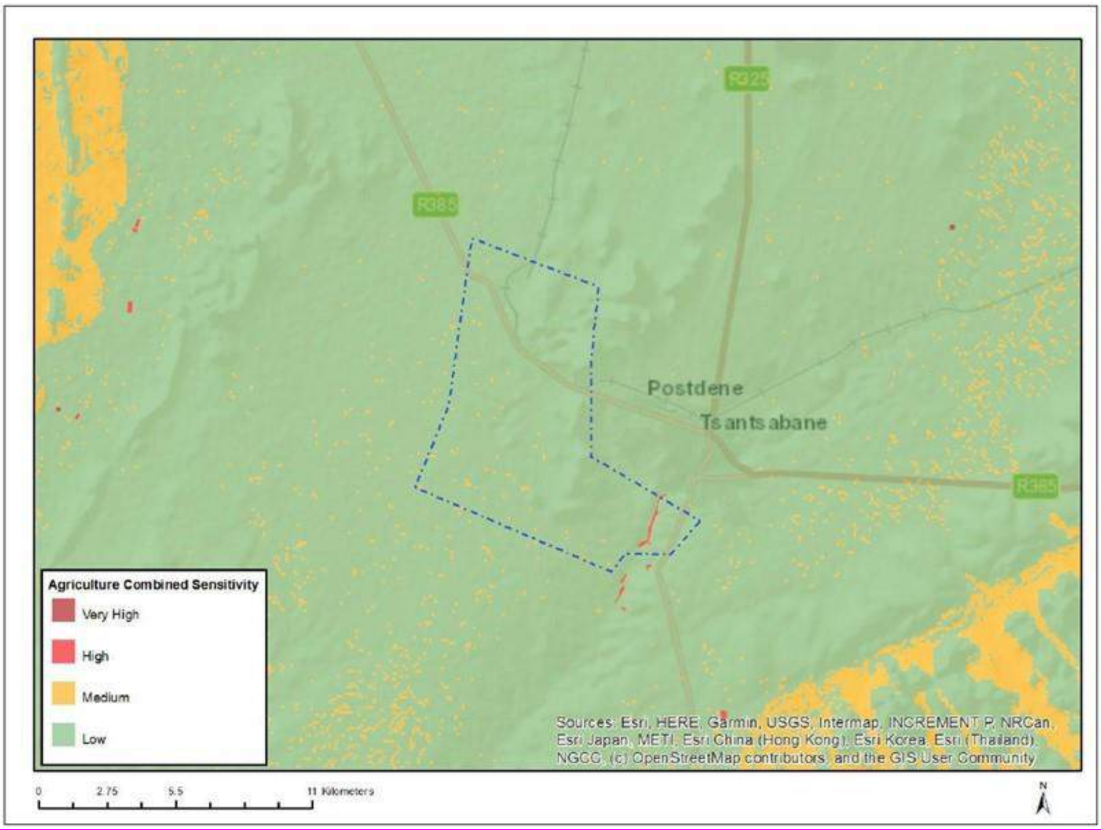


Figure 8: Screen tool – Agricultural Theme

2.e.iii.4.c Erodibility

For the Mine Optimisation Project, the soils within the focus area have a low to moderate water or wind erosion hazard, and the area is generally level to gently sloping land. The soils therefore have low to very high erodibility.

The majority of the study area at the railway line is sub-dominated by sand and is therefore susceptible to wind erosion, the remaining central western portion of the study area is dominated by pure sands and is thus highly susceptible to wind erosion.

2.e.iii.4.d Land Use and Land Capability

The dominant land use within the Mine Optimisation area is wildlife/wilderness (refer to Figure 43), access roads and services roads as well as existing expansion project. No cultivated commercial agricultural activities were observed within the focus area and the immediate vicinity. For the railway line, the dominant land uses in the surrounding areas include mining, airfield, wildlife/wilderness, access roads and services roads as well as existing railway line. No cultivated commercial agricultural activities were observed within the study area and the immediate vicinity.

Photo 2: Current Land Uses, STS, 2021

Figure 43: Land Capability description associated with the focus area according to the SOTER Database

2.e.iii.4.d.1 Mine Optimisation Area

The majority of the investigated focus area comprises extensively disturbed soils classified as Witbank/Cullinan formation which cover approximately 54.5%. These soils are considered as having poor physical characteristics which are not suitable for cultivated agricultural practices.

The shallow soils of Coega/Knersvlakte (Cg) and Mispah/Glenrosa (Ms/Gs) formations collectively cover approximately 35.6% of the total investigated focus area. The occurrence of Hardrock/Lithic and Hard Carbonate material near and/or at the surface on these soil forms restricts root growth and creates conditions that are not conducive to the cultivation of most cultivated crops.

Only 9.8% of the total investigated area is considered suitable for cultivated agricultural practices under intensive management practices (i.e. irrigation).

The table below presents the dominant soils, with their relative description of soil horizons as well as the associated land capability and land potential.

Table 38: Mine Optimisation Study - Dominant soil forms and their respective land capability and land potential

Soil Forms	Code	Diagnostic Horizon Sequence	Land Capability	Land Potential	Areal Extent (ha)	Percentage
Plooysburg	Py	Orthic/Red Apedal/Hard Carbonate or Hard Rock	Class (III)	Restricted potential	499.4	9.8
Vaalbos	Vb	Orthic/Red Apedal/Hard Rock				
Nkonkoni	Nk	Orthic/Red Apedal/ Lithic				
Kolke	Ko	Orthic/Soft Carbonate/Unconsolidated material with wetness	Grazing (Class V)	Vlei	3.2	0.1
Lepallane	Lp	Unconsolidated material with wetness				
Mispah	Ms	Orthic/Hard Rock	Grazing (Class VI)	Very Restricted potential	1802.0	35.6
Glenrosa	Gs	Orthic/Lithic				
Coega	Cg	Orthic/Hard Carbonate				
Knersvlakte	Kn	Orthic/Dorbank				
Witbank	Wb	Unspecified	Wilderness (Class VIII)	Very low potential	2757.6	54.5
Total					**5062.2**	**100**

Please refer to Figure 44 to Figure 46 for the land capability and Figure 50 for the land potential.

2.e.iii.4.d.2 Railway Line Area

The proposed railway line traverses a Calcic and Anthropic topo catena Coega/Knersvlakte, Mispah/Glenrosa, Plooysburg and Witbank soil forms being the dominant soil forms within the total investigated study area.

Arable soils (i.e. Plooysburg) constitute of approximately 6.3% (4.2 ha) of the investigated study area.

Shallow soils of Coega/Knersvlakte (Cg), Prieska/Addo and Mispah/Glenrosa (Ms/Gs) formations collectively cover approximately 51.9% of the total investigated study area and can be considered as having poor physical characteristics ideal in supporting cultivation agricultural practices. This is attributed to the occurrence of Hardrock/Lithic and Hard Carbonate material near and/or at the surface which restricts root growth and development. This creates conditions that are not conducive to the cultivation of most cultivated crops.

Some portions of the study area are comprised of extensively disturbed soils classified as Witbank formation (41.8%).

The table below presents the dominant soils, with their relative description of soil horizons as well as the associated land capability and land potential.

Table 39: Railway Line - Dominant soil forms and their respective land capability and land potential

Soil Forms	Code	Diagnostic Horizon Sequence	Land Capability	Land Potential	Areal Extent (ha)	Percentage
Plooysburg	Py	Orthic/Red Apedal/Hard Carbonate or Hard Rock	Class (III)	Restricted potential	499.4	9.8
Vaalbos	Vb	Orthic/Red Apedal/Hard Rock				
Nkonkoni	Nk	Orthic/Red Apedal/ Lithic				
Kolke	Ko	Orthic/Soft Carbonate/Unconsolidated material with wetness	Grazing (Class V)	Vlei	3.2	0.1
Lepallane	Lp	Unconsolidated material with wetness				
Mispah	Ms	Orthic/Hard Rock	Grazing (Class VI)	Very Restricted potential	1802.0	35.6
Glenrosa	Gs	Orthic/Lithic				
Coega	Cg	Orthic/Hard Carbonate				
Knersvlakte	Kn	Orthic/Dorbank				
Witbank	Wb	Unspecified	Wilderness (Class VIII)	Very low potential	2757.6	54.5
Total					**5062.2**	**100**

Please refer to Figure 44 and Figure 47 for the land capability and Figure 48 and Figure 51 for the land potential.

2.e.iii.4.d.3 Overall

The findings of this assessment suggest that the relevant soil limiting factors within the focus area for land capability and land use potential include the following:

- Shallow effective rooting depth due to shallow indurated bedrock of the Mispah/Glenrosa, Coega/Knersvlakte soil forms. As such, these soils are not considered to contribute significantly to agricultural productivity;
- Specifically at the Mine Optimisation Area - Seasonal waterlogging of the Kolke and Lepallane soil forms within the associated with the seasonal wetland features. Preservation of these soils for conservation purposes takes precedence, according to the National Water Act, 1998 (Act No. 36 of 1998); and
- Lack of soil medium for plants and crop growth for the rocky outcrop, mine infrastructure, surface water areas and Witbank (Anthrosols) soil types.

The climatic conditions associated with the focus area and surroundings are characterised by severe climatic limitations with Mean Annual Precipitation ranging between 201-400mm per annum, thus making the focus area unsuitable for commercial cultivation under rainfed conditions due to high risk of plant desiccation and subsequent permanent wilting. From a land capability point of view, the proposed expansion project footprint is largely dominated by shallow soils with low agricultural potential soils with only minor areas comprising of High agricultural potential. At best, the Coega/Knersvlakte, Mispah/Glenrosa soil forms are suitable for marginal grazing. Although arable soils occur with the expansion project footprint (Plooysburg), given the climatic constraints of the area (Rainfall less than 400 mm) and lack of irrigation options, these soils are not likely to contribute substantially to national food production. Furthermore, high temperatures occurring in this area are also likely to cause crop wilting, thus affecting crop yield. Given these constraints the extent of the high productivity soils is not considered sufficient for viable cultivated commercial farming.

Livestock commercial farming is marginal for one (1) landowner for the proposed area extent to be affected by mining activities, due to the grazing capacity low grazing capacity for this area (14 Hectares per animal). Although the grazing capacity indicated in the existing database is 14ha/LSU, based on the field investigation considering the veld condition (i.e., sparsity and palatability of grass) and occurring soils the grazing capacity is anticipated to be lower than indicated. Therefore, this area it is not considered sufficient for viable commercial farming unless intensive management practices are implemented.

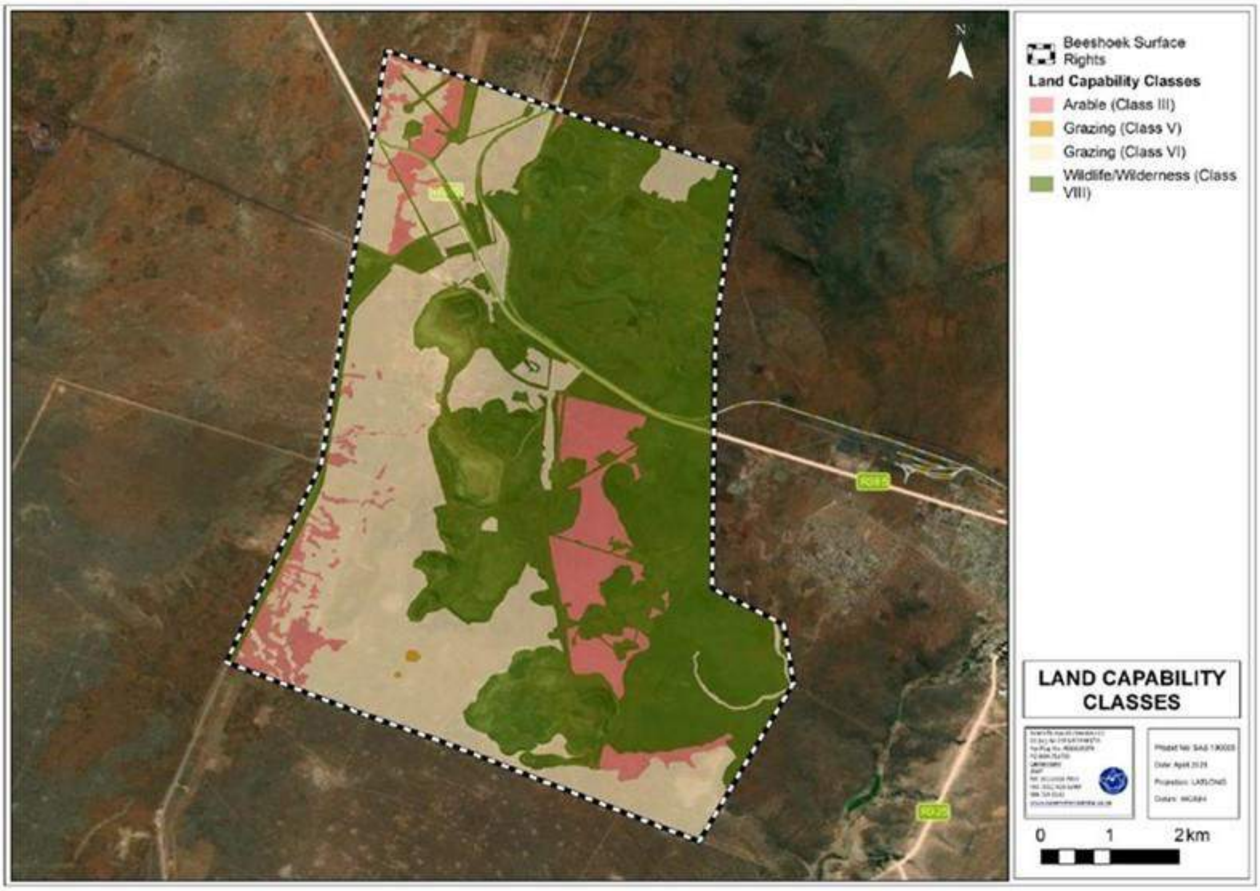


Figure 44: Map depicting land capability classes of soils occurring within the focus area

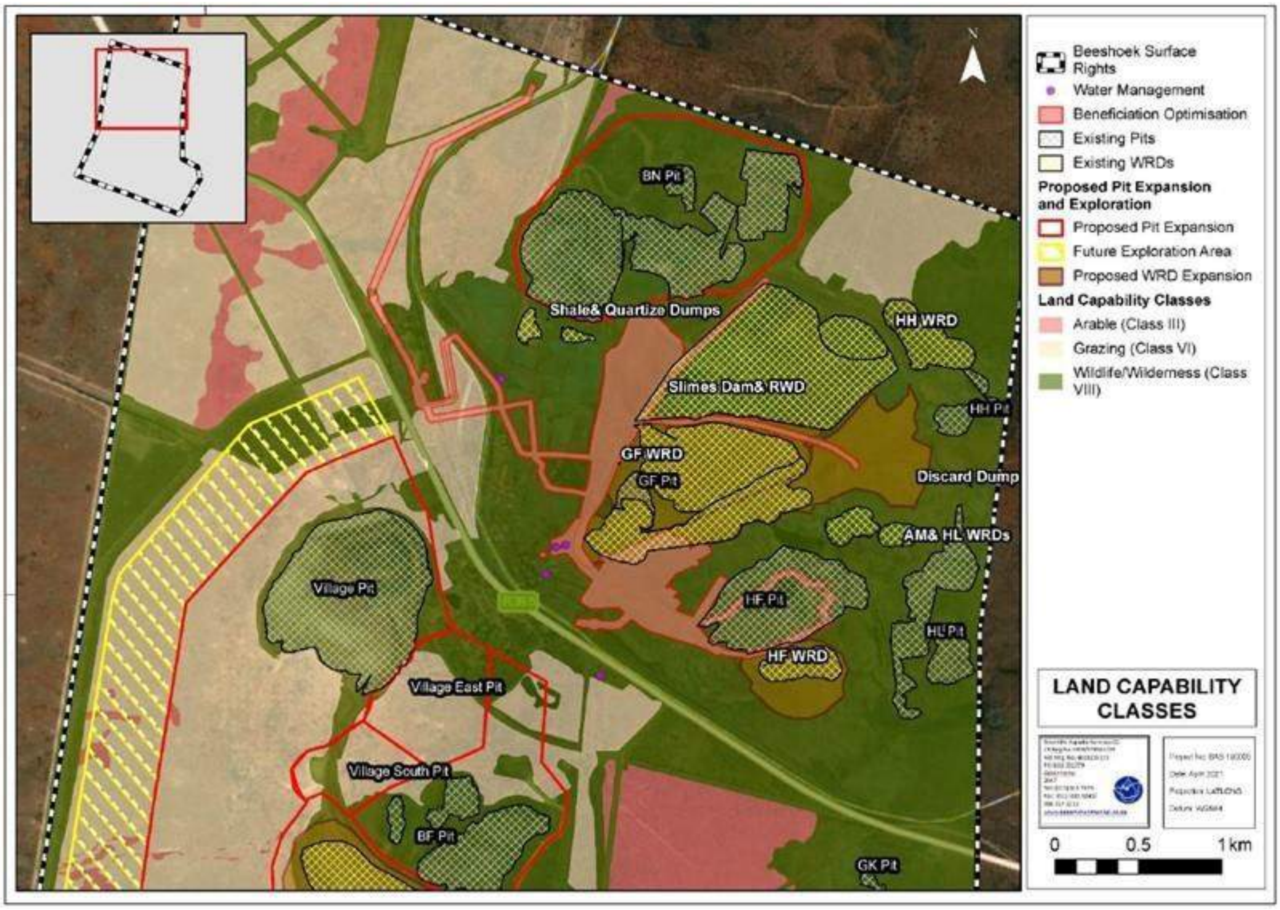


Figure 45: Map depicting land capability classes of soils overlain by the simplified layout of the proposed projects

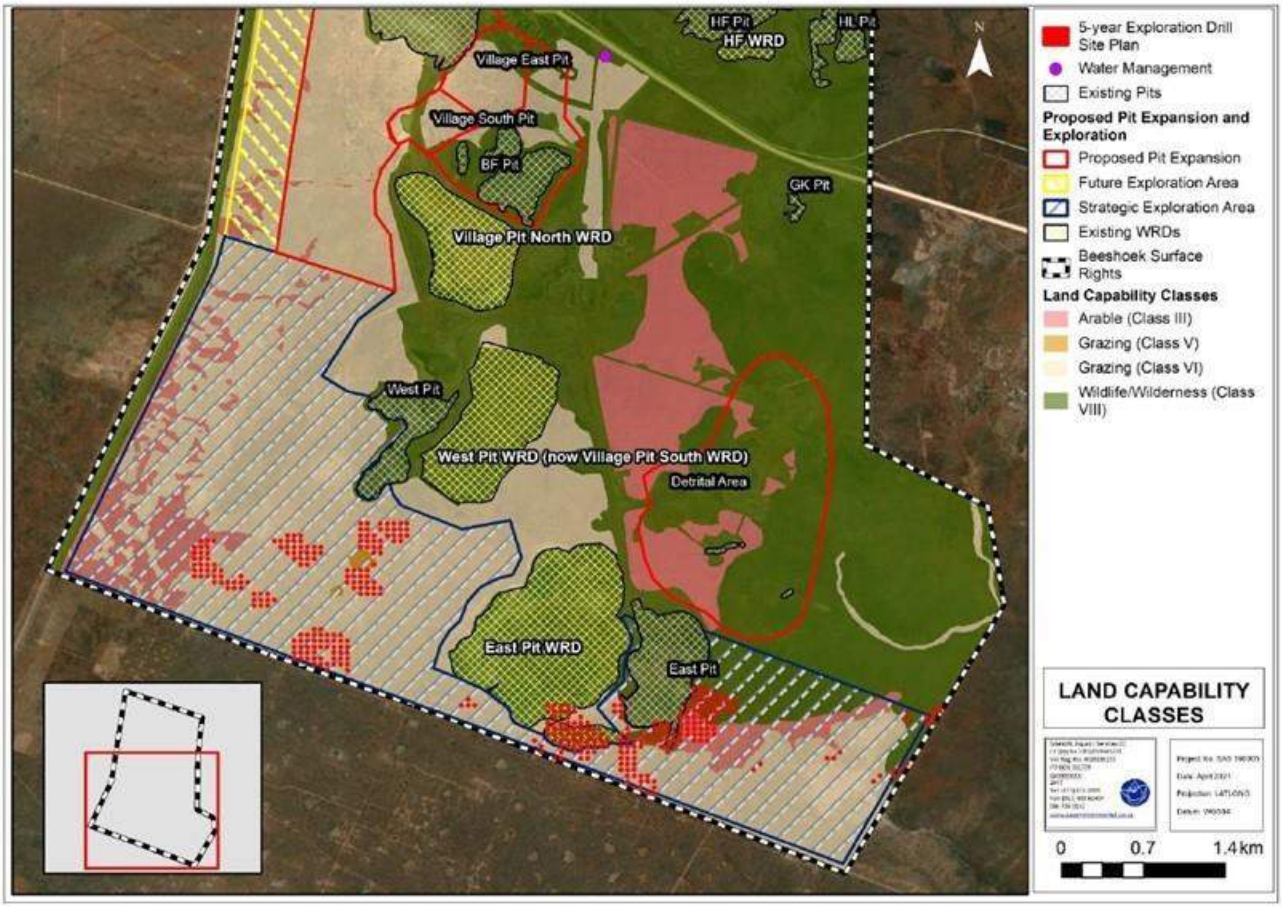


Figure 46: Map depicting land capability classes of soils overlain by the simplified layout of the proposed projects

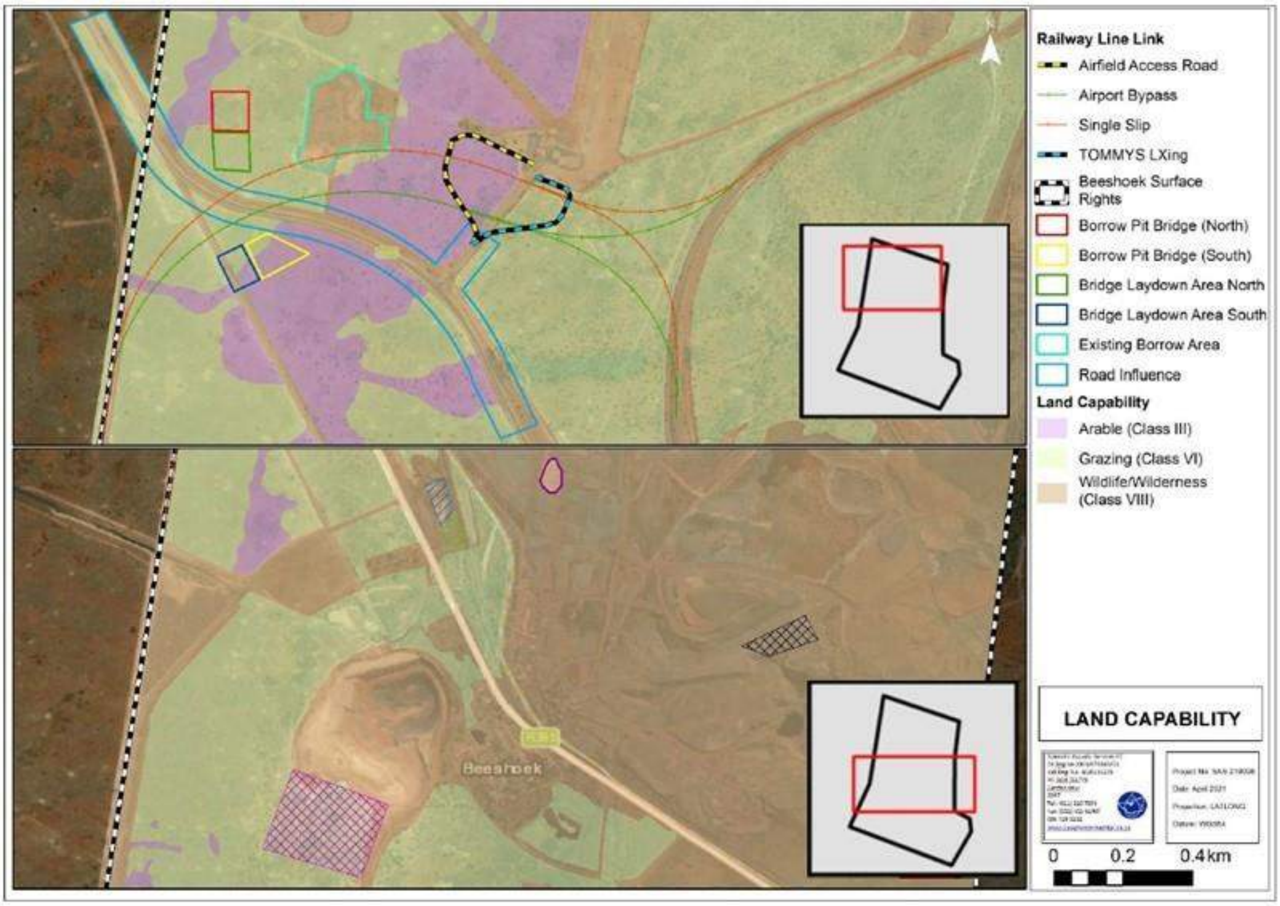


Figure 47: Map depicting land capability classes of soils occurring within the study area

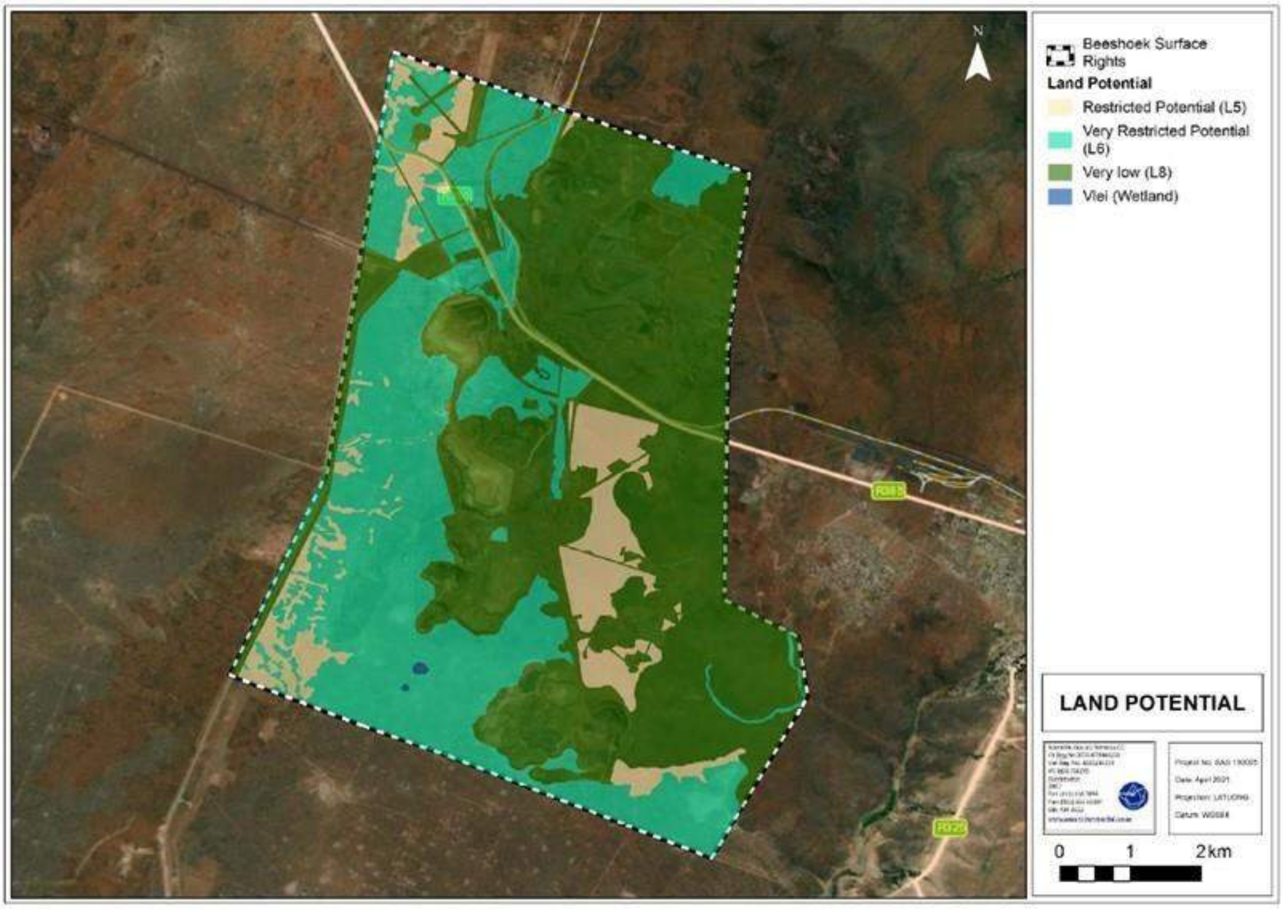


Figure 48: Map depicting land potential classes of soils occurring within the focus area

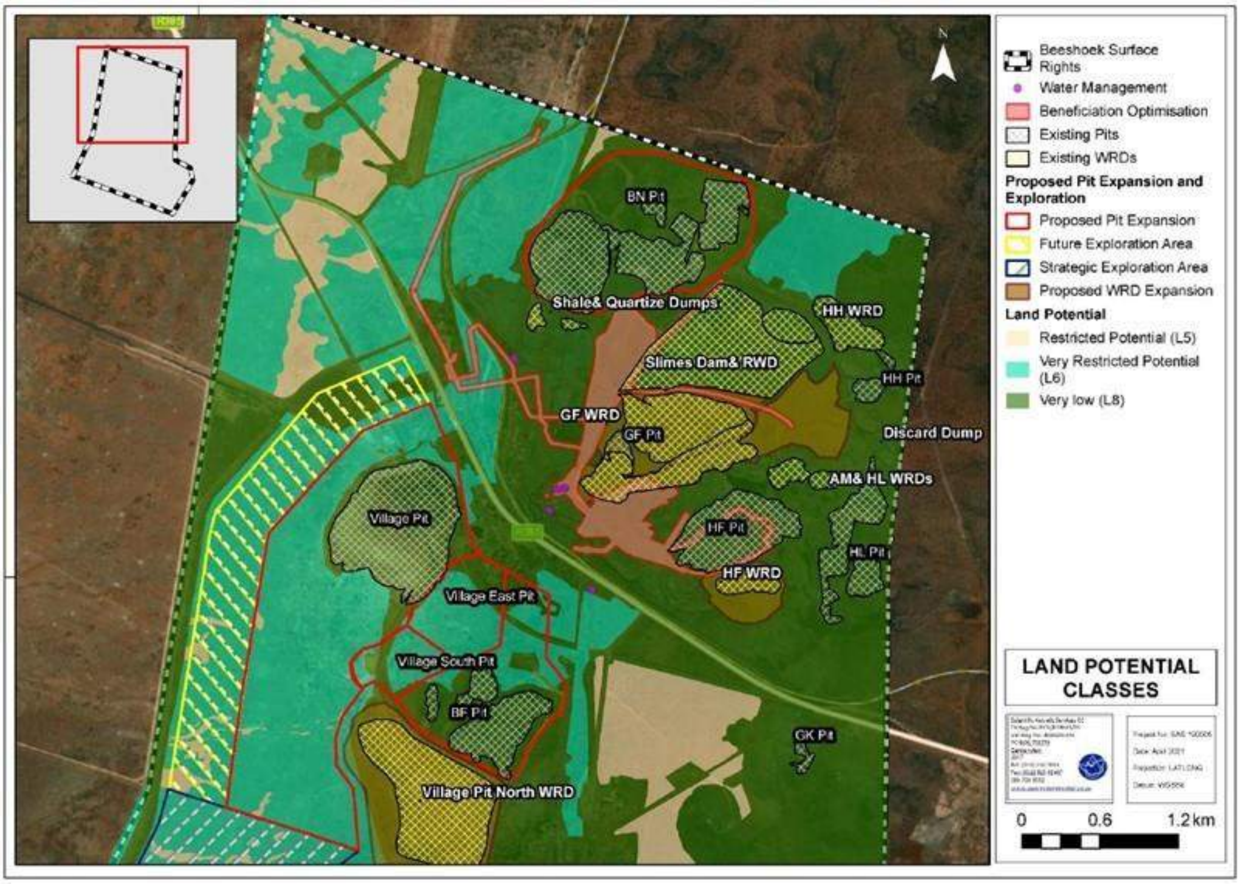


Figure 49: A zoomed map depicting land potential classes for the northern portion, overlain by the simplified layout of the proposed projects

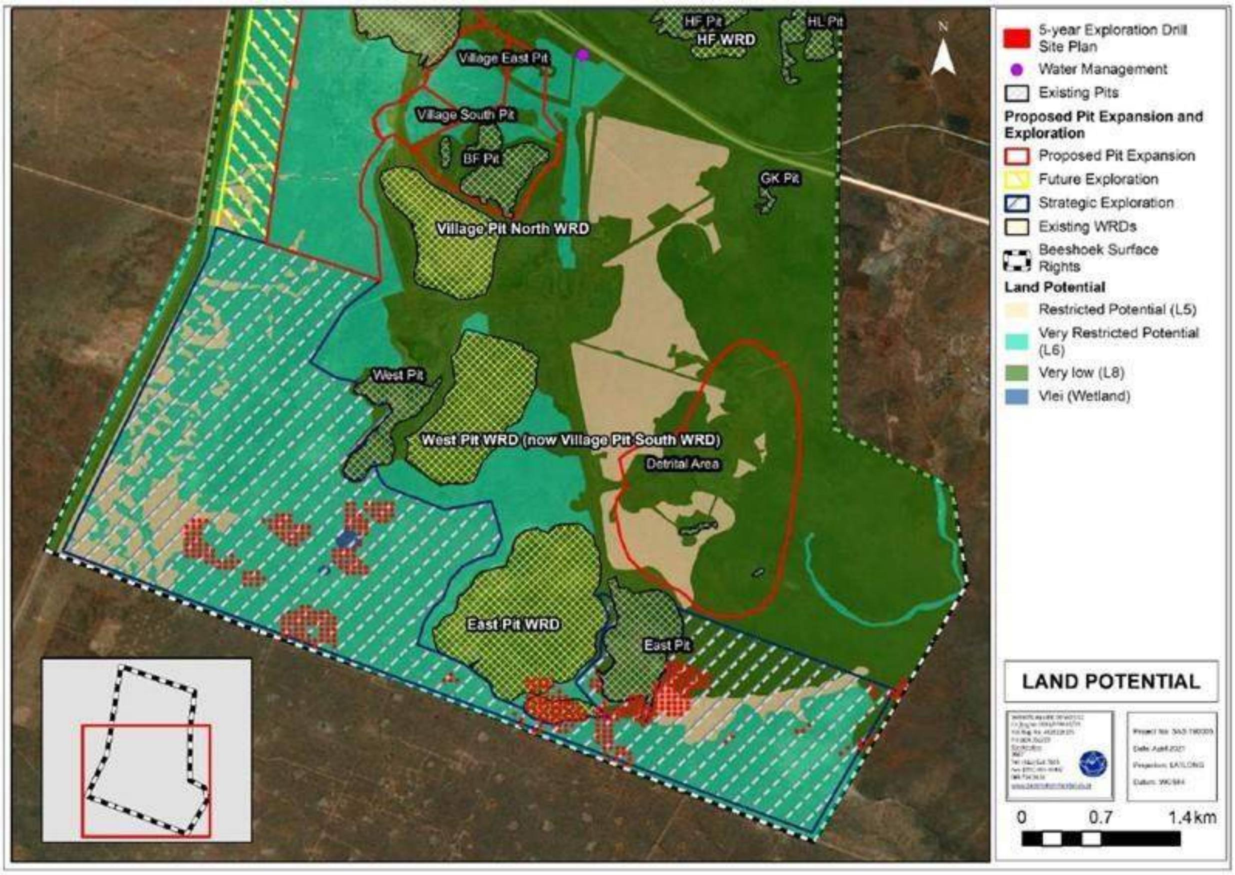


Figure 50: A zoomed map depicting land potential classes for the southern portion map depicting land potential classes overlain by the simplified layout of the proposed projects

Figure 51: Map depicting land potential classes of soils occurring within the study area

2.e.iii.4.d.4 Land Capability and Potential Classes Description

2.e.iii.4.d.4.1 Arable (Class III) Land Capability Class

The main soil forms are Vaalbos and Plooysburg. These soils have sufficient depth for most cultivated crops and rapid drainage characteristics (well-drained). However, the occurrence of impeding layers (layer of refusal), such as Hard Rock and Hard Carbonate may be the limiting factor for deep-rooted plants in some areas.

The identified Plooysburg soil forms are considered high potential agricultural soils, with high land capability (Class III) and moderate land potential. These soils are suitable for arable agricultural land use with minimal management interventions. Therefore, they potentially contribute to provincial and/or national agricultural productivity if used for crop cultivation, and are essentially also well-suited for other less intensive land uses such as grazing etc. However, emphasis is directed to their agricultural crop productivity due to the scarcity of such soil resources on national scale and food security concerns.

The identified soils are considered prime agricultural soils suitable for arable crops. These soils can yield profit returns under prudent crop selection and conservation soil management practices. However, the prevailing local climatic conditions severely restricts the choice of crop cultivation under rainfed agriculture. Lack of irrigation options further disqualify this area for commercial cultivated agriculture although ideal soils occur. Site-specific striping and stockpiling management measures must be implemented during all phases of any future development with the focus area to ensure that soils are stripped accordingly, and high potential soils are not mixed with low potential soils to try and reinstate which can be used for optimal support of grazing post mining.

2.e.iii.4.d.4.2 Grazing (Class V) land capability Class

The main soil forms are Kolke and Lepallane. These soils were found to be associated with a wetland feature located in the southern section of the proposed focus area. The land capability class in which these soils were assigned to is associated with water course or land with wetness limitations. Refer to land capability description above. These soils might be suitable for some crops, however, are not ideal for crop production since they are associated with wetland features and episodically saturated soils.

The identified Kolke and Lepallane soil forms are considered to be of limited grazing (class V) land capability and are not considered as prime agricultural soils. Theses soils, at best, are associated with seasonal wetlands as well as livestock grazing. Therefore, these soils are considered to make a substantial contribution to extensive commercial cattle farming.

Should the proposed infrastructure encroach on these soils, rehabilitation would be a requirement for these soils as they can be of significant use from an extensive commercial cattle farming point of view. In this instance, these soils are associated with a pan depression which enjoys protection from the NWA and the NEMA. These sites can be rehabilitated holistically at closure of the mine.

2.e.iii.4.d.4.3 Grazing (Class VI) land capability class and land potential class

The main soil forms are Mispah/Glenrosa and Coega/Knersvlakte. Shallow effective rooting depth is the primary limitation of the land capability of the Glenrosa/Mispah and Coega/Knersvlakte soil forms, which is due to the occurrence of a Lithic/Hard Rock and Hard Carbonate at relatively shallow depth, which would hinder penetration of plant roots.

The identified Glenrosa/Mispah and Coega/Knersvlakte soil forms are considered to be of poor land capability (class VII) and restricted land potential. These soils are not suitable for arable agricultural land use attributable to the occurrence of parent material at shallow depths which inhibits root penetration. These soils are, at best, suitable for natural pastures for light livestock grazing. The contribution of these soils to the local, regional and national food production grid is limited. However, livestock farming under managed grazing interventions may be of significant contribution to the food security of the country.

These soils only support shallow rooted crops due to their shallow nature which hinders root growth, leading to stunted growth to most crops. These soils, at best, are suited for grazing and/or wilderness practices. The impact to the land capability and land potential of these soils is anticipated range between moderate and low. However, implementation of rehabilitation interventions and the integrated measures to manage any potential impacts such as soil erosion, contamination, and compaction.

2.e.iii.4.d.4.4 Wildlife/Wilderness (Class VIII) land capability class and land potential class

The main soil forms are Witbank and Cullinan (Anthrosols). Comprises of significantly disturbed areas due from anthropogenic activities to an extent that no recognisable diagnostic soil horizon properties could be identified. These soils included existing gravel/dirt roads and open excavation as observed during the site assessment. These soils are characterised by various limitations, primarily the absence of soil as a growth medium for arable agriculture.

Comprises of significantly disturbed areas due from anthropogenic activities to an extent that no recognisable diagnostic soil horizon properties could be identified. These soils included existing gravel/dirt roads and open excavation as observed during the site assessment. These soils are characterised by various limitations, primarily the absence of soil as a growth medium for arable agriculture.

These identified soils (Witbank and Cullinan) have very poor land capability (Class VIII) and very low land potential, attributed to historic and ongoing mining activities. In addition, some of these soils have been subjected to long term compaction, erosion and chemical soil composition alteration. These soils are therefore not considered to make a significant contribution to agricultural productivity even on a local scale.

The current state of these soils requires major rehabilitation already and currently have no agricultural production potential. These areas can therefore be rehabilitated holistically at closure phase of any future development that may occur within the focus area.

2.e.iii.5 Ecological Footprint

The Ecological Assessment was undertaken by STS. Please refer to Annexure 7 for the detailed report.

2.e.iii.5.a Vegetation Types and Conservation

The mine and railway line area are situated within the Savanna Biome and within the Eastern Kalahari Bushveld Bioregion. The mine occurs in three vegetation types, namely the Postmasburg Thornveld (western Portion), Kuruman Thornveld (Eastern Portion) and the Kuruman Mountain Bushveld (Eastern Boundary) – all three vegetation types are Least Concern ecosystems (National Threatened Ecosystem, 2011) (Figure 52) and currently Poorly Protected. For the railway line three (3) vegetation types with a least concern conservation status are crossed by the proposed Railway Line Link Project, namely the Postmasburg Thornveld (western Portion), the Kuruman Thornveld (Eastern Portion) and the Kuruman Mountain Bushveld (eastern section).

All three types are classified as Least threatened. A target of 16% conservation is stipulated according to Mucina & Rutherford, 2012/2018. None of the unit is conserved in statutory conservation areas, but very little has been transformed, with 2% already transformed for the Kuruman Thornveld (Eastern Portion of the mine) vegetation type. No significant biodiversity or conservation features were identified for the Railway Line Link Project from a desktop database perspective.

For the Terrestrial Biodiversity Theme (Online Web Based National Environmental Screening Tool), the Beeshoek Mine is considered to have a very high sensitivity (see Figure 55). The triggered sensitivity features include an Ecological Support Areas (ESA), and a Freshwater ecosystem priority area. The Beeshoek Mine is further located in the Griqualand West Centre (GWC) of plant endemism and the Gamagara Corridor.

Most of Projects 2 and 3 footprints occur in the Postmasburg Thornveld that stretches across the western and southern extents of the Beeshoek Mine. The Detrital area is located in both the Kuruman Thornveld and the Kuruman Mountain Bushveld, with the proposed Beneficiation Optimisation project partially located in the Kuruman Thornveld. The remaining footprint areas largely occur in already mined or transformed sites.

Ecosystem types are categorised as “not protected”, “poorly protected”, “moderately protected” and “well protected” based on the proportion of each ecosystem type that occurs within a protected area recognised in the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEMPAA) and compared with the biodiversity target for that ecosystem type.

The ecosystem protection level status is assigned using the following criteria:

i. If an ecosystem type has more than 100% of its biodiversity target protected in a formal protected area either a or b, it is classified as well protected;
ii. When less than 100% of the biodiversity target is met in formal a or b protected areas it is classified it as moderately protected;
iii. If less than 50% of the biodiversity target is met, it is classified it as poorly protecte; and
iv. If less than 5% it is hardly protected.

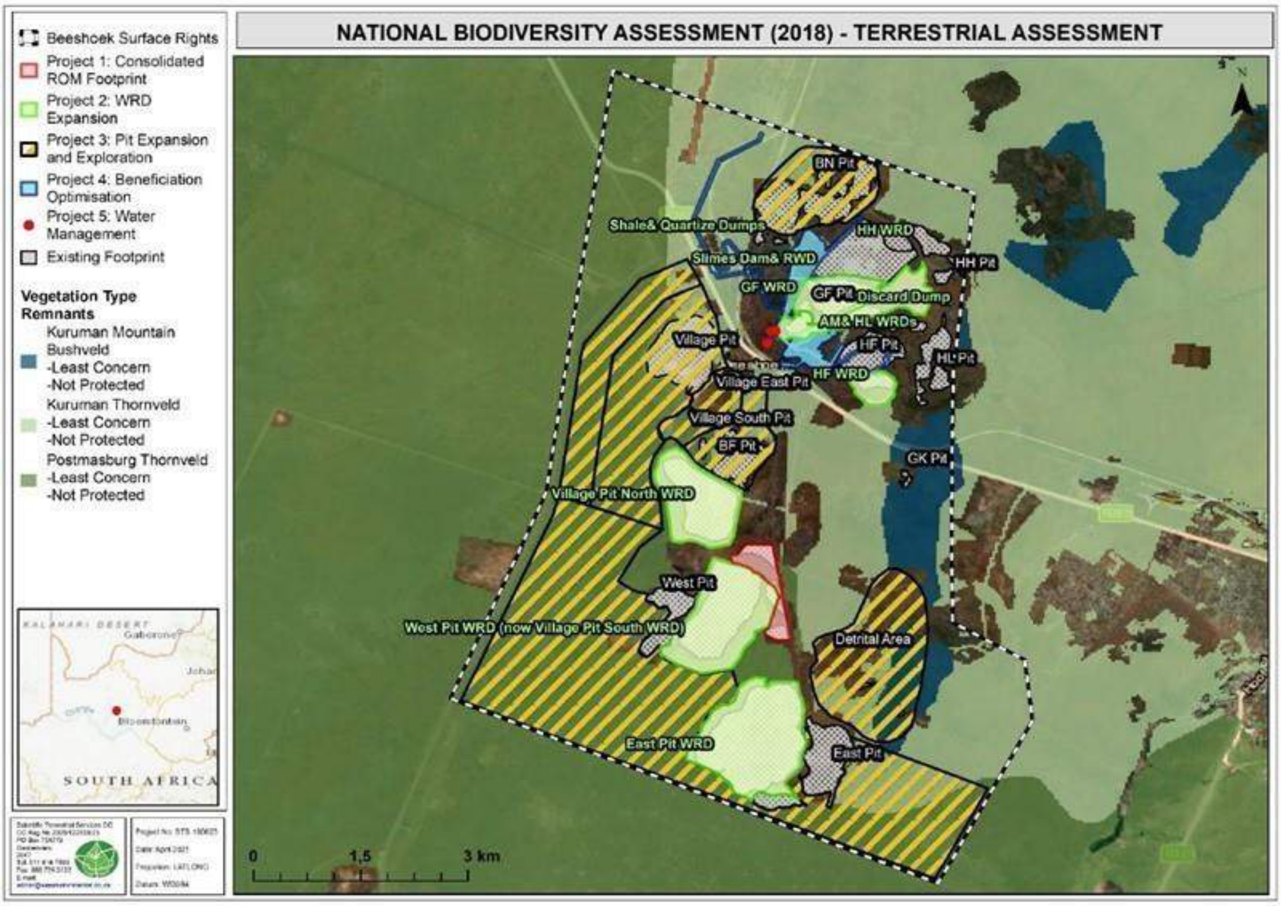


Figure 52: Vegetation types associated with the Beeshoek Mine (Mucina & Rutherford, 2018 (beta-version))

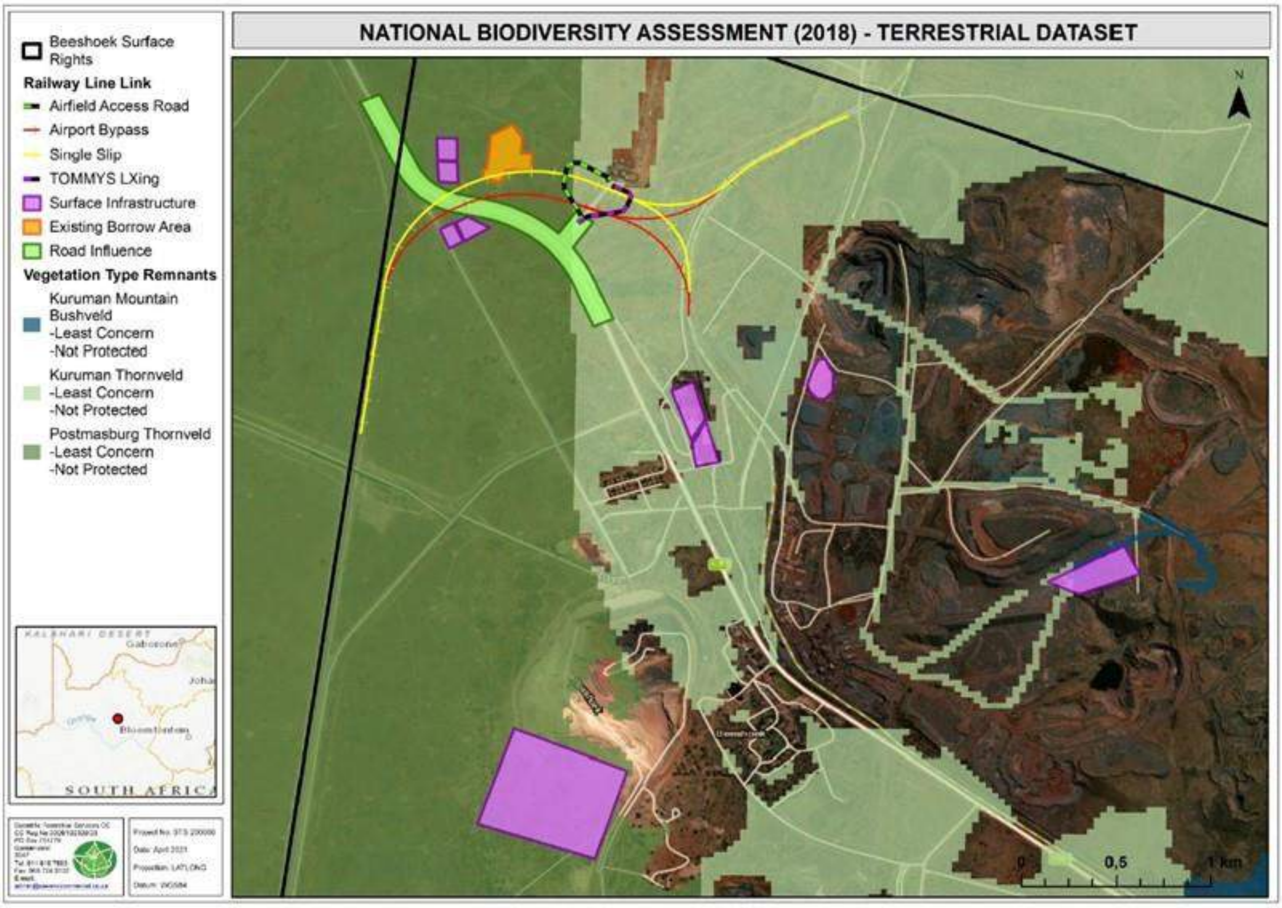


Figure 53: Vegetation types associated with the Railway Line (NBA, 2018)

2.e.iii.5.b Important Bird and Biodiversity Areas (IBA)

Not the mine, nor railway line is not located within or near an IBA (within 10 km).

2.e.iii.5.c Protected Areas

According to the South African Protected Areas Database (SAPAD, 2020), the South African Conservation Areas Database (SACAD, 2020) and the National Protected Areas Expansion Strategy (NPAES, 2009), no protected areas or conservation areas are indicated within 10 km of the Beeshoek Mine.

The sensitivities were triggered by the potential occurrence of the following species:

- High: the avifauna *Neotis ludwigii* (Ludwig's bustard) (Endangered); and
- Medium: the avifauna species *Sagittarius serpentarius* (Secretary bird) (Endangered).

2.e.iii.5.d Plant Specie Theme & Terrestrial biodiversity theme

For the plant species theme, the mine and railway line areas are considered to largely have a **low sensitivity**, with several sections scattered throughout the mine considered to be of **medium sensitivity**.

The sensitivity was triggered by the potential occurrence of vulnerable plant species (see figure below).

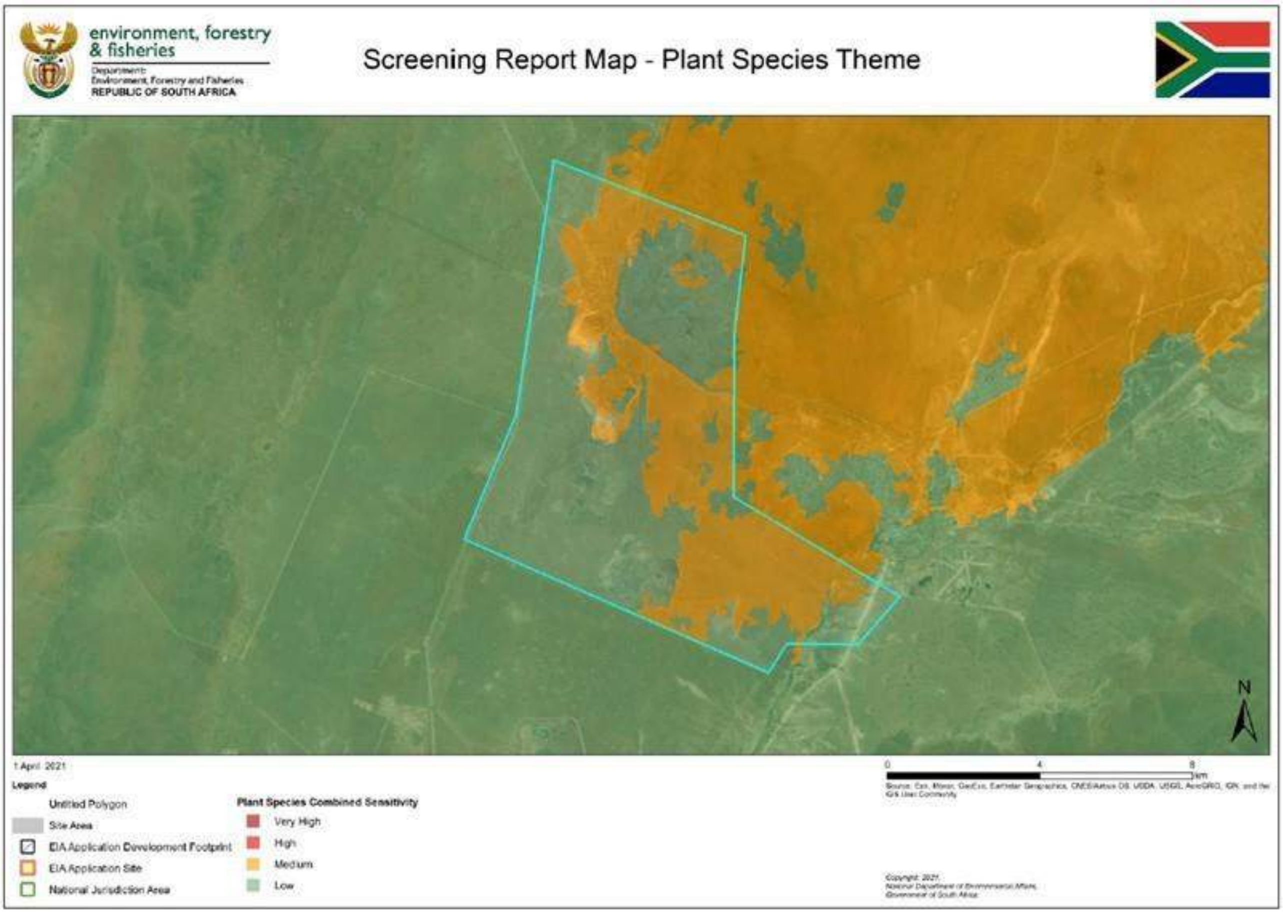


Figure 54: Screening Tool Outcome for the Plant Species Theme

For the Terrestrial Biodiversity Theme, the Beeshoek Mine is considered to have a very high sensitivity. The triggered sensitivity features for the mining area include an Ecological Support Areas (ESA), and a Freshwater Ecosystem Priority Area (FEPA). The triggered sensitivity features for the railway line area include FEPA quaternary catchments and an ESA.

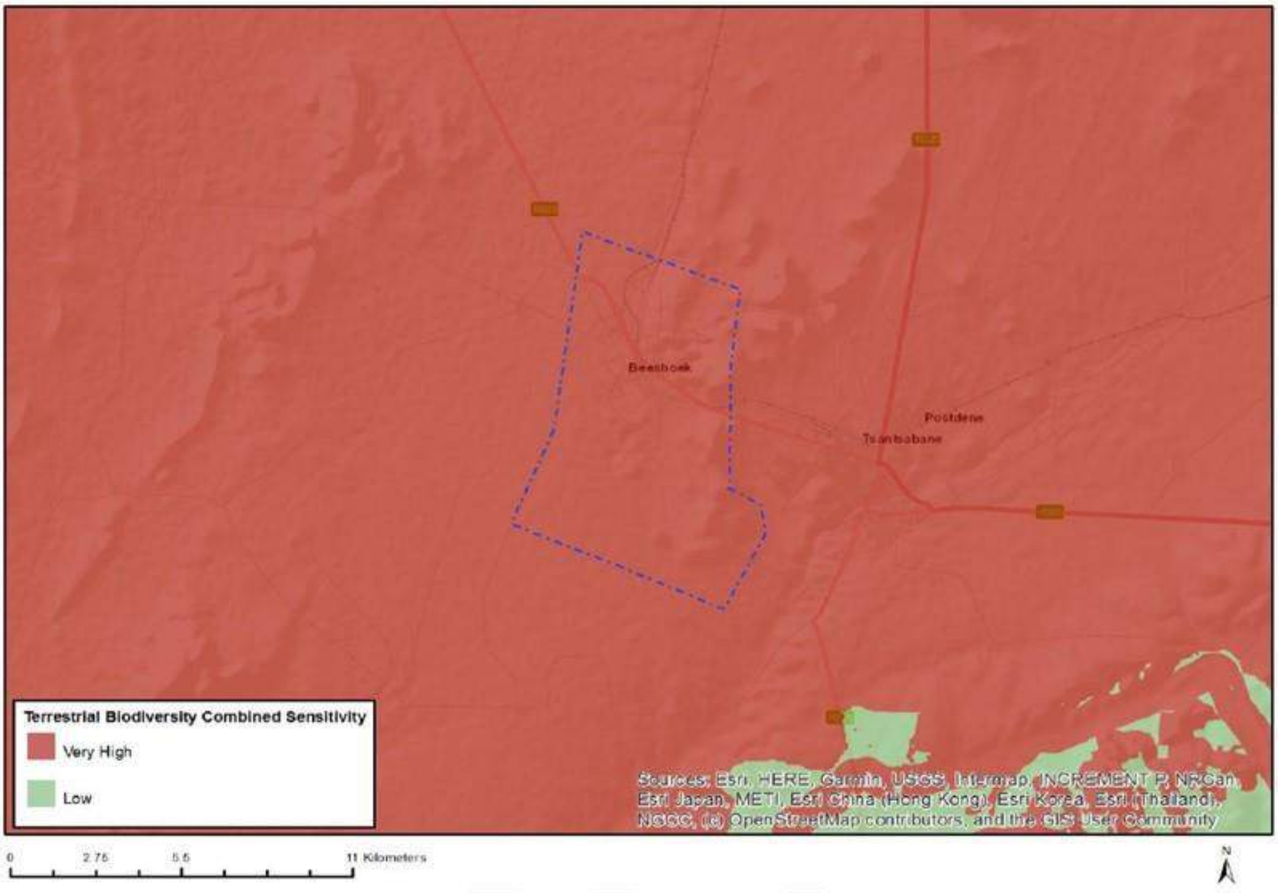


Figure 55: Screening Tool Outcome for the Terrestrial Theme

2.e.iii.5.e Northern Cape Critical Biodiversity Areas, 2016

The Detrital Area, and sections of the Opencast Pit Expansions are located within an ESA (please refer to the following figure).

According to the Technical Guidelines for CBA Maps, ESAs are areas that must retain their ecological processes in order to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for the representation of ecosystem types or Species of special concern when it's not possible to meet them in CBAs; support ecological functioning of protected areas or CBAs or a combination of these (SANBI, 2017) (see the following figure).

The Railway Line Link Project is largely associated with areas classified as Other Natural Areas. According to the Technical Guidelines for CBA Maps document ONA consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs (SANBI, 2017). There are several small sections that are associated with an ESA, namely the eastern extent of the Railway Line Link: Single Slip, small sections of the Laydown Area (within the Mine), the central portions of the Calcrete Material Source (also located within the mine), and small sections of the Landfill Slide 1 (part of the existing Beeshoek mine area) (see Figure 57).

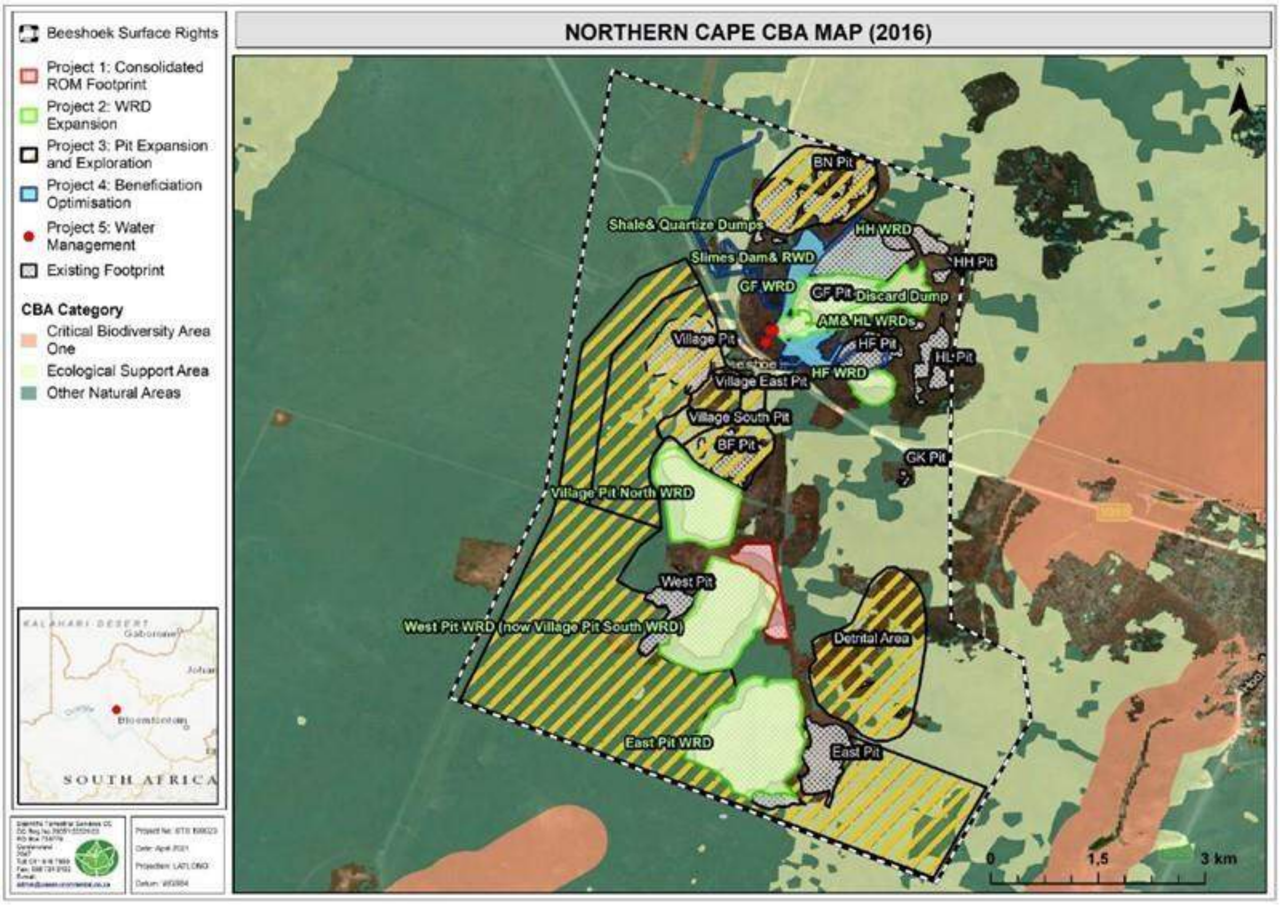


Figure 56: Ecological Support Areas (ESA) associated with the Beeshoek Mine according to the Northern Cape CBA Map (2016)

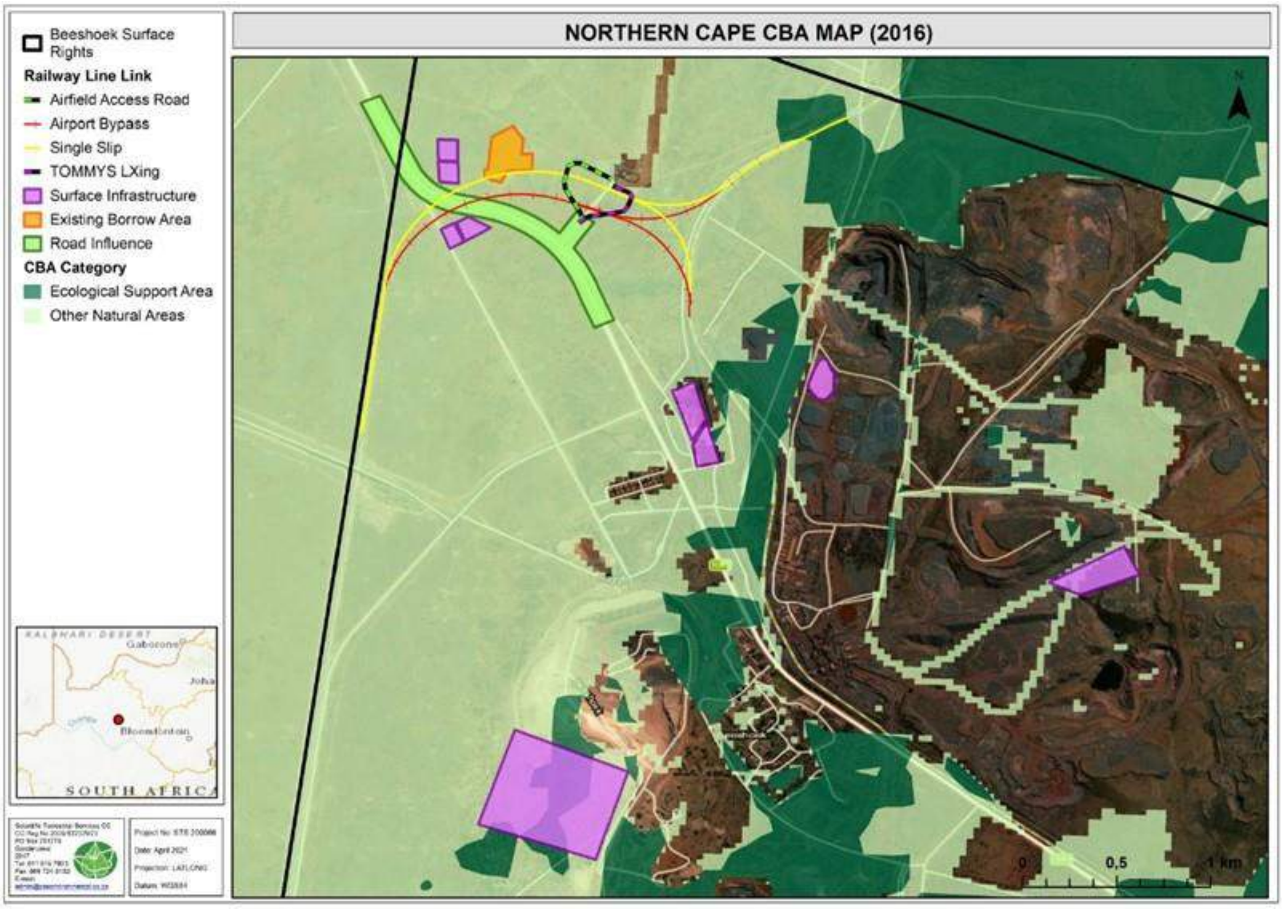


Figure 57: Ecological Support Areas (ESA) associated with the Railway line according to the Northern Cape CBA Map (2016)

2.e.iii.5.f Northern Cape Provincial Spatial Development Framework, 2019 (NCPSDF)

The NCPSDF is to function as an innovative strategy that will apply sustainability principles to all forms of land use management throughout the Northern Cape as well as to facilitate practical results, as it relates to the eradication of poverty and inequality and the protection of the integrity of the environment.

The mine and railway line are located within the **Griqualand West Centre** (GWC) of plant endemism. This semi-arid region is broadly described as savanna, forming part of the eastern Kalahari Bushveld Bioregion. Studies investigating the endemism of the centre report at least 23 plant species that have restricted distributions (Frisby et al. 2019). The mine also falls within the Gamagara Corridor. The Gamagara Corridor comprises the mining belt of the John Taolo Gaetsewe and Siyanda Districts and runs from lime acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese (please refer to Section A of Annexure 7).

2.e.iii.5.g Mining and Biodiversity Guidelines, 2012

The mine boundary is situated within an area currently not ranked under the mining and biodiversity guidelines.

2.e.iii.5.h Ecological Habitat Presentation

Based on the results of the field investigation six (6) broad habitat units were distinguished for the Beeshoek Mine Optimisation Project:

1. Calcrete Shrubland:
    a. Optimisation Project: This habitat unit (± 1 196ha) is located on shallow calcrete soils derived from the Coega/Knersvlakte soil forms. The vegetation mainly comprised shrubland with sparse grass cover. Species diversities were intermediate and trees generally of low diversity and abundance. Habitat integrity varied throughout this habitat unit, with some areas more encroached by indigenous woody species, and other areas characterised by largely intact vegetation;
    b. Railway line: Much of the Railway Line Link Project falls within this habitat unit, which is located on shallow calcrete soils derived from the Coega/Knersvlakte soil forms. This includes vegetation that has not been transformed (natural habitat). The vegetation mainly comprised shrubland with sparse grass cover. Species diversities were intermediate and trees generally of low diversity and abundance. Habitat integrity varied throughout this habitat unit, with some areas more encroached by indigenous woody species (mainly *Rhigozum trichotomum*), and other areas characterised by largely intact vegetation. This unit was differentiated as the following based on the floral composition:
        i. "Pure" Calcrete Shrubland; and
        ii. "Mixed" Calcrete Shrubland.
2. Modified Habitat Unit:
    a. Optimisation Project: This habitat unit includes areas where vegetation is significantly degraded or entirely absent as a result of mining-related activities. Two sub-units can be distinguished for this habitat unit, namely Transformed Habitat (± 2 016ha) and Degraded Thornveld (± 255ha).
    b. Within the Railway Line Link Project footprint, this unit refers to areas that have been transformed for mining, road and railway construction, and borders Tommy's Field Aerodrome.
3. Moisture-driven Habitat:
    a. Optimisation Project: This habitat unit is associated with cryptic wetlands, seasonal depressions, preferential flow paths and a recharge area. The Moisture-driven Habitat includes watercourses as delineated within the Freshwater Ecological Assessment (SAS 219099, 2021), but also includes non-watercourse habitat which is not considered true watercourse as defined in the NWA. Instead, these are low-lying areas where water will preferentially flow or accumulate during rain events, but the floral communities lack wetland indicator vegetation (e.g., vegetation within the centre of the Seasonal Depressions especially differed from that of the Cryptic Wetlands). There is also an occurrence of different soil forms between the Watercourse and Non-watercourse habitat;
4. Open Thornveld Habitat Unit:
    a. Optimisation Project: Habitat (± 686ha) restricted to the deeper red soils of the Vaalbos and Plooysburg soil forms. Vegetation included an almost continuous grass layer with large tree species such as Vachellia erioloba scattered throughout. Habitat integrity also varied throughout the site;
    b. Railway line: The central section of the Railway Line Link Project crosses through this habitat unit. The Open Thornveld Habitat is restricted to the deeper red soils of the Vaalbos and Plooysburg soil forms. Vegetation included an almost continuous grass layer with large tree species such as Vachellia erioloba scattered throughout. Habitat integrity varied throughout the site but generally had little disturbances within the sections where the Railway Line Link Project will pass through.

5. Rupicolous Habitat Unit:
    a. Optimisation Project: This habitat unit (± 812 ha) includes areas with shallow red soils of the Mispah/Glenrosa soil forms, comprising darker iron-rich stones that either present as lower-lying areas with small pebbles or as prominent rock outcrops on hills. The vegetation communities were generally dominated by encroaching Senegalia melifera subsp. detinens but also included a higher species diversity when compared to the other habitat units within the Beeshoek Mine Surafce Rights Area.
6. Non-watercourse habitat:
    a. Railway line: This habitat unit is associated with seasonal depressions (outside of the proposed footprint) and an anthropogenically derived drainage line (within the footprint). The non-watercourse habitat is not considered true watercourses as defined in the NWA (please refer to the freshwater ecosystem assessment undertaken by Scientific Aquatic Services (2021) for further details pertaining to the non-watercourse classification) (Annexure 8).

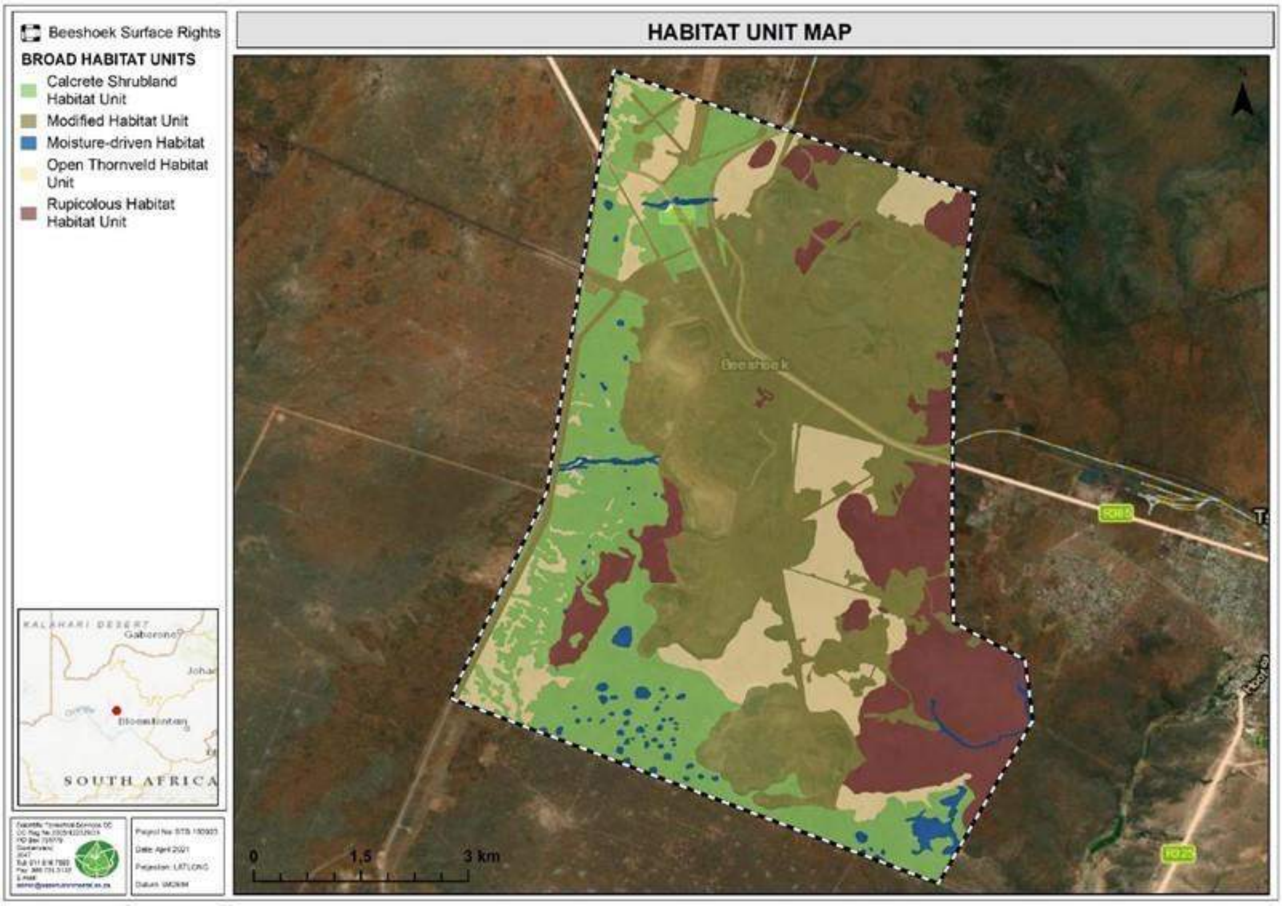


Figure 58: Conceptual illustration of the broad habitat units associated with the Beeshoek Mine

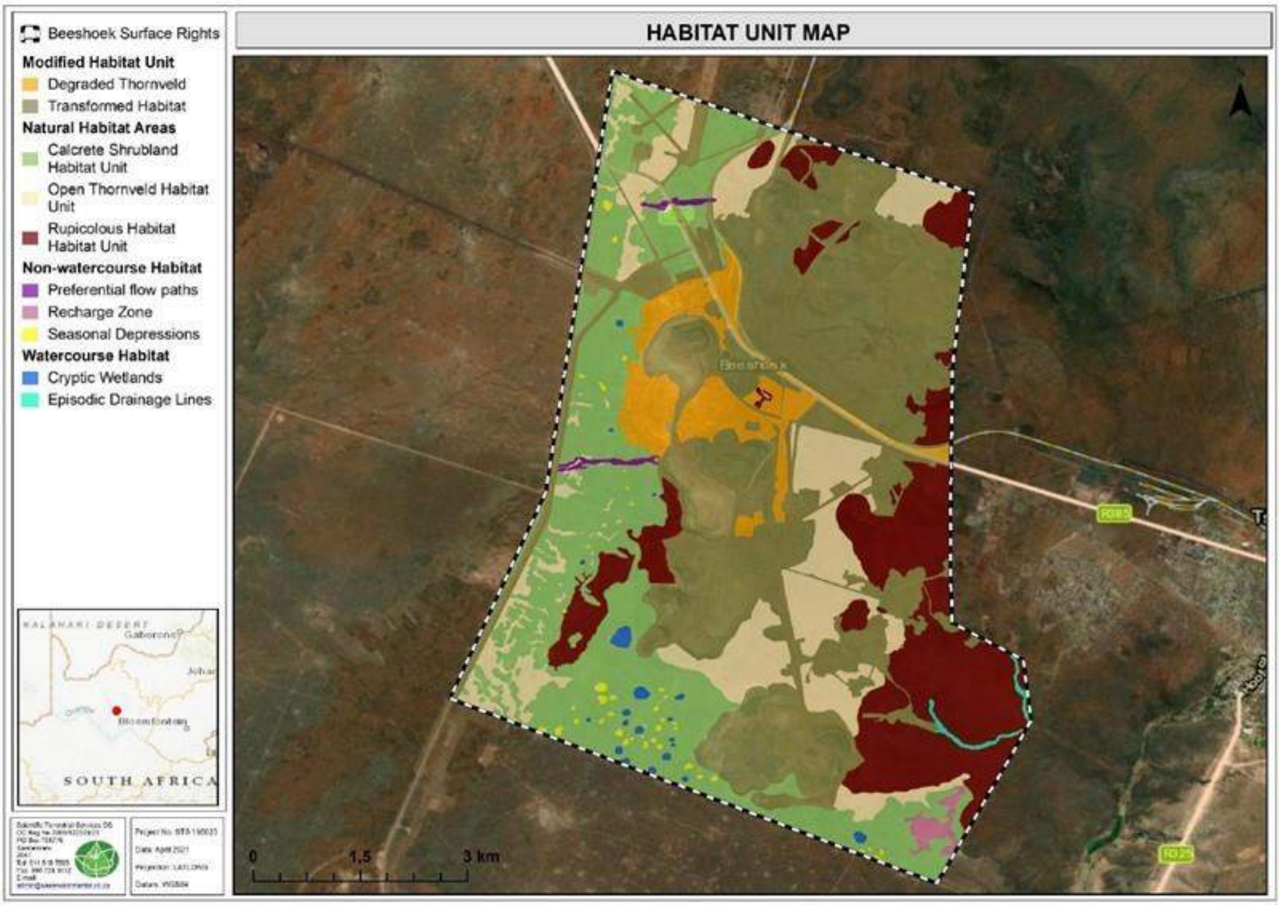


Figure 59: Breakdown of the subunits associated with the Beeshoek Mine

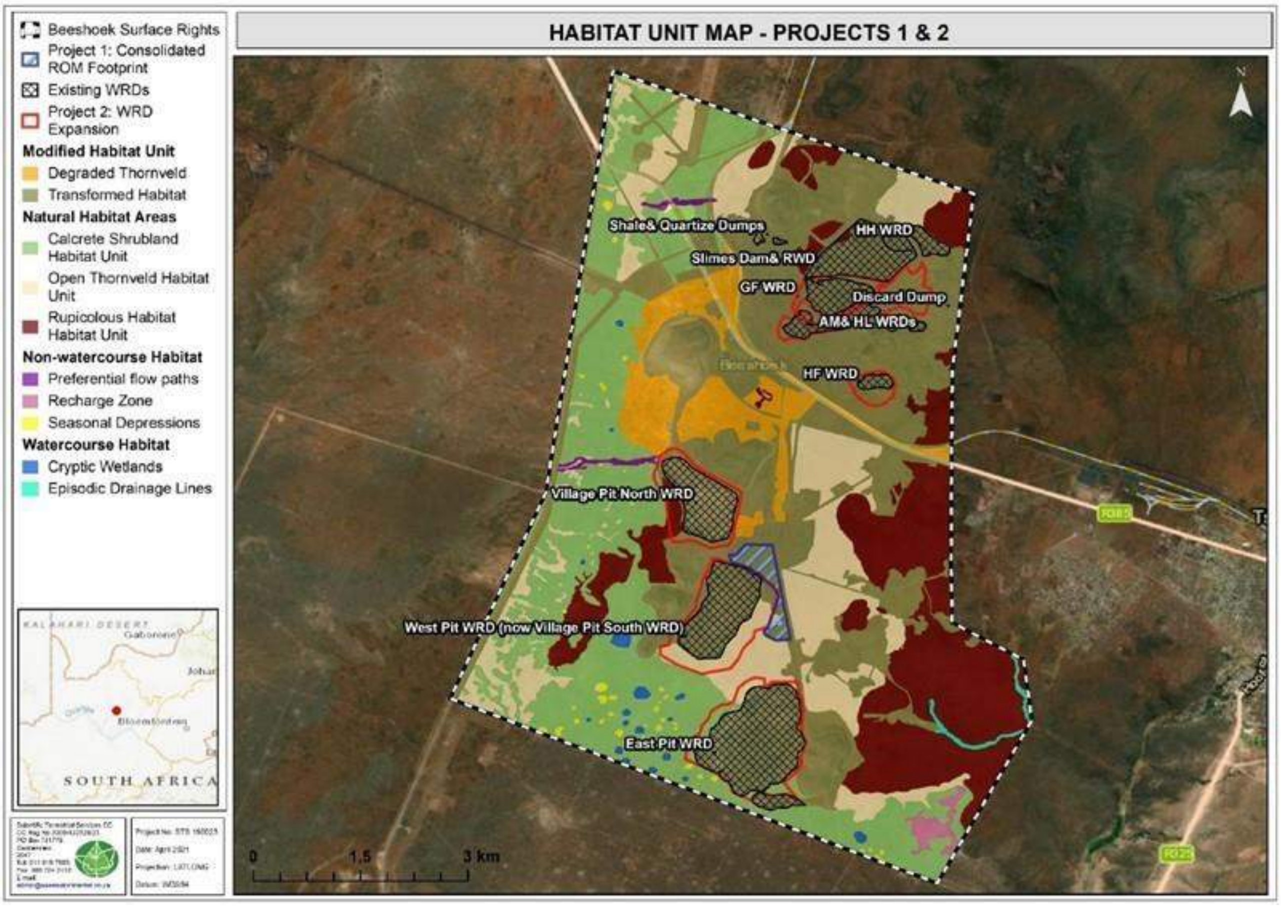


Figure 60: The proposed footprints of Project 1 and 2 superimposed onto the delineated habitat units

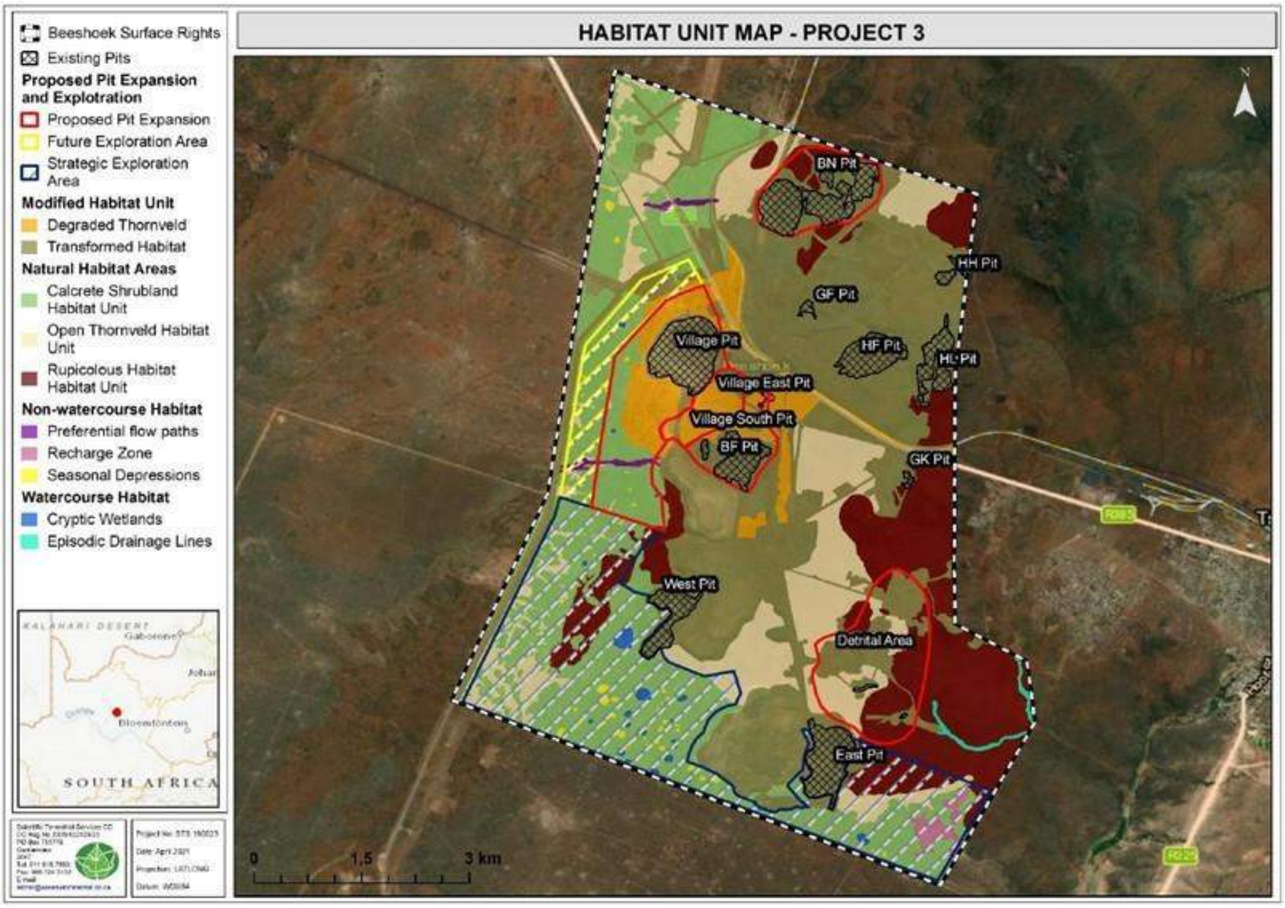


Figure 61: The proposed footprints of Project 3 superimposed onto the delineated habitat units

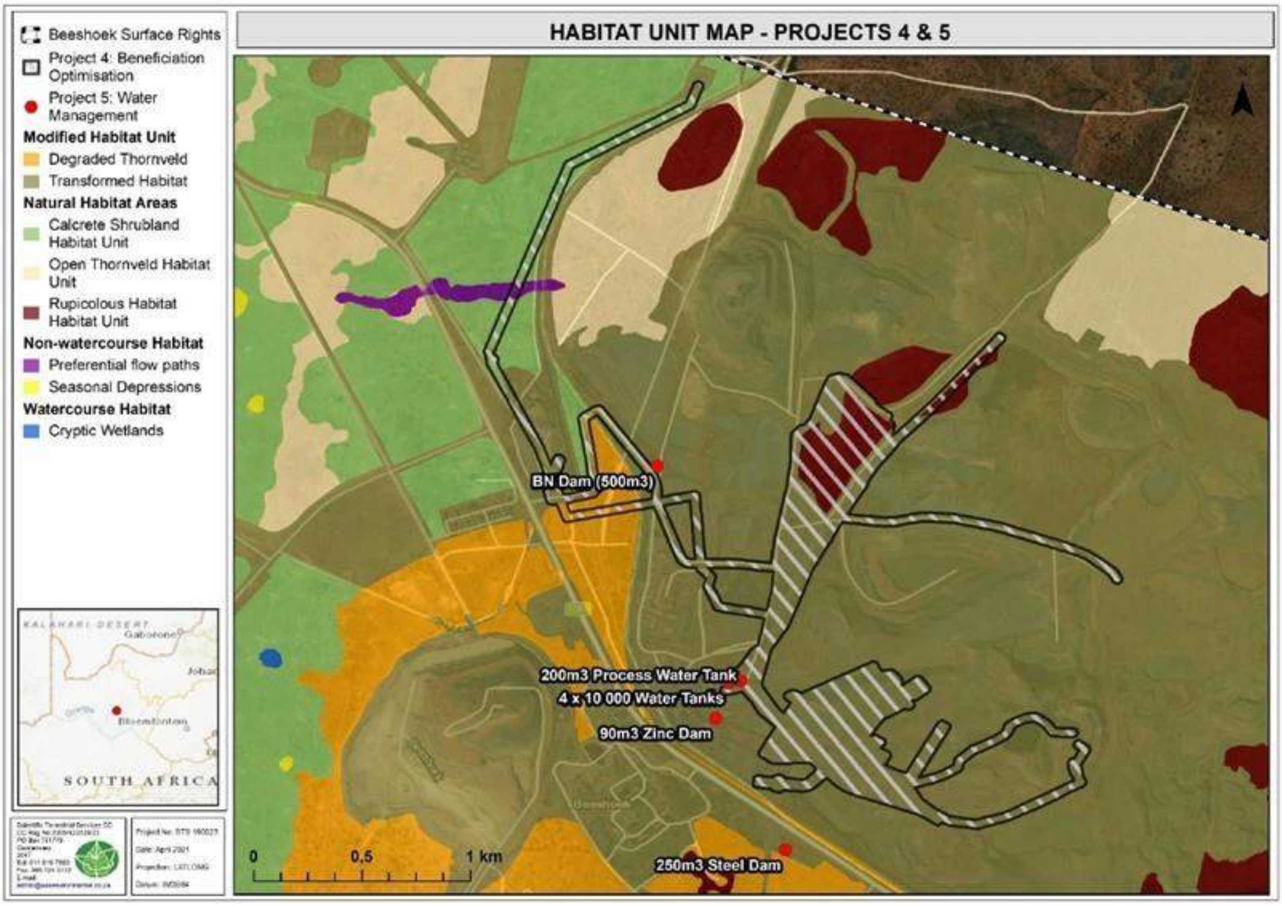


Figure 62: The proposed footprints of Project 4 and 5 superimposed onto the delineated habitat units

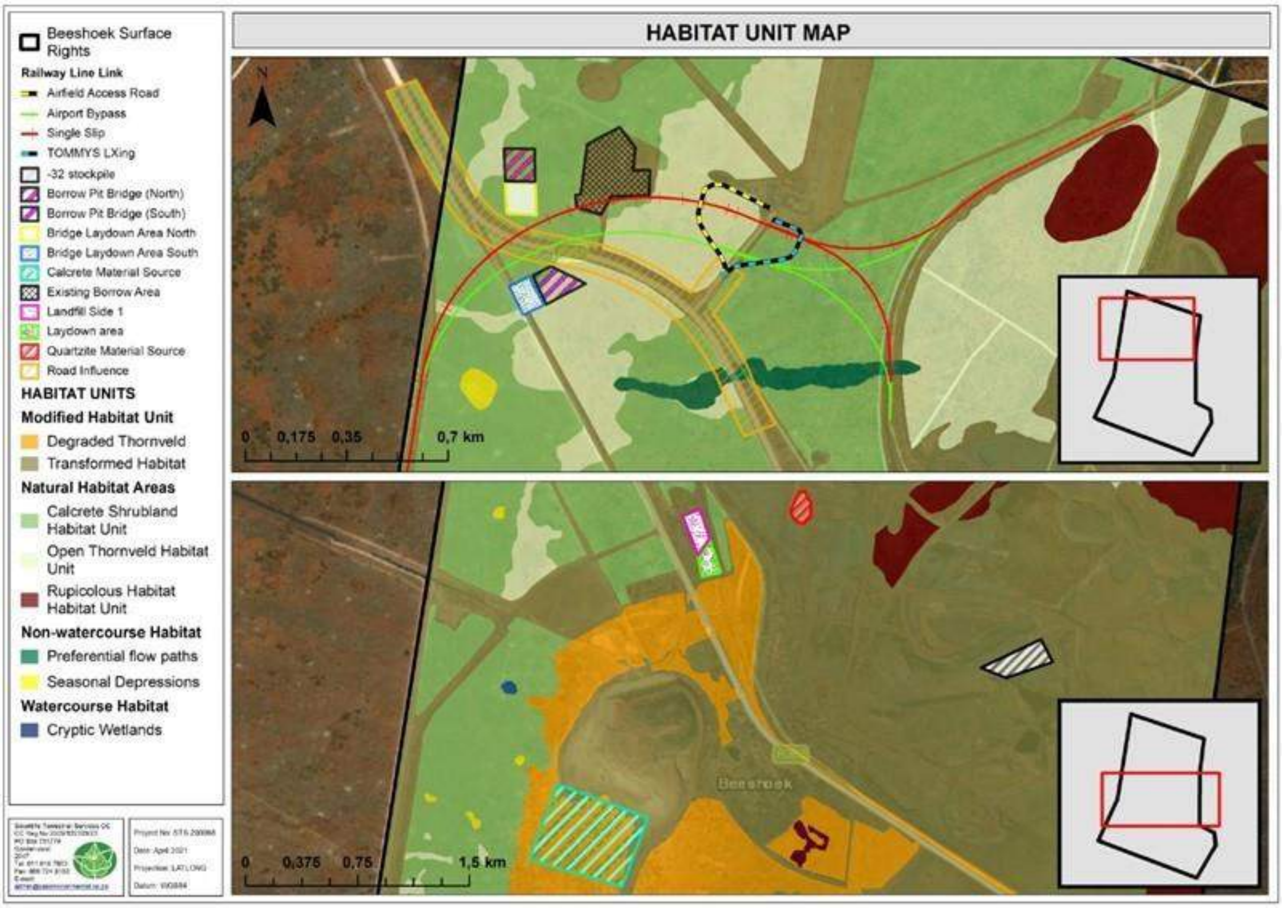


Figure 63: The proposed footprints of Project 6 superimposed onto the delineated habitat units

Based on conservation significance, presence of SCC and the level of habitat degradation, the floral sensitivity of the habitat units indicate that the Modified Habitat Unit is of **Low and Moderately Low Sensitivity**, the Calcrete Shrubland is of **Intermediate Sensitivity**, the Watercourses (Cryptic Wetlands and Episodic Drainage lines) of **Moderately High Sensitivity**, the Non-watercourses (Preferential Flow Paths, Seasonal Depressions and Recharge zone) of **Moderately Low and Intermediate Sensitivity**, the Open Thornveld varied between **Intermediate and Moderately Low Sensitivities**, and the Rupicolous Habitat varied between **Moderately Low and Moderately High Sensitivities**. The proposed activities will impact on these habitat units to varying degrees.

When considering the conservation significance, presence of Species of Conservation Concern (SCC) and the level of habitat degradation, the faunal sensitivity of the habitat units indicate that the Modified Habitat Unit is of **Low and Moderately Low Sensitivity**, the Natural Habitats are of **Intermediate Sensitivity** and the Watercourses and Non-watercourses of **Moderately High Sensitivity**.

Floral SCC recorded within the focus area included species protected under the National Forest Act, 1998 (Act No. 84 of 1998, as amended in September 2011), National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) (NEMBA) Threatened or Protected Species lists (TOPS) regulations, and Schedule 2 protected species of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA). Mining activities associated with Project 1, 2 and especially Project 3 are anticipated to have an unfavourable impact on floral SCC. Projects 4 and 5 will minimally impact on floral SCC. Faunal SCC observed and expected to occur on site include species protected under TOPS as well as being listed either as protected or specially protected in Schedules 1 and 2 of the NCNCA. Project 3 will have the greatest impact on potential faunal SCC as a result of the increased areas where vegetation clearance will take place.

Table 40: Habitat Unit Discussion Summary

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
Calcrete Shrubland Habitat Unit  Shallow soils on calcrete outcrops  Vegetation dominated by dwarf shrubs 	Optimisation Project: The Calcrete Shrubland habitat can be described as short, open shrubland where the woody component is dominated mainly by dwarf shrubs, with tall shrubs and/or small trees scattered in between. In areas where disturbances such as increased grazing pressures were more prominent, a notable increase in woody encroacher species such as *Senegalia melifera subsp. detinens* and *Rhigozum trichotomum* occurred. Habitat integrity ranges from moderately intact to moderately degraded. The results of edge effects from mining activities as well as grazing pressures have resulted in sub-optimal habitat conditions within encroached and/or trampled sections. The habitat is, however, still largely intact, and supports a variety of species. This Habitat Unit is considered representative of the reference Postmasburg Thornveld. Railway Line: The Open Thornveld occurs in the central section of the proposed Railway Line Link Project and is characterised	Optimisation Project: The vegetation communities within the Calcrete Shrubland were of intermediate to moderately high diversity, depending on the extent of woody encroachment and grazing pressures. The woody layer is well represented within this habitat unit and is characterised by sparsely occurring short trees / tall shrubs such as *Boscia albitrunca, Searsia tridactyla, Senegalia mellifera subsp. detinens* (encroaching in some areas) and *Tarchonanthus camphoratus*. Dwarf shrubs occur much more prominently throughout this habitat unit, comprising a range of species, namely *Aptosimum lineare, Eriocephalus cf. ericoides, Lasiosiphon polycephalus* (previously Gnidia), *Leucas capensis, Monechma incanum, Peliostomum leucorrhizum, Pentzia cf. calcarea, Roepera (Zygophyllum) pubescens*, and *Caroxylon dealatum*. Forbs were poorly represented which is characteristic of the reference state, namely the Postmasburg Thornveld. The graminoid layer was more	Optimisation Project: The Calcrete Shrubland is not associated with significant biodiversity or conservation features such as threatened ecosystems or Critical Biodiversity Areas (CBAs); however, the habitat unit seems to have a strong association with Cryptic Wetlands and Seasonal Depressions (pans) within the region. This association with pans aligns with sections of this habitat unit occurring within an Ecological Support Area (ESA), as per the Northern Cape CBA Map (2016). The Calcrete Shrubland is well represented in the broader region and also forms the largest habitat unit within the Beeshoek Mine. This habitat unit is representative of the Postmasburg Thornveld, an endemic vegetation type in South Africa, thus contributing to the uniqueness of this habitat unit within a national setting. Railway Line: No important features were identified in the Railway Line Link Project footprint	No threatened floral SCC were recorded in this habitat unit during the field assessment. In terms of Section 56 of the NEMBA, threatened species are Red Data Listed (RDL) species falling into the Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected (P) categories of ecological status. Nor were any species listed in the NEMBA Threatened or Protected Species lists (TOPS, 2007) were identified in this habitat unit. The online National Environmental Screening Tool (or "Screening Tool") has identified one vulnerable plant species for the Beeshoek Mine with potential habitat within this habitat unit; however, more suitable habitat for this species is found in the Rupicolous Habitat Unit. The nationally protected tree, *Boscia albitrunca*, or Shepherd's tree, occurred in high abundances throughout this habitat unit. Most of the individuals were mature, reaching up to three metres in height. This species is protected under the National Forest Act, 1998 (Act No. 84 of 1998, as amended in September 2011) (NFA) with a least threatened conservation status. The NFA protected tree, Vachellia erioloba, or the Camel thorn, was recorded more along the edge of this habitat unit in areas where soils were deeper, however, some	Key considerations for the Optimisation Project: This habitat unit is of intermediate sensitivity and importance from a floral ecological and resource management perspective. Some sections in the northern extent of the Beeshoek SRA have been encroached by Rhigozum trichotomum, resulting in the habitat being homogenous and of moderately low importance from a floral ecological perspective. Approximately 133 ha of this habitat unit will be impacted by the proposed activities. Loss of this habitat unit within the Beeshoek SRA is thus of restricted extent and impact on floral ecology can be reduced and managed with mitigation measures implemented. Considering that the Postmasburg Thornveld is an endemic vegetation type and the fact that there are several additional mining expansions planned in the region, further impact on the remaining extent of the currently least concern, but poorly protected, vegetation type may increase the threat status of the vegetation type. It will therefore be important to limit all activities within this habitat unit to what is absolutely necessary and where possible, it is recommended that encroachment of Senegalia melifera subsp. detinens and Rhigozum trichotomum be managed outside of all authorised footprint areas so to prevent further loss of habitat via indirect impacts. This habitat unit has been impacted by grazing pressure with woody encroachment evident in several sections. As a whole this habitat unit is still intact and supports an intermediate diversity of floral species. Several nationally and numerous provincially protected species were recorded in this habitat unit, although none were considered range restricted or threatened. If the proposed layout is authorised, it will be necessary to conduct a thorough walkdown of the footprint areas, including at least a 20 m buffer around the footprint area, where all protected floral species are marked for relocation to suitable habitat outside

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
Encroachment by indigenous woody species (*Senegalia melifera* subsp. *detinens*)  Open Thornveld Habitat  Rhigozum trichophora-encroached veld 	by areas with deeper red soils of the Vaalbos and Plooysburg soil forms. The habitat typically includes open thornveld with scattered *Vachellia erioloba* trees, as well as other *Senegalia* and *Vachellia* species. Several areas are, however, degraded due to mining edge effects and some grazing pressures, which have resulted in woody species such as Senegalia melifera subsp. detinens and *Rhigozum trichophora* encroaching into these areas. The "pure" Calcrete Shrubland habitat occurs along the western section of the proposed Railway Line Link Project and can be described as short, open shrubland where the woody component is dominated mainly by dwarf shrubs, with tall shrubs and/or small trees sparsely scattered in between. In areas where disturbances were more prominent, a notable increase in woody encroacher species such as Rhigozum trichotomum was noted. The eastern section of the Railway Line Link Project occurs in habitat that mostly reflects that of the Calcrete Shrubland habitat in term of species composition; however, this section also includes characteristics of the Open Thornveld with the	diverse and comprised *Aristida adscensionis, Aristida diffusa subsp. burkei, Cymbopogon pospischilii, Enneapogon cenchroides, Enneapogon desvauxii* (abundant), *Eragrostis lehmanniana, Eragrostis obtusa, Fingerhuthia africana* and *Themeda triandra.* Refer to Appendix C of Annexure 7 for a list of species recorded within this habitat unit. Railway Line: The Open Thornveld has a moderately low to intermediate species richness and is characterised by the presence of taller thorn trees such as Vachellia erioloba and Vachellia tortilis subsp. heteracantha. The grass layer is almost continuous, with some open soil patches scattered throughout this habitat. The best represented grasses included Enneapogon cenchroides, Eragristis trichophora, Stipagrostis uniplumis and Schmidtia kalahariensis. Forb and succulent species were not abundant but did not lack diversity either. Some rather range-restricted species were recorded in this habitat unit, namely E*uphorbia cf. duseimata* and an *Orbea* species. Species from the Aizoaceae family were also abundant within this section	area. The habitat is not considered to support significant ecological processes, nor are any significant ecological corridors present.	scattered individuals were recorded in this habitat unit. Numerous provincially protected species, i.e., those listed in Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA), were recorded in the Calcrete Shrubland, with several additional species likely occurring within this habitat unit. Schedule 2 Protected Plants recorded in this habitat unit included the below: Optimisation Project: - Species from the Aizoaceae family, *Mestoklema tuberosum, Ruschia cf. griquensis* and *Ruschia calcarea*; - Species from the protected Iridaceae family, namely *Babiana cf. bainesii*; - Numerous individuals from the protected genus *Boscia*, i.e., *Boscia albitrunca*; - Species of the protected family Oleaceae, namely *Olea europaea subsp. africana*; and - Species of *Oxalis cf. lawsonii*. Railway Line: - Species from the *Aizoaceae family, Mestoklema tuberosum, Ruschia calcarea* and *Ruschia cf. griquensis*; - Species from the protected *Iridaceae* family, namely *Babiana cf. bainesii* were not present, but are highly	the direct footprint (for species that qualify for relocation). The protected species walkdown must be conducted during the flowering season of the species to ensure adequate detection and identification of the species. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation. These species require permit applications from the relevant governing authorities such as DFFE and DENC before they can be harmed or relocated or destroyed. It is also possible that these authorities may pose certain conditions for SCC removal, e.g., the DFFE has in the past recommended biodiversity offsetting for the loss of NFA protected trees within the Kathu area. Also refer to Section 5.3.2 of this report. In terms of the National Web-based Environmental Screening Tool outcome, these areas align with the Medium Sensitivity assigned to the Plant Species Theme as the habitat is suitable for the triggered vulnerable plant species, though it is more likely that this species will be found in areas with more prominent outcropping in neighbouring habitat units. In terms of the Very High Sensitivity assigned to the Terrestrial Biodiversity Theme, only a small section of this habitat unit occurs in the triggered ESA. However, this habitat unit has a strong association with wetlands in the region. As such, loss of this habitat is unlikely to have a restricted impact, i.e., if this habitat is destroyed in areas where wetlands are present, there is potential for local to regional scale impacts on floral ecology. Key considerations for the Optimisation Project: This habitat unit is of intermediate sensitivity and importance from a floral ecological and resource management perspective, except for sections that have been significantly encroached and which are considered of moderately low sensitivity and importance. No significant impacts on floral ecology are anticipated from the proposed Railway Line Link Project within this habitat unit, given that mitigation measures are sufficiently implemented. Key considerations:

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
"Pure" Calcrete Shrubland  "Mixed" Calcrete Shrubland	presence of deeper red soils and taller thorn trees – thus not "pure" Calcrete Shrubland ("Mixed" Calcrete Shrubland). Disturbance in this section was notably higher than in the remaining sections of the Railway Line Link Project, largely due to grazing pressures from equine species.	(occurring in clumps rather than evenly distributed). The vegetation communities within the "pure" Calcrete Shrubland were of intermediate to moderately high diversity. The woody layer is well represented within this habitat unit and is characterised by sparsely occurring short trees / tall shrubs such as *Boscia albitrunca, Senegalia mellifera subsp. detinens* and *Tarchonanthus camphoratus*. Dwarf shrubs occur much more prominently throughout this habitat unit, comprising a range of species, such as *Aptosimum lineare, Cadaba aphylla, Eriocephalus cf. ericoides, Lasiosiphon polycephalus* (previously Gnidia), *Leucas capensis, Monechma incanum, Peliostomum leucorrhizum, Pentzia cf. calcarea, Roepera* (Zygophyllum) *pubescens*, and *Caroxylon dealatum*. Forbs were poorly represented which is characteristic of the reference state, namely the Postmasburg Thornveld. The graminoid layer was more diverse and comprised *Aristida adscensionis, Aristida diffusa subsp. burkei, Cymbopogon pospischilii, Enneapogon cenchroides, Enneapogon desvauxii* (abundant), *Eragrostis lehmanniana, Eragrostis obtusa,*		likely to be found in the footprint areas; - Numerous individuals from the protected genus *Boscia*, i.e., *Boscia albitrunca*; - Species from the protected genus *Euphorbia*, namely *Euphorbia cf. duseimata*; - Species from the protected family *Amaryllidacae*, namely *Boophone disticha*; - Species from the protected family *Asphodelaceae*, namely *Aloe claviflora*; and - Species of the protected family *Apocynaceae*, namely *Orbea* species. Permits from NCDENC and the Department of Forestry, Fisheries and the Environment (DFFE) should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place. Refer to Appendix B of Annexure 7for a list of species assessed as part of the SCC assessment for the Optimisation Project. Refer to Appendix F of the railway line ecological report (Annexure 7) for a list of species assessed as part of the SCC assessment.	Several nationally (NFA) and provincially (Schedule 2) protected species were recorded in this habitat unit, some of which are considered range-restricted (e.g., Euphorbia cf. duseimata). If the proposed layout is authorised, it will be necessary to conduct a thorough walkdown of the footprint areas where all protected floral species are marked for relocation to suitable habitat outside the direct footprint (as far as is feasible). The protected species walkdown must be conducted during the flowering season of the species to ensure adequate detection and identification of the species. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation. These species require permit applications from the relevant governing authorities such as DFFE and DENC before they can be harmed or relocated or destroyed. In terms of the National Web-based Environmental Screening Tool outcome, these areas align with the Medium Sensitivity assigned to the Plant Species Theme as the habitat is suitable for the triggered vulnerable plant species. In terms of the Very High Sensitivity assigned to the Terrestrial Biodiversity Theme, this section is not within the triggered ESA and does not align with the high sensitivity. Alien vegetation was noted to encroach into several sections if this habitat unit, but woody encroachment by Senegalia melifera subsp. detinens and Rhigozum trichophora was a more severe problem in this habitat unit. It is recommended that an AIP plan be implemented for this habitat unit especially since the proposed Railway Line Link Project is a linear development and will possibly serve as a corridor along which AIPs can spread. The habitat in this section of the Beeshoek Mine is already fragmented by road and rail networks. The addition of the Railway Line Link Project will further fragment the habitat but the impact on floral ecology will be of localised extent.

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
		Fingerhuthia africana and *Themeda triandra*. The eastern section of the Railway Line Link Project where the Calcrete Habitat included influences of Open Thornveld habitat, species richness was considered intermediate. Due to grazing pressures, grass cover was poorly represented and woody encroaching of Senegalia melifera subsp. detinens and Rhigozum trichotomum were prominent in most sections. Refer to Appendix H of the railway line ecological report (Annexure 7) for a list of species assessed as part of the SCC assessment.			
Modified Habitat Unit 	This habitat unit excludes vegetation communities that are in any way representative of the reference state(s). The extent of transformation due to mining activities, or the fragmentation of habitat due to housing developments and mine expansion, has resulted in denuded veld. No clear vegetation structure can be linked to these areas as the natural vegetation structure has been altered or completely transformed. These areas are often associated with alien vegetation or a lack of floral heterogeneity.	Optimisation Project: This habitat was generally species-poor, if not entirely without floral species. Due to anthropogenic landscapes such as housing developments and the old golf course being part of this habitat unit, many of the species are alien. Refer to Appendix C of Annexure 7 for a list of species recorded within this Habitat Unit. Railway Line: None. The habitat is considered transformed and no significant areas remain that are considered to be important for floral ecology. From a floral perspective, and in its current degraded	None. Due to the extent of habitat modification, no significant areas remain that is considered important for floral ecology within the region. No unique landscapes important to flora was thus present. From a floral perspective, and in its current degraded state, this habitat unit is not important for species diversity or community structure.	No threatened SCC are located within this habitat unit. Not are any anticipated to be present. Optimisation Project: Several isolated and scattered individuals of nationally (Boscia albitrunca and Vachellia erioloba) and provincially (*Boophone disticha, Babiana sp*,) protected floral species are present and would ideally necessitate a rescue and relocation initiative as far as is feasible. Permits from DENC and the DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place. Refer to Appendix B of Annexure 7 for a list of species assessed as part of the SCC assessment.	This habitat unit is not considered important from a floral ecological importance and resource management perspective. Much of this habitat is already used for mining or housing development and as such largely falls outside of the proposed mining expansion. Projects 4 and 5 are, however, proposed to occur in this habitat unit which is highly unlikely to result in any significant impacts to floral ecology on a local or regional scale. Key considerations: The habitat is severely degraded and no longer represents the original state(s), nor is it suitable to sustain viable populations of floral SCC. The infrastructure proposed within this habitat unit is unlikely to disrupt any significant ecological processes or impede any ecological corridors (from a purely floral perspective). No CBAs or ESAs are mapped within this habitat unit and thus no constraints on development are recognised. In terms of the National Web-based Environmental Screening Tool outcome, these areas match the Low

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
  		state, this habitat unit is not important for species diversity or community structure. Apart from the Calcrete Material Source which is located in an ESA, no significant conservation or biodiversity features were identified for this habitat unit within the provincial and national desktop datasets. The Calcrete Material Source is, however, in an area that is degraded from a vegetation perspective, much of which resulting from this section being fragmented for several years along with associated edge effects from the adjacent active mining activities. Its purpose as an ESA and movement corridor has largely been diminished.		Railway Line: No threatened SCC are located within this habitat unit, nor are any anticipated to be present. The NFA protected trees, Boscia albitrunca and Vachellia erioloba occurred sparsely in the Degraded Thornveld. Permits. Refer to Appendix F of the railway line ecological report (Annexure 7) for a list of species assessed as part of the SCC assessment.	Sensitivity assigned to the Plant Species Theme; however, it does not align with the Very High Sensitivity assigned to the Terrestrial Biodiversity Theme (due to habitat being significantly degraded and/or transformed). Due to the area already being exposed to disturbances and edge effect impacts from mining-related activities, this habitat unit is susceptible to Alien and Invasive Plant (AIP) proliferation. Care must be taken to limit edge effects on the surrounding natural areas. Furthermore, it is recommended that an AIP species management plan be developed to manage AIP proliferation within the Beeshoek Mine. Several areas are also severely encroached. This encroachment, if not cleared, must me contained within degraded areas and prevented from increasing their extent within the remaining natural areas in the Beeshoek Mine.
Moisture-driven Habitat Unit	The Moisture-driven Habitat comprises a specialist group of vegetation that is adapted to living in saturated soils, however, this vegetation does not necessarily indicate the presence of a watercourse as defined in the NWA. The habitat is split between watercourse and non-watercourse habitat,	Characteristic of the Cryptic Wetlands was the lining of trees around the outer edge. Trees considered to be indicator species of Cryptic Wetlands within the study area setting included *Ziziphus mucronata* and occasionally Olea europaea *subsp. africana* and less frequently Vachellia	The watercourse habitat is significant from a biodiversity and conservation perspective. Important ecological corridors include the numerous Cryptic Wetlands and the Episodic Drainage Lines of the Groenwaterspruit – albeit more prominent during	No nationally threatened SCC (i.e., RDL plants), or TOPS listed plants in terms of NEMBA Section 56(1) were recorded in this habitat unit during the site assessment. The NFA protected tree, Vachellia erioloba, or the Camel thorn was present within this habitat unit. The Vachellia erioloba individuals were not abundant but did consist of	This habitat unit is of Moderately High (watercourse habitat) to Moderately Low (non-watercourse habitat) sensitivity from a floral ecological and resource management perspective. Habitat integrity varied between the Cryptic Wetlands, many of which have suffered impacts from grazing pressures. The Cryptic Wetlands and Episodic Drainage Lines comprise species that are protected either nationally or provincially and these features are important ecological corridors not only in the

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
 Cryptic wetlands  Cryptic wetlands  Seasonal depressions	where vegetation differed significantly between these two. The watercourse habitat includes: - Cryptic Wetlands, i.e., pans considered to meet the classification as watercourses in the NWA (SAS 219099, 2021) with distinct vegetation communities considered to be key indicators of wetlands in arid regions. The pans/wetlands in arid regions differ from the more conventional wetlands in humid regions (which are continuously inundated systems with saturated soils) by only being inundated after sufficient rainfall (NRF, 2018). Throughout the study area numerous pans are present that meet the definition of Cryptic Wetlands. - An Episodic drainage line (unnamed tributary of the Groenwaterspruit) typically associated with a riparian zone (as per the NWA definition) formed by woody species within the channel or immediately adjacent to it. The non-watercourse habitat is not defined as	erioloba. *Tarchonanthus camphoratus* and *Senegalia melifera subsp. detinens* were typically abundant around the Cryptic wetlands but are not considered indicator species due to their abundance across the Beeshoek Mine. Characteristic grass species found along the outer edges of the Cryptic Wetlands included *Eragrostis echinochloidea* and *Eragrostis lehmanniana*, which always co-occurred with Cullen tomentosum (forb) and *Eragrostis bicolor* (grass) - typical wetland indicators occurring in the centre of the Cryptic Wetlands. Trees lined the Seasonal Depressions but manly included *Tarchonanthus camphoratus* and *Senegalia melifera subsp. detinens* - Ziziphus mucronata often not present. The graminoid layer was less diverse and often lacked the presence of the Cryptic Wetlands indicator species, i.e., *Eragrostis bicolor*. Seasonal Depressions often comprised a grass layer where *Aristida congesta subsp. congesta* and *Enneapogon cenchroides* were dominant. The Preferential Flow Paths, anthropogenic drainage lines and recharge zone were sparsely lined with tree species, mainly comprising	rainfall events. Many of these features are mapped within ESAs in the 2016 Northern Cape Critical Biodiversity Areas (NCDENC, 2016) dataset. From a floral perspective, the non-watercourse habitat (seasonal depressions, preferential flow paths, anthropogenic drainage line) is not considered to significantly contribute towards floral ecology within the Beeshoek Mine, nor within the greater region. Only the recharge zone may be important for recharge of a small tributary of the Groenwaterspruit as it is very likely that water from this area flows to the Groenwaterspruit and may thus contribute to the continued ecological functioning thereof (SAS 219099, 2021).	mature individuals in a good condition. The Schedule 2 protected Nerine laticoma and Olea europaea subsp. africana were recorded within the Cryptic Wetlands. The Non-watercourse Habitat only included a small number of SCC which comprised of commonly occurring species such as *Boscia albitrunca* and *Boophone disticha*. Additional species potentially occurring within this habitat unit, which are known from the region and that are listed as Schedule 2 protected species (NCNCA), include *Bulbine abyssinica* and *Trachyandra saltii*. Permits from DENC and DFFE should be obtained to remove, cut or destroy the above-mentioned protected species before any vegetation clearing may take place. Refer to Appendix B of Annexure 7 for a list of species assessed as part of the SCC assessment.	Beeshoek Mine but also in the larger region. Despite the lower species diversity when compared to other natural areas, these features remain important in the greater landscape. With the currently proposed activities, there will be minimal loss of Cryptic Wetlands and no loss of the Episodic Drainage Line. The non-watercourse habitat (especially the Seasonal Depressions, Preferential Flow Paths and Anthropogenic Drainage Line) is deemed less important from a floral ecological perspective and these features are either species-poor or comprise a homogenous vegetation community, with a low probability of floral SCC occurring within them. The recharge zone, however, is potentially important from an overall ecological perspective (i.e., considering fauna and wetland ecology in the region as well), but from a pure floral perspective, no vegetation communities uniquely associated with wetland conditions were noted within this feature. As such, floristically the recharge zone is of less importance than the true watercourse habitat where more unique and habitat-restricted species were recorded. Important recommendations: It is recommended that mining expansion be limited in the Cryptic Wetlands. Currently only two Cryptic Wetlands will be impacted by the proposed Village Pit Expansion. Most of the Cryptic Wetlands are located in the Strategic Exploration Area and exploration activities will need to ensure there is little to no impact on these systems. Impacts on floral communities associated with the Cryptic Wetlands will be unfavourable if not avoided during exploration activities, especially since these provide unique habitat within this semi-arid region and they serve as important ecological corridors - many of which are indicated as ESAs in the 2016 Northern Cape Critical Biodiversity Areas (NCDENC, 2016) dataset. To avoid the loss of potentially occurring floral SCC, the presence of such species should be confirmed before vegetation clearing commences. A thorough walkdown of the footprint areas should take place where all floral SCC are marked for rescue and relocation, or removal (where permit application would be required). This walkdown must take place

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
	watercourses from an ecological perspective and include the seasonal depressions, preferential flow paths, anthropogenic drainage lines and a recharge zone.	the terrestrial species from the surrounding habitat units. The graminoids mainly included *Aristida congesta subsp. congesta, Enneapogon desvauxii, Enneapogon cenchroides, Eragrostis trichophora* and *Eragrostis truncata* (dominant in the recharge zone). Refer to Appendix C of Annexure 7 for a list of species recorded within this habitat unit.			during the growing season (ideally after adequate rains) when species identification will be more accurate, and many geophytes (e.g., Babiana species) will emerge from their winter dormancy. Marking, removing and/or translocating of tree species can occur during any time of the year seeing that these species are easily identifiable without flowers. For the non-watercourse habitat, none are mapped as ESAs in the 2016 Northern Cape CBA Map and no development constraints recognised for these features. In terms of the Screening Tool, the medium plant species theme is not supported for the triggered vulnerable plant species; however, the habitat is suitable for provincially protected floral species that are uniquely adapted to the seasonally, or periodically, soil-saturated conditions. The Very High Sensitivity in terms of the Terrestrial Sensitivity is supported due to the presence of naturally occurring watercourses.
Open Thornveld Habitat Unit  	The Open Thornveld is characterised by areas with deeper red soils of the Vaalbos and Plooysburg soil forms. The habitat typically includes open thornveld with scattered *Vachellia erioloba* trees, as well as other *Senegalia* and *Vachellia* species. Several areas are, however, degraded due to mining edge effects and some grazing pressures, which has resulted in woody species such as *Senegalia melifera subsp. detinens* and *Rhigozum trichophora* encroaching into these areas. This habitat unit ranges from large stretches in the central section of the Beeshoek Mine where the vegetation	The habitat unit is less species-rich than others within the Beeshoek Mine which is likely attributable to the unique habitat provided by the deeper red soils, as well as its very scattered distribution and often small extent within the Beeshoek Mine. Woody species are largely represented by thorn trees such as *Senegalia mellifera* subsp. *detinens*, *Vachellia erioloba, Vachellia hebeclada* subsp. hebeclada, *Vachellia tortilis* subsp. *heteracantha*, but also includes several other woody species that are well represented throughout the Beeshoek Mine such as *Eriocephalus cf. ericoides, Grewia flava, Lycium*	This habitat unit largely occurs outside of any of the significant biodiversity and conservation features, although some small sections in the central regions of the Beeshoek Mine occur with an ESA. This habitat unit is not well-represented within the Beeshoek Mine, especially not sections where the vegetation communities remain fully intact.	No nationally threatened SCC (i.e., RDL plants), in terms of NEMBA Section 56(1) were recorded in this habitat unit during the site assessment. Two NEMBA TOPS species, Harpagophytum procumbens and Hoodia gordonii (also a Schedule 1 NCNCA species) were recorded within the northern sections of this habitat unit. The deeper red soils provide ideal conditions for this species and it is anticipated that several more are present throughout this unit. The NFA protected tree, Vachellia erioloba, or the Camel thorn was present within this habitat unit – more prominent within this habitat unit than within others. The Vachellia erioloba individuals consisted of mature individuals in a healthy condition. Boscia erioloba, also an NFA protected	This habitat unit is of intermediate sensitivity to moderately low sensitivity and importance from a floral ecological and resource management perspective. Mining expansions are largely excluded from the more intact sections of this habitat unit and hence will minimally impact on floral ecology associated with the areas of deeper red soils. Key considerations: The greatest direct impact on this habitat unit will be from Pit and WRD expansion; however, this habitat unit has been fragmented (especially in the central section of the mine) and evidence of edge effect impacts are becoming more prominent. No ecological corridors are linked to this habitat unit, but it does provide unique habitat from a grazing perspective which in turn allow for the dispersal of floral species throughout the Beeshoek Mine. The Open Thornveld is also the only habitat unit where there is a prominent tree cover, as opposed to the dominant shrub cover in the remaining habitat units. It is recommended that the fragmented section of this habitat unit that is outside of authorised footprint areas be managed to prevent woody encroachment and AIP proliferation,

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
 	is most representative of the Kuruman Thornveld vegetation type, to smaller, scattered pockets in the western section of the Mine.	*hirsutum, Tarchonanthus camphoratus* and *Ziziphus mucronata*. The grass layer was very prominent within this habitat unit, with grasses often much taller than within the surrounding habitat units. The more abundant graminoid species included Enneapogon cenchroides, Eragristis trichophora, Stipagrostis uniplumis and Schmidtia kalahariensis. Refer to Appendix C of Annexure 7 for a list of species recorded within this habitat unit.		tree, was present in low abundances within the open Thornveld Habitat Unit. Numerous provincially protected species, i.e., those listed in Schedule 1 and 2 of the NCNCA, were recorded in the Open Thornveld, with several additional species likely occurring within this habitat unit. Schedule 2 Protected Plants recorded in this habitat unit included the below: - Species from the Aizoaceae family, *Mestoklema tuberosum, Ruschia cf. griquensis* and *Ruschia calcarea* (more in the mixed veld with some calcrete also present); - Species from the protected Amaryllidaceae family, namely *Boophone disticha*; - Scattered individuals from the protected genus Boscia, i.e., *Boscia albitrunca*; - Species from the protected genus Euphorbia, namely *Euphorbia cf. duseimata*; - Species of the protected family Apocynaceae, namely *Orbea species*; - One individual was found from the specially protected *Hoodia gordonii*; and - Species of *Oxalis cf. lawsonii*. Permits from NCDENC and the DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place.	especially in the areas not earmarked for future mining expansion. As far as is possible, fragmentation must be limited, and connectivity reinstated through the rehabilitation and management of areas where mining no longer occurs. Several nationally (NFA and TOPS) and provincially (Schedule 1 and 2) protected species were recorded in this habitat unit, some of which are considered range-restricted (e.g., *Euphorbi*a cf. duseimata). If the proposed layout is authorised, it will be necessary to conduct a thorough walkdown of the footprint areas where all protected floral species are marked for relocation to suitable habitat outside the direct footprint (where species qualify for translocation). It is also recommended that a plant nursery be instated on the mine property where floral SCC are temporarily relocated and further propagated to be used in rehabilitation activities later down the line. The protected species walkdown must be conducted during the flowering season of the species to ensure adequate detection and identification of the species. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation. These species require permit applications from the relevant governing authorities such as DFFE and DENC before they can be harmed or relocated or destroyed. In terms of the National Web-based Environmental Screening Tool outcome, these areas do not align with the Medium Sensitivity assigned to the Plant Species Theme as the habitat is not suitable for the triggered vulnerable plant species. In terms of the Very High Sensitivity assigned to the Terrestrial Biodiversity Theme, only a small section of this habitat unit minimally occurs in the triggered ESA of which largely fall outside of the proposed mine expansion and consolidation. Alien vegetation was noted to encroach into several sections if this habitat unit, especially species from the cacti family and several Prosopis species. It is recommended that an AIP plan be implemented for this habitat unit especially where mining activities might result in edge effect impacts on this unit.

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
				Refer to Appendix B of Annexure 7 for a list of species assessed as part of the SCC assessment.	
Rupicolous Habitat Unit   	Vegetation structure of the Rupicolous Habitat can be described as short, closed shrubland with the habitat unit comprising two vegetation communities that are similar in species composition, but different in the biophysical environment – some sections include prominent outcrops, while others comprise smaller pebbles on flatter plains. One of the main defining characteristics of this unit is the shallow red soils on Mispah/Glenrosa soil forms, resulting in a similar species composition despite differences in the biophysical environment. In some regards this habitat unit reflects the species composition expected from the Kuruman Mountain Bushveld habitat unit; however, the vegetation structure does not. *Senegalia melifera subsp*. detinens is a prominent encroacher in this habitat unit and several areas are considered significantly degraded due to the extent of encroachment.	This habitat unit is more species-rich than most of the units within the study area, albeit greatly dominated by *Senegalia melifera* subsp. *detinens*. The woody, forb and graminoid layers are generally well developed, but occurs scattered due to the rocky nature of the environment. This habitat unit further harboured a higher diversity of succulent species than the remaining habitat units in the Beeshoek Mine. Vegetation communities largely comprise small trees such as *Boscia albitrunca, Searsia burchellii, Senegalia mellifera subsp. detinens* and *Ziziphus mucronata*, as well as shrubs such as, *Cadaba aphylla, Searsia tridactyla* and *Tarchonanthus camphoratus*. Dwarf shrubs with a karroid affinity occur scattered within this habitat unit, mainly including the species *Justicia divaricata, Pentzia incanum* and *Roepera* (Zygophyllum) *pubescens*. The habitat is ideal for succulent species, with *Anacampseros filamentosa* subsp. *tomentosa, Euphorbia cf. rhombifolia, Kleinia longiflora, Lycium cinereum, Pachypodium succulentum* and several	This habitat unit was once well-represented within the Beeshoek Mine area but has been extensively mined over the years. This habitat unit occurs within scattered sections of an ESA and provides unique habitat for a high diversity of floral species on site. Due to the uniquely different floral communities represented in this habitat unit, it is considered unique on a local scale.	No threatened SCC (i.e., RDL plants), or TOPS listed plants, in terms of Section 56 of NEMBA, were recorded during the site assessment. The nationally protected tree, Boscia albitrunca, or Shepherd's tree, occurred in moderate to high abundances throughout this habitat unit. The Screening Tool has identified one vulnerable plant species for the Beeshoek Mine with potential habitat within this habitat unit. Although none were recorded during the site assessment, it is likely that they occur on site. Numerous provincially protected species, i.e., those listed in Schedule 2 of the NCNCA, were recorded within this habitat unit and are listed below: - Species from the Aizoaceae family, *Mestoklema tuberosum*, Ruschia calcarea) and *Tridentea sp*; - Species from the protected Asphodelaceae family, namely *Aloe grandidentata* and *Aloe hereroense*; - Species from the protected Amaryllidaceae family, namely *Boophone disticha* and *Ammocharis cf. coranica*; - Species in the protected genus Anacampseros, namely *Anacampseros filamentosa*;	This habitat unit is of moderately high sensitivity and importance (eastern sections) to moderately low (western sections) from a floral ecological and resource management perspective. Mining activities are largely excluded from this habitat unit and the impact will this be locally restricted. The detrital area and BN Pit expansion will impact most on this habitat unit, especially on sections that are still intact, and which currently still have high species diversities. Key considerations: This habitat unit is extensively encroached in most sections. As a whole this habitat unit is still intact despite the woody encroachment and it supports a high diversity of floral species within the woody, graminoid, succulent and forb components. Further loss of this habitat unit is not recommended as rehabilitation of these areas is highly unlikely to result in the pre-mined condition. Several nationally and provincially protected species were recorded in this habitat unit. If the proposed layout is authorised, it will be necessary to conduct a thorough walkdown of the footprint areas, including at least a 20m buffer around the footprint area, where all protected floral species are marked for relocation to suitable habitat outside the direct footprint (as far as is feasible). The protected species walkdown must be conducted during the flowering season of the species to ensure adequate detection and identification of the species. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation. These species require permit applications from the relevant governing authorities such as DFFE and DENC before they can be harmed or relocated or destroyed. In terms of the National Web-based Environmental Screening Tool outcome, these areas do not align with the Medium Sensitivity assigned to the Plant Species Theme as the habitat is not suitable for the triggered vulnerable plant species. In terms of the Very High

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
		alien *Opuntia* sp. often recorded within this habitat. Refer to Appendix C of Annexure 7 for a list of species recorded within this habitat unit.		- Scattered individuals from the protected genus Boscia, i.e., *Boscia albitrunca*; - Numerous individuals from the protected Iridaceae family, especially *Babiana cf. bainesii* but also individuals of *Gladiolus permeabilis* subsp. *edulis*; - Species from the protected genus Euphorbia, namely *Euphorbia cf. rhombifolia*; - Species of the protected family Oleaceae, namely *Olea europaea subsp. africana*; - The protected species *Nymania capensis*; and - Species of *Oxalis cf. lawsonii*. Permits from NCDENC and the DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place. Refer to Appendix B of Annexure 7 for a list of species assessed as part of the SCC assessment.	Sensitivity assigned to the Terrestrial Biodiversity Theme, several sections of this habitat unit occur in the triggered ESA of which a large section occurs in the proposed mine expansion and consolidation footprint. Alien vegetation was noted to encroach into several sections if this habitat unit, especially species from the cacti family. It is recommended that an AIP plan be implemented for this habitat unit especially where mining activities might result in edge effect impacts on this unit. Woody encroachment by Senegalia melifera subsp. detinens should be managed and further spread of this species should be prevented.
Non-watercourse Habitat Unit	Moisture-driven habitat comprises a specialist group of vegetation adapted to living in saturated soils; however, this vegetation does not necessarily indicate a watercourse as defined in the NWA. The non-watercourse habitat is not defined as watercourses from an ecological perspective and includes	The drainage line was lined with tree species, mainly comprising the terrestrial species from the surrounding habitat units. Alien vegetation was also dominant in this section, including *Cirsium vulgare, Bidens pilosa* and *Tagetes minuta*. Where water collects more frequently,	From a floral perspective, the non-watercourse habitat is not considered to significantly contribute towards floral ecology within the Railway Line Link Project, nor within the greater region.	No threatened SCC are located within this habitat unit, nor are any anticipated to be present.	This habitat unit is of Moderately Low (non-watercourse habitat) sensitivity from a floral ecological and resource management perspective. The non-watercourse habitat is deemed less important from an ecological perspective and these features are species-poor in terms of native species, but well represented by alien vegetation. There is a low probability of floral SCC occurring within this habitat unit. Important recommendations:

Habitat Unit	Habitat Overview	Species Overview	Presence of Unique Landscapes	Species of Conservation Concern	Key Considerations
 Anthropogenic drainage line  Anthropogenic drainage line	seasonal depressions and an anthropogenic drainage line. Only the anthropogenic drainage line is within the Railway Line Link Project footprint.	*Phragmites australis stands* were present. Refer to Appendix H of the railway line ecological report (Annexure 7) for a list of species assessed as part of the SCC assessment.			For the non-watercourse habitat, none are mapped as ESAs in the 2016 Northern Cape CBA Map and no development constraints recognised for these features. In terms of the Screening Tool, the medium plant species theme is not supported for the triggered vulnerable plant species; however, the habitat is suitable for provincially protected floral species that are uniquely adapted to the seasonally, or periodically, soil-saturated conditions. The Very High Sensitivity in terms of the Terrestrial Sensitivity is not supported. No features of biodiversity significance are associated with the Non-watercourse Habitat, but it is recommended that an AIP species management plan be developed to manage AIP proliferation along these areas.

2.e.iii.5.i Alien and Invasive Plant (AIP) Species

South Africa has released several Acts legislating the control of alien species. Currently, invasive species are controlled by the National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) – Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020. AIPs defined in terms of NEMBA are assigned a category and listed within the NEMBA List of Alien and Invasive Species (2020) in accordance with Section 70(1)(a) of the NEMBA:

- Category 1a species are those targeted for urgent national eradication;
- Category 1b species must be controlled as part of a national management programme, and cannot be traded or otherwise allowed to spread;
- Category 2 species are the same as category 1b species, except that permits can be issued for their usage (e.g., invasive tree species can still be used in commercial forestry, providing a permit is issued that specifies where they may be grown and that permit holders "Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to Regulation 3"); and
- Category 3 are listed invasive species that can be kept without permits, although they may not be traded or further propagated, and must be considered a Category 1b species if they occur in riparian zones.

Duty of care related to listed invasive species are referred to in NEMBA Section 733. The motivation for this duty of care is both environmentally and economically driven. Management of alien species in South Africa is estimated to cost at least ZAR 2 billion (US$142 million) each year - this being the amount currently spent by the national government's DFFE - i.e. the Working for Water programme (van Wilgen, 2020). Managing AIPs early on will reduce clearing costs in the long run.

Of the AIPs recorded during the field assessment, 12 species are listed under NEMBA Category 1b and two under Category 2. The remaining species are not listed under NEMBA but species such as *Bidens bipinnata, Chenopodium album* and *Tagetes minuta* are considered problem plants having a negative impact on indigenous floral communities within disturbed and degraded areas.

Table 41: Alien and invasive alien species associated with the Mine Optimisation Area

Scientific name	**Common Name**	NEMBA Status	**Calcrete Shrubland**	**Modified Habitat Unit**	**Open Thornveld Habitat Unit**	**Rupicolous Habitat Unit**	**Non-watercourse Habitat**	**Watercourse Habitat**
		WOODY SPECIES						
Ailanthus altissima	Tree-of-heaven	Category 1b		x				
Grevillea robusta	Australian silky oak	Category 3		x				
Jacaranda mimosifolia	Jacaranda	Not listed in the NC		x				
Pinus sp.	N/A	N/A		x				
Prosopis glandulosa var. torreyana	Honey mesquite	Category 3 in NC		x	x			x
Schinus molle	Peruvian pepper	Not Listed	x	x	x			
		FORBS						
Alternanthera pungens		Not Listed		x				
Argemone ochroleuca subsp. *ochroleuca*	White-flowered Mexican poppy	Category 1b		x				
Bidens bipinnata	Spanish needles, Blackjack	Not Listed		x	x			
Chenopodium album	Goosefoot	Not Listed		x	x			x
Portulaca oleracea	Common purslane, also known as Duckweed	Not Listed						x
Salsola kali	Tumbleweed	Category 1b		x				
		SUCCULENTS						
Austrocylindropuntia cylindrica	Cane cactus	Category 1b		x				
Harrisia tortuosa	Spiny snake cactus	Category 1b		x		x	x	
Opuntia ficus-indica	Sweet prickly pear	Category 1b		x	x	x		

Scientific name	Common Name	NEMBA Status	Calcrete Shrubland	Modified Habitat Unit	Open Thornveld Habitat Unit	Rupicolous Habitat Unit	Non-watercourse Habitat	Watercourse Habitat
Opuntia imbricata	Imbricate prickly pear	Category 1b		x				
Opuntia microdasys	Yellow bunny-ears, Teddybear cactus	Category 1b		x	x			
Tephrocactus articulatus	Pine cone cactus, Paperspine cholla	Category 1b		x				
Trichocereus schickendantzii	Torch Cactus	Category 1b	x			x	x	
GRAMINOIDS								
Pennisetum setaceum	Fountain grass	Category 1b		x	x			

Alien vegetation were scattered throughout the Beeshoek Mine, but the most problematic species included a variety of cacti species mostly recorded within the Modified Habitat Unit and sections of the Open Thornveld and the Rupicolous Habitat Units. The cacti species are all listed as Category 1b invaders and consisted of *Austrocylindropuntia cylindrica, Harrisia tortuosa, Opuntia ficus-indica, Opuntia imbricata, Opuntia microdasys, Tephrocactus articulatus* and *Trichocereus schickendantzii*.

Within the actively mined areas as well as rehabilitated areas the Category 1b grass *Pennisetum setaceum* was abundant (this is a well-known species known used for mine rehabilitation). To control *Pennisetum setaceum*, it will be necessary to take a phased approach where the species is slowly replaced with indigenous species.

Table 42: Alien and invasive alien species associated with the Railway Line Area

Scientific name	Common Name	NEMBA Status	Calcrete Shrubland	Modified Habitat Unit	Open Thornveld Habitat Unit	Non-watercourse Habitat
WOODY AIPS						
Prosopis glandulosa var. torreyana	Honey mesquite	Category 3 in NC			x	
Schinus molle	Peruvian pepper	Not Listed	x	x	x	
FORBS						
Alternanthera pungens	Khaki weed	Not Listed				
Bidens pilosa	Common Blackjack	Not Listed			x	x
Chenopodium album	Goosefoot	Not Listed			x	x
Cirsium vulgare	Spear thistle, Scotch thistle	Category 1b				x
Erigeron canadens	Horseweed	Not Listed				x
Portulaca oleracea	Common purslane, also known as Duckweed	Not Listed				x
Schkurhia pinnata	Dwarf marigold	Not Listed			x	x
Tagetes minuta	Khaki bush	Not Listed			x	x
SUCCULENTS						
Opuntia ficus-indica	Sweet prickly pear	Category 1b		x	x	
Tephrocactus articulatus	Pine cone cactus, Paperspine cholla	Category 1b		x		
GRAMINOIDS						
Pennisetum setaceum	Fountain grass	Category 1b		x		

2.e.iii.5.j Ecological Sensitivity Mapping

The National Web-Based Environmental Screening Tool identified the Beeshoek Mine to be in a **Low** and a **Medium Sensitivity** area for the Plant Species Theme and a **Very High Sensitivity** for the Terrestrial Biodiversity Theme. Based on the *ground-truthed results* of the site visit, sensitivity mapping was undertaken (please refer to Section 4 of Annexure 7, specifically Table 2 for more detailed information).

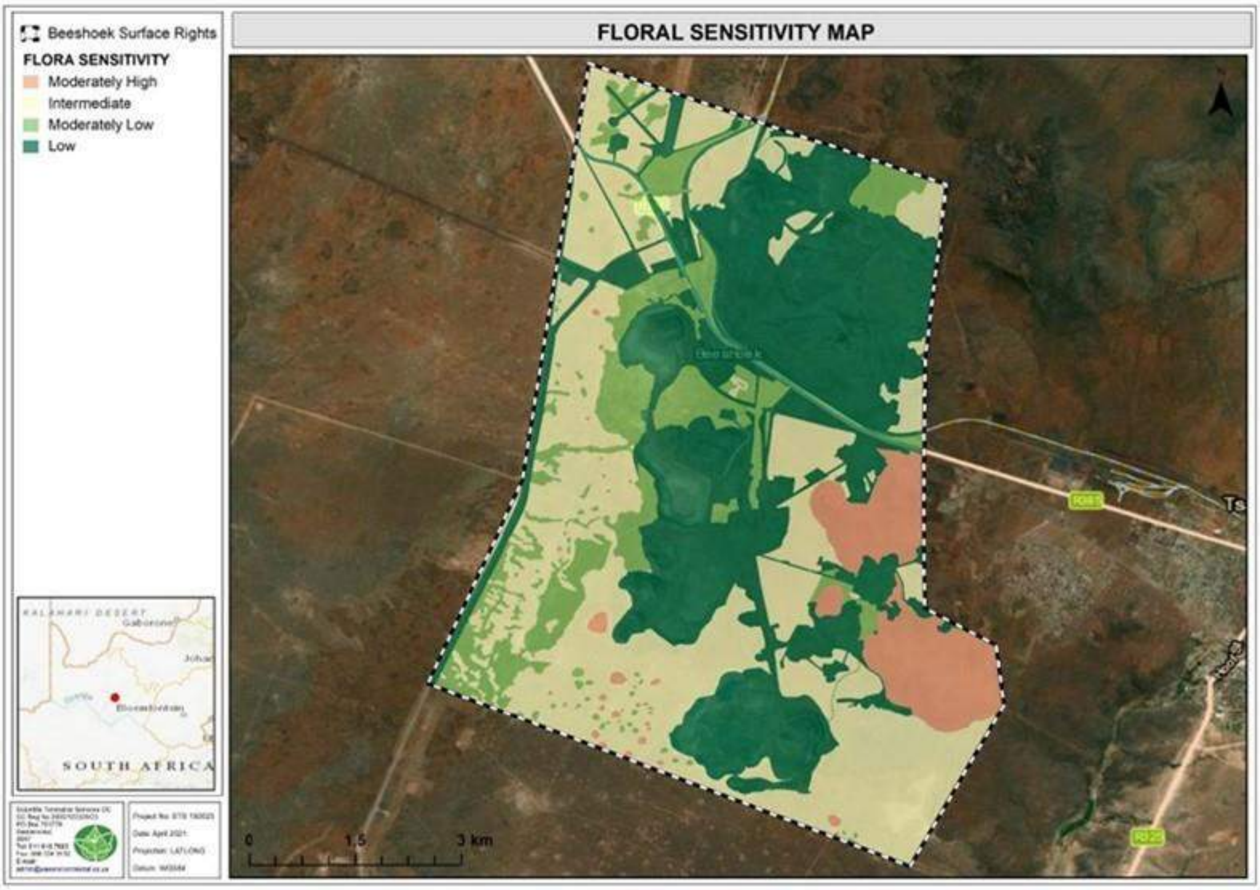


Figure 64: Floral sensitivity map for the Beeshoek Mine

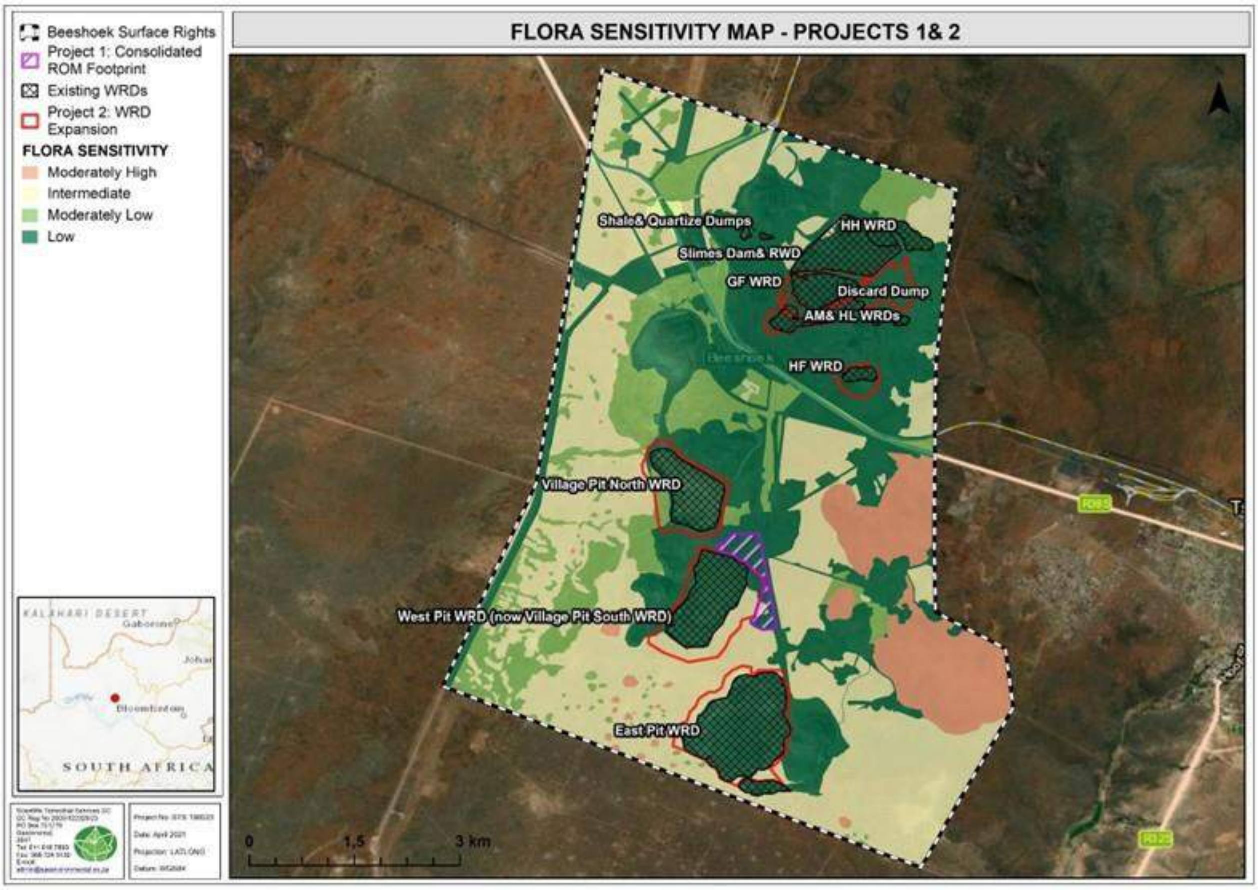


Figure 65: Floral sensitivity map for the Beeshoek Mine with the proposed Project 1 and 2 superimposed on the habitat sensitivities

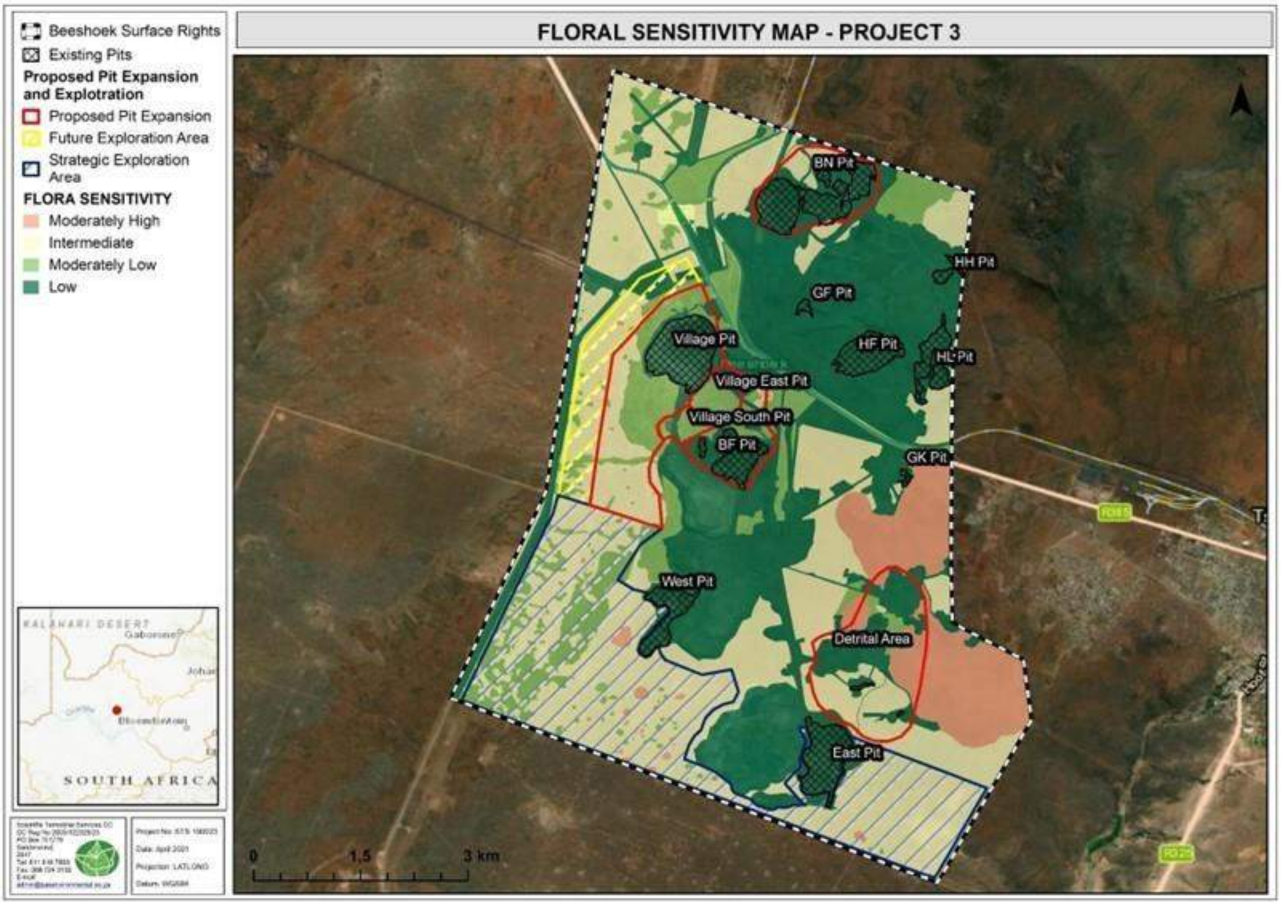


Figure 66: Floral sensitivity map for the Beeshoek Mine with the proposed Project 3 superimposed on the habitat sensitivities

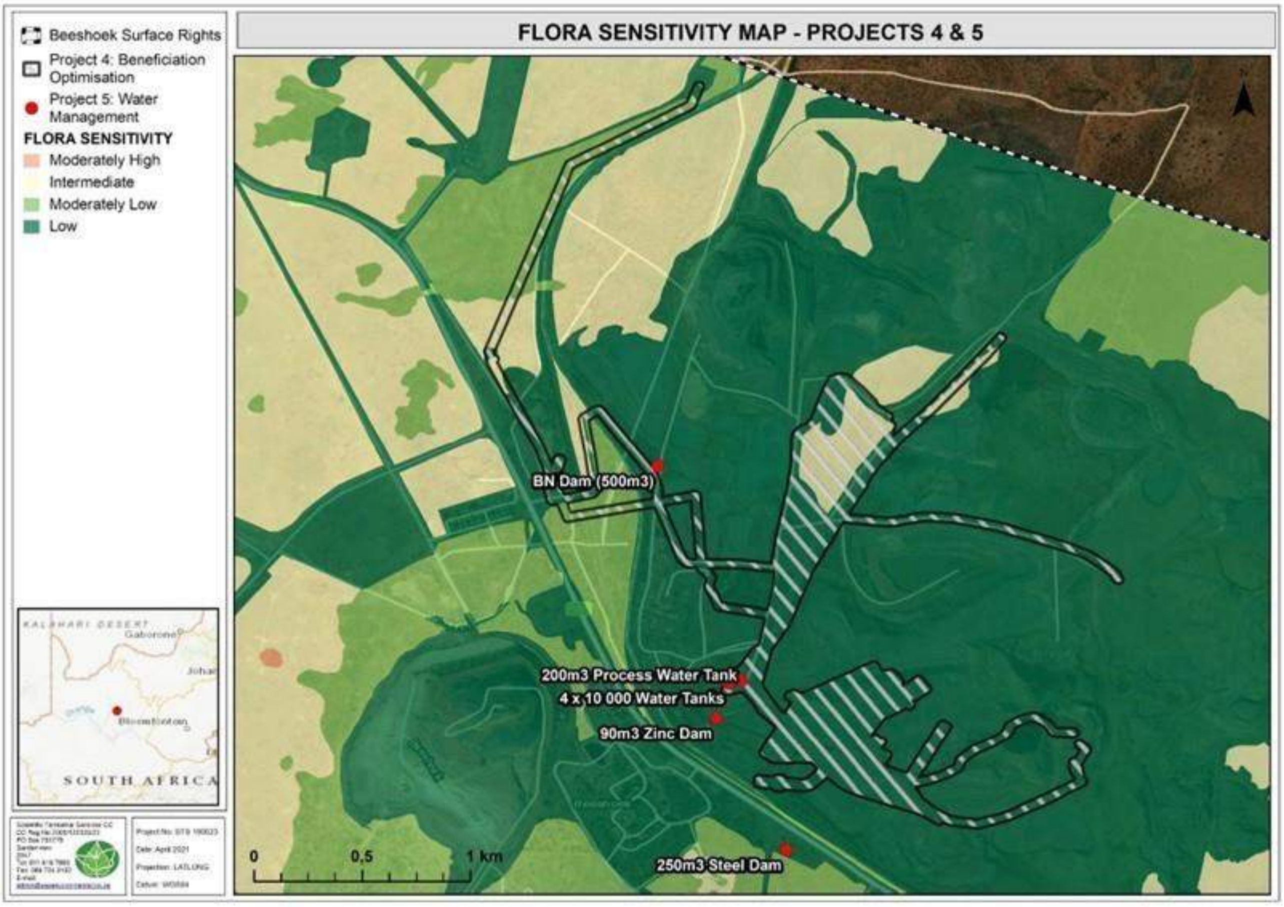


Figure 67: Floral sensitivity map for the Beeshoek Mine with the proposed Project 4 and 5 superimposed on the habitat sensitivities

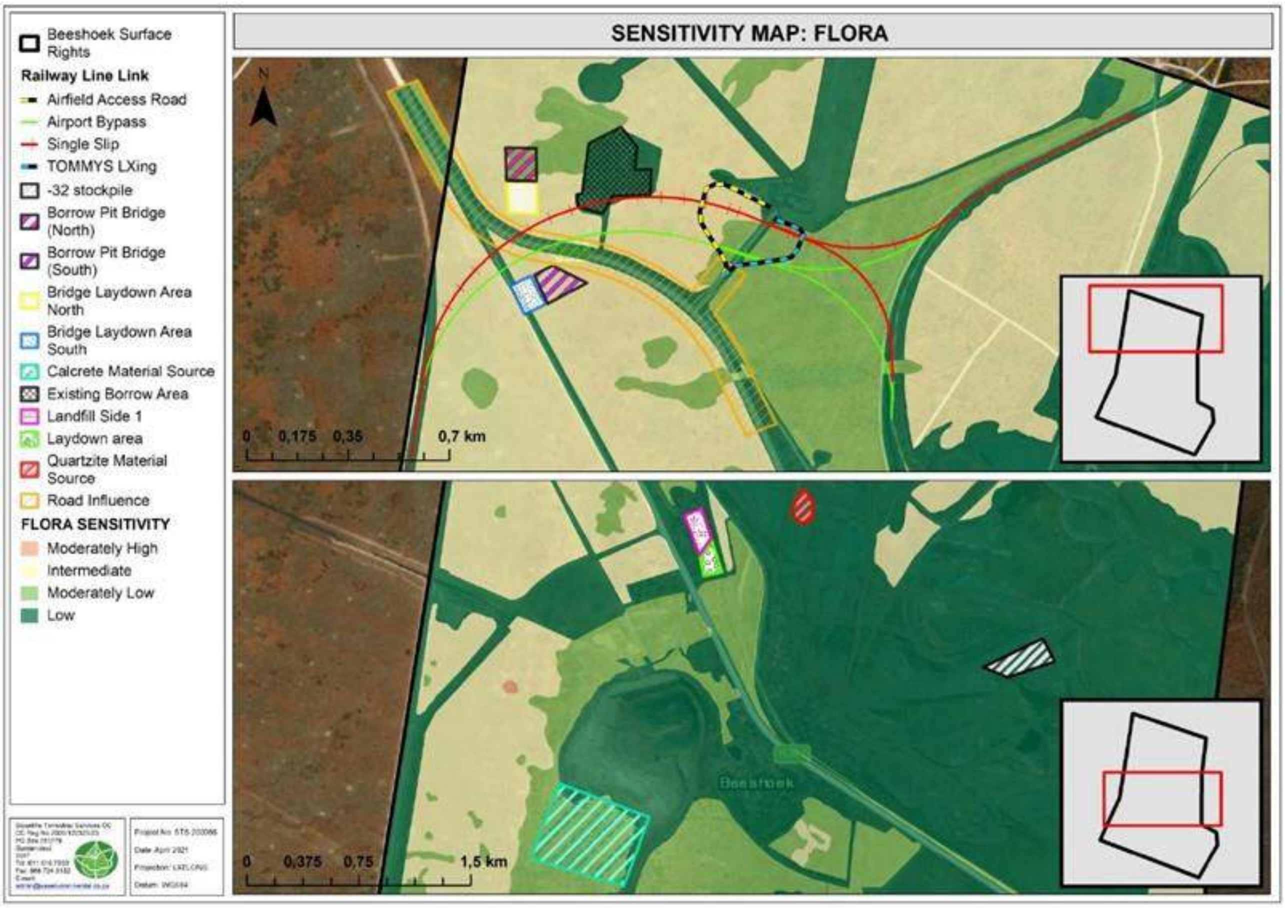


Figure 68: Floral sensitivity map for the Beeshoek Mine with the proposed Project 6 superimposed on the habitat sensitivities

2.e.iii.5.k Animal Species Theme

For the animal species theme, the mine is considered to largely have a low sensitivity, with several sections scattered throughout the mine considered to be of medium sensitivity. One small area in the southern section of the mine is a high sensitivity area for the animal species theme, the Railway Line Link Project is considered to largely be of medium sensitivity, with a small section within the southern portion of the Railway Line Link Project considered to be of low sensitivity. The sensitivities were triggered by the potential occurrence of the following species:

- Medium: the avifauna species Sagittarius serpentarius (Secretary bird) (Endangered) and
- Medium: the avifauna species Neotis ludwigii (Ludwig's bustard) (Endangered).

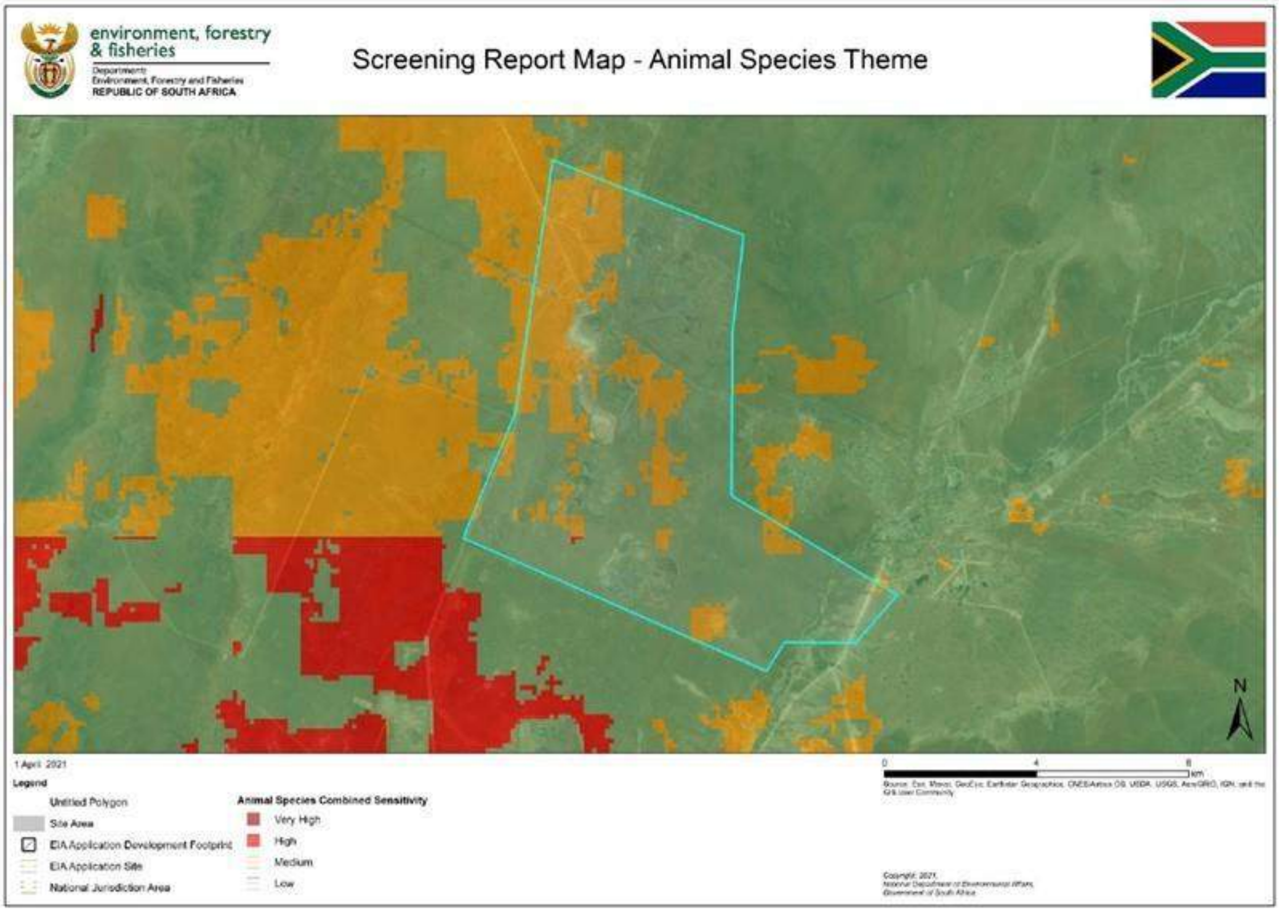


Figure 69: Screening Tool outcome for the Animal Species Theme

2.e.iii.5.l Faunal Habitat Assessment

The SRA comprised of four (4) broad faunal habitat units, with each broad unit comprising smaller habitat units that support various faunal species, often some of which are niche and habitat restricted species. These habitat units are discussed briefly in terms of faunal utilisation and importance below. For a more detailed description and discussion of these habitat units see Section B (Floral Report) and refer to the freshwater ecological assessment undertaken by Scientific Aquatic Services (SAS).

The vegetation communities were grouped based on species compositions, but vegetation groupings also largely relied on the various soil forms found on site.

- Natural Habitat Areas comprising:
  - Calcrete Shrubland;
  - Open Thornveld; and
  - Rupicolous Habitat;
- Modified Habitat Areas comprising:
  - Degraded Thornveld Habitat; and
  - Transformed Habitat;
- Watercourse Habitat comprising:
  - Cryptic Wetlands; and
  - Episodic Drainage Lines.

- Non-watercourse habitat comprising:
    - Preferential Flow Paths;
    - Recharge Zone; and
    - Seasonal Depressions.

Please refer to Section 2.e.iii.5.a and Section 2.e.iii.5.h for more information. Figure 59 depicts the detailed extent of the habitat units within the Beeshoek Mine. Figure 60 to Figure 62 include the proposed layout.

2.e.iii.5.l.1 Habitat Field Assessment Descriptions

The following tables provide the outcomes of the field assessment:

- Mammals (Table 43 and Table 44);
- Avifaunal (Table 45 and Table 46);
- Herpetofauna (Table 47 and Table 48);
- Invertebrates (Table 49 and Table 50).

Table 43: Field assessment results pertaining to mammal species within the Mine Optimisation area

Photograph Notes:

Top: Left: *Geosciurus inauris* (Ground Squirrel). Right: *Cynictis penicillata* (Yellow Mongoose). **Middle:** Left: *Raphicerus campestris* (Steenbok). Right: *Canis mesomelas* (Black-backed Jackal) scat. **Bottom:** Left: *Tragelaphus strepsiceros* (Kudu). Right: *Hystrix africaeaustralis* (Porcupine).

Mammal SCC

Species	Discussion	Threat Status	POC
Otocyon megalotis (Bat-eared Fox)	Although no records are available of this species being located within the focus area, the habitat in the natural areas surrounding the active mining sites may provide foraging grounds for this species, however breeding activity herein is unknown. Food resources appear to be abundant enough to support a pair of breeding individuals.	Protected - TOPS Specially Protected - NCNCA	M
Orycteropus afer (Aardvark)	This species has been observed in the adjacent Doornfontein property during the 2019 assessment, and as such, may occur within the focus area. If present, this species will most likely occur outside of the fenced mining footprint where habitat availability and connectivity to the surrounding farms is more suitable.	Specially Protected - NCNCA	H
Poecilogale albinucha (African Striped Weasel)	This species may occur throughout the focus area, not being limited to certain areas. This species is small enough to traverse all fences and will likely only avoid the active mining footprint.	Specially Protected - NCNCA	M
Vulpus chama (Cape Fox)	This species has been observed in the adjacent farms and as such, may occur within the focus area. If present this species will most likely occur outside of the fenced mining footprint where habitat availability and connectivity to the surrounding farms is more suitable.	Specially Protected - NCNCA Protected - TOPS	M
Ictonyx striatus (Striped Polecat)	This species may occur throughout the focus area, not being limited to certain areas. This species is small enough to traverse all fences and will likely only avoid the active mining footprint.	Specially Protected - NCNCA	M
Felis nigripes (Black-footed Cat)	This species has been observed in the adjacent farms and as such, may occur within the focus area. If present this species will most likely occur outside of the fenced mining footprint where habitat availability and connectivity to the surrounding farms is more suitable.	VU Protected - TOPS Specially Protected - NCNCA	M

General Discussion

Mammal diversity within the focus area has been notably impacted upon by the current mining activities, adjacent cattle farming and the illegal snaring activities from the adjacent communities. Large mammals were largely absent from the focus area with the exception of *Tragelaphus strepsiceros* (Kudu) as this species is wide roaming, able to jump fences, appears adaptable to areas of increased anthropogenic activities and as a strict browser, able to utilise the browse available in the SRA. Medium size mammals such as *Phacochoerus africanus* (Warthog), *Raphicerus campestris* (Steenbok) and *Hystrix africaeaustralis* (Porcupine) were evidently the most active mammals in the focus area, with spoor, burrows and direct observations being made throughout. The mesopredators *Canis mesomelas* (Black-backed Jackal) is likely the dominant predator in the focus area, although likely to occur in low abundances, utilising not only the focus area but the surrounding natural areas as well. Small species such as *Geosciurus inauris* (Ground Squirrel), *Cynictis penicillata* (Yellow Mongoose), *Procavia capensis* (Rock Dassie), *Tatera leucogaster* (Bushveld Gerbil), *Micaelamys namaquensis* (Namaqua Rock Mouse), *Elephantulus* sp. (Elephant Shrew), *Saccostomus campestris* (Pouched Mouse), *Mastomys coucha* (Southern Multimammate Mouse) and *Gerbillurus paeba* (Hairy-footed Gerbil) will occur throughout the more intact areas of the focus area. Additionally, these small species form a base food resource for mesopredators, raptors as well as predatory snakes.

Although the focus area retains a natural setting around the current mining footprint, the large fence surrounding the SRA limits species movement, notably larger mammals, to and from this area and the surrounding areas. Smaller mammals can more easily move through this fence structure, with several diggings identified underneath the fence, and as such are less inhibited in terms of movement and habitat access. It is noted that the region has been experiencing a sustained and abnormal dry period, leading to decreased food resources within the focus area noted during the 2019 and 2020 surveys. Prior to the 2021 survey, the region received above average rainfall which resulted in an increased rate of recovery of the vegetation and an increase in available food resources, though there still remained a low diversity and abundance of mammal species at the time of the survey. With time and given the resurgence of vegetation (food resources), it is probable that mammal species abundance and diversity levels will begin to recover, however this is largely dependent on future good rains and habitat recovery. At present, the seasonal depressions and cryptic wetlands provide temporary sources of surface water, but also increased vegetation growth (food resource). This increase in vegetation and water naturally attracts herbivorous species to these localities, and likewise the mesopredators will follow. As such, the watercourse and non-watercourse habitats are of increased ecological importance in the greater landscape.
Conclusion
The screening tool did not associate any sensitive or important mammals with the focus area, however following the site assessment, it is considered likely that six SCC (as listed in this table) have a medium to high probability of utilising the focus area. The fenced active mining area is likely only used for foraging whilst the western and south-western portions of the focus area located outside the active mine fence may possibly be use for breeding and more permanent habitation. Overall, the mammal abundance and diversity of the focus area was lower the expected, most likely attributable to the current and past land use activities, which has further been compounded by an extended dry period in which food resources declined and many mammal species either moved further out into the surrounding landscape in search of available resources or deceased. The planned mining activities will result in the loss of habitat and consequently a further decrease in species diversity and abundance within the local setting. Many of the mammal species will likely relocate into the surrounding natural habitats, whilst several of the smaller species may be able to continue inhabiting the areas amongst the mining footprints, albeit at lower abundance levels.

Table 44: Field assessment results pertaining to mammal species within the Railway Line area

Photograph Notes:

Top: Left: *Cynictis penicillata* (Yellow Mongoose). Right: *Cryptomys hottentotus* (Common Mole-rat) mounds. **Bottom:** Multitude of spoor observed along the edge of the ephemeral drainage line. Spoor observed in this area include: *Phacochoerus africanus* (Warthog), Domestic Goats and *Raphicerus campestris* (Steenbok).



Mammal SCC

Species	Discussion	Threat Status	POC
Otocyon megalotis (Bat-eared Fox)	Although not recorded within the Railway Line Link Project or associated buffer, individuals may forage within the area.	Protected - TOPS Specially Protected - NCNCA	M
Orycteropus afer (Aardvark)	This species has been observed in the adjacent Doornfontein property during the 2019 assessment, and as such, may occur within the focus area. If present, this species will most likely only use the Railway Line Link Project for foraging.	Specially Protected - NCNCA	M
Poecilogale albinucha (African Striped Weasel)	This species may occur on an ad hoc basis throughout the extent of the Railway Line Link Project, predominantly whilst foraging, not being limited to certain areas. This species is small enough to traverse all fences.	Specially Protected - NCNCA	M
Vulpus chama (Cape Fox)	This species has previously been observed in the adjacent farms. If present this species will most likely only forage herein.	Specially Protected - NCNCA Protected - TOPS	M
Ictonyx striatus (Striped Polecat)	This species may occur throughout the Railway Line Link Project, not being limited to certain areas. This species is small enough to traverse all fences and will likely move in and out of the habitats whilst foraging.	Specially Protected - NCNCA	M
Felis nigripes (Black-footed Cat)	This species is known to occur in the surrounding areas and although it is unlikely to breed within the area associated with the Railway Line Link Project, it may traverse these areas whilst foraging,	VU Protected - TOPS Specially Protected - NCNCA	M

General Discussion

Mammal diversity within the Railway Line Link Project was low, predominantly as the railway route traverse areas previously disturbed from the construction and operation of roads, the airport and the current rail network. Medium size mammals such as *Phacochoerus africanus* (Warthog) and *Raphicerus campestris* (Steenbok) were evidently the most active mammals along the Railway Line Link Project, with spoor and direct observations being made. The mesopredator *Canis mesomelas* (Black-backed Jackal) is likely to forage along the proposed route as well. Small species such as *Geosciurus inauris* (Ground Squirrel), *Cynictis penicillata* (Yellow Mongoose), *Tatera leucogaster* (Bushveld Gerbil) *Elephantulus* sp. (Elephant Shrew), *Saccostomus campestris* (Pouched Mouse), *Mastomys coucha* (Southern Multimammate Mouse) and *Gerbillurus paeba* (Hairy-footed Gerbil) are also likely to occur within the habitats associated with the Railway Line Link Project. Additionally, these small species form a base food resource for mesopredators, raptors as well as predatory snakes.

The Railway Line Link Project traverses various sections of the SRA which has fences located at several location, limiting large mammal movement. Smaller mammals can more easily move through this fence structure, with several diggings identified underneath the fences, and as such are less inhibited in terms of movement and habitat access. Food resources appear sufficient, yet not abundant, for small and medium size mammals observed and expected, and as such, they will have to utilize areas outside of the Railway Line Link Project to ensure that they maintain sufficient energy intake. The section of property between the eastern railway line and the airport is also used to graze horses, which although not at high intensity, does increase resource competition amongst grazers.

Conclusion

The screening tool did not associate any sensitive or important mammals with the focus area, however following the site assessment, it is considered possible that six SCC (as listed in this table) have a medium probability of utilizing the habitat associated with the Railway Line Link Project.

Overall, the mammal abundance and diversity associated with the Railway Line Link Project was low, most likely attributable to the current and past land use activities, which has further been compounded by an extended dry period in which food resources declined and many mammal species either moved further out into the surrounding landscape in search of available resources or succumbed. The proposed Railway Line Link Project will result in a loss in the loss of habitat along its length whilst contributing to habitat fragmentation, and consequently a further decrease in species diversity and abundance. Many of the mammal species will likely relocate into the surrounding natural habitats with limited impacts to the population numbers.

Table 45: Field assessment results pertaining to avifaunal species within the Mine Optimisation Project

Photograph Notes:

Top: Left: *Philetairus socius* (Sociable Weaver). Right: Sociable Weavers nest. **Middle:** Left: *Mirafra fasciolata* (Fawn-coloured Lark). Right: *Mirafra sabota* (Sabota Lark). **Bottom:** Left: *Alopochen aegyptiacus* (Egyptian Goose). Right: *Anas capensis* (Cape Teal).

Mammal SCC

Species	Discussion	Threat Status	POC
Ardeotis kori (Kori Bustard	This species was observed foraging within the southern portion of the focus area in the Calcrete Shrubland Habitat. It is likely that this species will make wide use of this habitat unit as well as the surrounding Open Thornveld Habitat. It is possible that this species may utilise the focus area for breeding, although no breeding pairs, only an individual was observed.	VU - TOPS	Confirmed
Neotis ludwigii (Ludwig's Bustard)	This species has been recorded in the SABAP pentad 2820_2255 in 2017. This species will likely favour the Calcrete Shrubland and Thornveld Habitats within the focus area. Although not observed on site, this species distribution encompasses the focus area and given sufficient food resources, may inhabit the less impacted areas of the focus area.	VU – TOPS EN - IUCN Specially Protected - NCNCA	M
Sagittarius serpentarius (Secretarybird)	This species will likely favour the Calcrete Shrubland and Thornveld Habitats within the focus area. Although not observed on site, this species distribution encompasses the focus area and given sufficient food resources, may inhabit the less impacted areas of the focus area. Although there are currently no recordings of this species within the pentads associated with the focus area, the habitat is considered suitable, and it is possible that individuals may utilise the focus area for foraging.	EN - IUCN Specially Protected - NCNCA	M

General Discussion

Avifaunal species were well represented within the focus area, with species diversity being largely commensurate with observations as per the corresponding pentads on the South African Bird Atlas Project. The varying habitats within the focus area, spanning the Open and Encroached Thornveld, Rocky outcrops and Watercourse Habitats provided a good heterogenous vegetation structure that several avifauna can make use of. Species observed on site, not including the ones listed above, include: *Streptopelia capicola* (Cape turtledove), *Pycnonotus nigricans* (Red-eyed bulbul), *Laniarius astrococcineus* (Crimson-breasted shrike), *Prinia masulosa* (Karoo prinia), *Sylvietta rufescens* (Long-billed crombec), *Ardeotis kori* (Kori Bustard, VU), *Pterocles Namaqua* (Namaqua Sandgrouse), *Rhinoptilus africanus* (Double-banded Courser) and *Afrotis afraoides* (Northern Black Korhaan). Ground dwelling birds (bustards, korhaans, larks and coursers) all appeared to favour the more open habitat areas whilst the dense thornveld areas and rocky outcrops were predominantly inhabited by smaller species that select for these areas. Waterfowl and bird's dependant on water were restricted to the cryptic wetlands and seasonal depressions that contained water post heavy rainfall. These habitats provide temporary high forage resources for wading and other birds following periods of high rainfall.

Overall, large areas of the focus area have been impacted upon as a result of mining activities and prospecting. This has resulted in fragmentation of the available habitats and a potential discontinuity in flight paths, notably for smaller birds. The focus area is considered to have an intermediate amount of forage for avian species due to the impacts mining as well as the general arid nature of the environment, notably for granivorous species. During the summer months the overall food resource production of the herbaceous layer does increase, especially for granivorous species, and a higher abundance of avifauna can be supported. Additionally, the summer months will see an increase in insect abundance which provides an energy rich source of food for many avifaunal species. This increase is likely mimicked by an increase in small mammals as well as lizards and skinks which are an important food resource for raptors and some smaller bird species.

Conclusion

Although a large contingent of common avifaunal species assemblage was observed, only three SCC have a high probability of utilising the focus area. Two of these SCC may utilise the focus area for breeding, namely: *Ardeotis kori* (Kori Bustard) and *Neotis ludwigii* (Ludwig's Bustard). Overall, species abundance levels will vary within the focus area in accordance with rainfall and seasonal changes and their effect on available food resources, with some avifaunal species migrating north during the winter months.

Clearing of vegetation for the proposed mine expansion will have a direct impact on habitat availability within the focus area, leading to localised migration of many avifaunal species to adjacent habitats outside that of the proposed mining footprints as well as to areas outside of the focus area. Species that relocate into the surrounding areas will be subject to higher levels of competition for food resources and space which may lead to further species displacement and potentially, species loss. Some more adaptable species will likely continue to occur within the active mining footprints, utilising the modified areas in conjunction with the small patches of habitat that are likely to remain between the various mining footprints.

Table 46: Field assessment results pertaining to avifaunal species within the Railway Line Area

<table>
<tr><th>Photograph Notes:</th><th colspan="4">Mammal SCC</th></tr>
<tr><td rowspan="4">Top: Left: Left: Mirafra fasciolata (Fawn-coloured Lark). Right: Mirafra sabota (Sabota Lark). Bottom: Left: Euplectes orix (Southern Red Bishop). Right: Prinia flavicans (Black-chested Prinia).
</td><td>Species</td><td>Discussion</td><td>Threat Status</td><td>POC</td></tr>
<tr><td>Ardeotis kori (Kori Bustard</td><td>This species has been observed foraging within the southern portion of the SRA during the field assessments for the mine expansion EIA. It is possible that this species may forage within the habitat, which is traversed by the Railway Line Link Project, though it is unlikely to breed herein.</td><td>VU - TOPS</td><td>M</td></tr>
<tr><td>Neotis ludwigii (Ludwig's Bustard)</td><td>This species has been recorded in the SABAP pentad 2820_2255 in 2017. This species will likely favour the Calcrete Shrubland and Open Thornveld Habitats for foraging activities, but is unlikely to permanently utilise the associated areas.</td><td>VU – TOPS
EN - IUCN
Specially Protected - NCNCA</td><td>M</td></tr>
<tr><td>Sagittarius serpentarius (Secretarybird)</td><td>This species, should it occur in the habitats, will likely favour the Calcrete Shrubland and Open Thornveld Habitats within the focus area. This species is likely to only forage herein and not breed or reside permanently.</td><td>EN - IUCN
Specially Protected - NCNCA</td><td>L</td></tr>
<tr><th colspan="5">General Discussion</th></tr>
<tr><td colspan="5">Avifaunal species abundance and diversity along the Railway Line Link Project was relatively low. Although the habitat units provide suitable and varying vegetative structure for avifauna, it appears that many species have selected for the natural areas further away from the proposed Railway Line Link Project. The low abundance observed may be attributed to the existing anthropogenic activities in the area but is more likely attributable to the fact that the surrounding natural areas likely provide increased mating opportunities, habitat and food resources as they are located further away from any disturbance activities. Species observed on site, not including the ones listed above, include: Streptopelia capicola (Cape turtledove), Pycnonotus nigricans (Red-eyed bulbul), Prinia masulosa (Karoo Prinia), Pterocles Namaqua (Namaqua Sandgrouse) and Afrotis afraoides (Northern Black Korhaan). Ground dwelling birds (bustards, korhaans, larks and coursers) will favour the more open habitat areas. Avifauna that are dependent or actively select for water bodies were restricted to the anthropogenically derived drainage line were water collects, as well as the seasonal depression when water is present therein. The seasonal depression additionally may provide temporary high forage resources for wading and other birds following periods of high rainfall.</td></tr>
</table>

<table>
<tr><td>Overall, several areas which the Railway Line Link Project traverses have been disturbed, resulting in fragmentation of the available habitats and loss of habitat for avifauna. The habitats are considered to have an intermediate amount of forage for avian species due general arid nature of the environment and previous habitat disturbances. During the summer months the overall food resource production of the herbaceous layer does increase, especially for granivorous species, and a higher abundance of avifauna can be supported. Additionally, the summer months will see an increase in insect abundance which provides an energy rich source of food for many avifaunal species. This increase is likely mimicked by an increase in small mammals as well as lizards and skinks which are an important food resource for raptors and some smaller bird species.</td></tr>
<tr><td>Conclusion</td></tr>
<tr><td>Only common avifaunal species were observed along the proposed Railway Line Link Project, whilst the remains the potential that three SCC may utilise the associated habitats for foraging. Overall, species abundance levels will vary within the Railway Line Link Project in accordance with rainfall and seasonal changes and these effect on available food resources, with some avifaunal species migrating north during the winter months.
Clearing of vegetation along the Railway Line Link Project will impact on habitat availability, leading to highly localised migration of avifaunal species to adjacent habitats outside that of the proposed footprint as well as to areas further way. Species that relocate into the surrounding areas will be subject to higher levels of competition for food resources and space which may lead to further species displacement and potentially, species loss. Many of the species observed during the field assessment will likely remain in the area, as they appear to be well adapted to the already existing mine operations, road noise and active railways already present.</td></tr>
</table>

Table 47: Field assessment results pertaining to herpetofauna species within the Mine Optimisation Project

<table>
<tr><th>Photograph Notes:</th><th>Discussion</th></tr>
<tr><td>Top: Left: Pedioplanis lineoocellata (Spotted Sand Lizard). Right: Trachylepis spilogaster (Kalahari Tree Skink). Middle: Left: Kassina senegalensis (Bubbling Kassina) tadpole). Right: Kassina senegalensis (Bubbling Kassina) metamorphosising to the adult stage. Bottom: Left: Stigmochelys pardalis (Leopard Tortoise). Right: Cryptic Wetland.
</td><td>No Amphibian or Reptile SCC were observed within the focus area during the assessments. Further, consultation of the various databases such as the Animal Demography Units Virtual Museum and iNaturalist also indicated no previous records of any herpetofauna SCC. The arid nature of the focus area naturally limits amphibian diversity, yet it will be favoured by reptiles who are generally physiologically well adapted for such climates. The cryptic wetlands and depressions that do occur within the focus area will only be filled temporarily for a short period of time during times of high rainfall and present ideal localities for amphibians to breed within. Overall amphibian diversity, conferred with the online databases indicates a low expected species composition, with only less water dependant species such as Kassina senegalensis (Bubbling Kassina) (observed), Vandijkophrynus gariepensis (Karoo Toad), Sclerophrys poweri (Power's Toad), Tomopterna cryptotis (Tremelo Sand Frog) and Breviceps adspersus (Bushveld Rain Frog) expected to occur within the focus area. Food resources around the wetlands and depressions is likely to be sufficient for amphibian species due to the increased abundance of insect species surrounding these localities, however this will be temporary and seasonal, with the remaining periods of the year noting a decrease in food resources. During this time, it is likely that most amphibian species will go into a state of aestivation or limited activity, either burrowing down into the ground or seeking shelter under larger logs or rocks in the vicinity of these temporary water bodies.

Several reptile species were observed during the field assessments, ranging from the small skinks, to larger predaotry snakes and tortoises. Nucras intertexta (Spotted Sandveld Lizard) and Pedioplanis lineoocellata lineoocellata (Spotted Sand Lizard) were observed on many ocasions, whilst Agama aculeata aculeata (Common Ground Agama) appeared to be less abundant. A single Bitis arietans arietans (Puff Adder) was observed on site during the 2021 assessment. It is important to remember that reptiles are inherently secretive and shy, making their detection and identification in the field challenging. As such, based on the available databases, habitat availability and the databses, the focus area is likely to have a moderate diversity of common reptile species which are well represented in the region. Reptile species are likely to make use of all habitat units, with many of the skinks being closely associated with the areas of infrastructure as they appear to be highly adaptable to modified environments. Food reources for reptiles will follow a cyclical nature, with prey species (invertebrates and small mammals) numbers being determined by seasons and similarly, the vegetation growth/decline accompanying such changes.</td></tr>
<tr><td></td><td>Conclusion</td></tr>
<tr><td></td><td>Reptiles are well adapted to surviving in arid areas and as such, are often some of the only species inhabiting these areas. Likewise, reptiles can adapt to modified environments more readily than other species, provided there are suitable food resources available. Conversely, amphibian species are not well suited to such environments and often are some of the first species to decline in changing environments (through loss of water resources as well as changes to water quality). Many of the reptiles will be able to self-relocate ahead of mining expansion activities, however amphibian species cannot do so as readily, notably those that are more dependent on being located nearby to areas of increased moisture. Mining expansion and the loss of the depressions and cryptic</td></tr>
</table>

 	wetlands will have a significant impact on amphibian species, likely leading to the loss individuals in the focus area who rely on these habitats. Reptile species will likely be able to exist within or adjacent to these areas (albeit at lower abundances) or relocate to the surrounding natural areas ahead of the mine expansion.

Table 48: Field assessment results pertaining to herpetofauna species within the Railway Line Area

Photograph Notes:	**Discussion**
Top: Left: *Pedioplanis lineoocellata lineoocellata* (Spotted Sand Lizard). Right: *Stigmochelys pardalis* (Leopard Tortoise). **Botton:** anthropogenically derived drainage line containing water.   	No amphibian or reptile SCC were observed within the Railway Line Link Project during the assessments. Further, consultation of the various databases such as the Animal Demography Units Virtual Museum and iNaturalist also indicated no previous records of any herpetofauna SCC. The arid nature of the Railway Line Link Project naturally limits amphibian diversity, yet it will be favoured by reptiles who are generally physiologically well adapted for such climates. The drainage line presents an ideal locality for amphibians to breed within, as it appears to hold water all year round due to water discharge from the mine (although water quality ma impact suitability of this water source). Overall amphibian diversity, conferred with the online databases indicates a low expected species composition, with only less water dependant species such as *Kassina senegalensis* (Bubbling Kassina) (observed) in anthropogenically derived drainage line, *Vandijkophrynus gariepensis gariepensis* (Karoo Toad), *Sclerophrys poweri* (Power's Toad), *Tomopterna cryptotis* (Tremelo Sand Frog) and *Breviceps adspersus* (Bushveld Rain Frog) expected to occur within the Railway Line Link Project. Food resources around the anthropogenically derived drainage line and seasonal depressions are likely to be sufficient for amphibian species due to the increased abundance of insect species surrounding these localities, however this will be seasonal, with the remaining periods of the year noting a decrease in food resources. During this time, it is likely that most amphibian species will go into a state of aestivation or limited activity, either burrowing down into the ground or seeking shelter under larger logs or rocks in the vicinity of these habitats. A low diversity and abundance of reptile species were observed along the proposed Railway Line Link Project, with the majority of species observed being the smaller Sandveld and Sand Lizards - *Nucras intertexta* (Spotted Sandveld Lizard) and *Pedioplanis lineoocellata lineoocellata* (Spotted Sand Lizard) which were observed on many occasions, whilst *Agama aculeata aculeata* (Common Ground Agama) and an individual as well as a Leopard Tortoise was only observed once. It is important to remember that reptiles are inherently secretive and shy, making their detection and identification in the field challenging. As such, based on the available databases, habitat availability
Conclusion	

Reptiles are well adapted to surviving in arid areas and as such, are often some of the only species inhabiting these areas. Likewise, reptiles can adapt to modified environments more readily than other species, provided there are suitable food resources available. Conversely, amphibian species are not well suited to such environments and often are some of the first species to decline in changing environments (through loss of water resources as well as changes to water quality). Many of the reptiles will be able to self-relocate as habitat is cleared, however amphibian species cannot do so as readily, notably those that are more dependent on being located nearby to areas of increased moisture. Should the anthropogenically derived drainage line be disturbed and water flow cease, this will have a significant impact on amphibian species, likely leading to the loss individuals herein who rely on this habitat. Reptile species will likely be able to exist within or adjacent to these areas or relocate to the surrounding natural areas ahead of construction activities.

and the databases, the Railway Line Link Project is likely to support a moderate diversity of common reptile species which are well represented in the region. Reptile species are likely to make use of all habitat units, with many of the skinks being closely associated with the areas of infrastructure as they appear to be highly adaptable to modified environments. Food resources for reptiles will follow a cyclical nature, with prey species (invertebrates and small mammals) numbers being determined by seasons and similarly, the vegetation growth/decline accompanying such changes.

Table 49: Field assessment results pertaining to invertebrate species within the Mine Optimisation Area

Photograph Notes:

Top: Left: *Acanthoplus discoidalis* (Brown Armoured Corncricket). Right: *Anacridium moestum* (Tree Locust). **Middle:** Left: *Uroplectes carinatus* (Common Lesser-thicktail). Right: *Africallagma glaucum* (Swamp Bluet). **Bottom:** Left: Possible *Pterinochilus* sp burrow (Golden-brown Baboon Spider). Right: *Parabuthus granulatus* (Rough Thicktail).

Mammal SCC

Species	**Discussion**	**Threat Status**	**POC**
Pterinochilus spp Potential burrow: 28°20'21.80"S 22°59'35.92"E	A potential burrow of the species was observed adjacent to the waste rock dump in the southern western of the focus area. Species of this genus dig vertical burrows in sandy soil where the either lay in wait for prey species or come out at night and hunt.	Specially Protected – NCNCA	H
Ceratogyrus spp and *Harpactira* spp	Although there are no records of species from either genus occurring within the focus are or surrounds, there remains a possibility that individuals may still inhabit the focus area, predominantly in the western and south western portions of the focus area, outside of the direct mining footprint.	Specially Protected – NCNCA Protected - TOPS	L
Hadogenes spp and *Opisthacanthus* spp	Although there are no records of species from either genus occurring within the focus are or surrounds, there remains a possibility that individuals may still inhabit the focus area, predominantly in the western and south western portions of the focus area, outside of the direct mining footprint.	Protected – NCNCA Protected - TOPS	L
Opistopthalmus spp	Species from this genus have been recorded in the region of Postmasburg. Similar habitat presents within the focus area and as such there is an increased likelihood that species from this genre may occur within the focus area.	Protected – NCNCA Protected - TOPS	M


Photographs:

Image left illustrates rocky habitat under a *Boscia* sp favoured by many protected scorpions and potential baboon spiders. Image right illustrates the open sandy area where the baboon spider burrow was observed.


General Discussion

Although the focus area is located in the more arid, western portion of South Africa, a relatively high abundance of invertebrates was observed. Insect species of the Orders Coleoptera, Orthoptera and Lepidoptera were dominant throughout, however the diversity within these orders was not high. This may be as a result of the extended dry period through which the more sensitive / niche insect species did not survive, as well as the fact that the arid landscape perpetuates the accordance of only the hardier and often more generalist species. Generalist species observed have the ability to utilise various plants as food resources, an important adaptation for arid environment survival. Insects are generally the most abundant macro-organisms within landscapes and often perform services vitally important for ecosystem functioning. Therefore, high insect abundance and diversity can indicate a healthy landscape. Insects serve as pollinators, remove detritus material, bury dung and associated parasites below the surface helping to cycle nutrients back into the soil while decreasing the parasitic load within an environment, reducing the risk of disease. Additionally, insects serve as a food resource for various fauna within the focus area, and as such an increased insect diversity and abundance within the focus area buffers forage sustainability for other faunal species as well as helps to maintain ecosystem functioning.

Several Nymphalidae (Monarch butterflies) and Lycaenidae (Coppers and Blues), which are all protected within the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) are known to occur within the area. The habitat integrity of the focus area for insects is considered moderately high. Although habitat transformation has occurred within the focus area the remaining habitats are largely still inhabitable for insects with food resources varying for different insect orders in accordance with the vegetation and season.

Arachnid species are notoriously hard to detect over a relatively short period of time, which can often lead to the under estimation of diversity and abundance. Taking this into consideration, habitat conditions for arachnids as well as available resources were analysed, whilst additional information on arachnid occurrences and species diversity for the QDS was collected from databases such as iNaturalist and the Animal Demography Unit (ADU). Several funnel-webs, spiders and scorpions were observed during the site assessment. The general habitat supplemented with the observations recorded on the site suggest that the focus area is likely to be inhabited by an abundance of scorpion and spider species, albeit by the more common species who are well adapted to arid environments as well as tolerant to increased ground vibrations as a result of mining activities. The varying landscape of the focus area, with rocky outcrops and lowland thornveld areas of varying density provide habitat for an increased breadth of arachnid species. Many arachnid species only venture out during the safety of night when they can avoid desiccation from the sun, opting to seek refuge under rocks, bark and dead trees during the day. Arachnid species are predatory, preying predominantly on invertebrates and in some instance small reptiles and rodents. Although the focus area was abundant in insect species, many of these were flying and largely arboreal species, limiting actual food availability to ground dwelling arachnids such as scorpions. Further, such food resources are cyclical in nature, commensurate with the seasons, which will, to a degree, inhibit arachnid populations in the focus area. Arachnids observed, apart from those listed above, include Family Agelenidae (Funnel Weaving Spiders), *Argiope australis* (Common Garden Orbweb Spider) and Genus *Thanatus* (Spider).

Conclusion

The focus area, with varying landscapes and potential areas of habitat will likely support an abundance of invertebrate species, however, due to the arid nature of the region, the diversity thereof will be limited to species that are well adapted to such conditions. Due to the extended dry period experienced up until late 2020, invertebrate assemblages, although well represented for the region, likely still have to fully recover. The proposed mine expansion activities will impact invertebrates as a result of extensive habitat loss, particularly the niche depressions and cryptic wetlands. Expanding mining activities will further lead to increased vibration disturbances in areas that currently do not experience such, which may be unfavourable to ground dwelling arachnids who rely on subtle vibrations to detect prey. Such hinderances to hunting may result in these species relocating to more suitable areas further away, decreasing species abundances and diversity in the focus area. Additionally, night-time lights from operations are likely to attract insects to the operations area, leading to potential increase in mortality rates as well as disruption of night-time navigation for insects that utilise the moon and / or stars as navigation tools as the lights out shine or mimic the moon and starlight.

Table 50: Field assessment results pertaining to invertebrate species within the Railway Line Area

Photograph Notes:	**Mammal SCC**			
Top: Left: *Acanthoplus discoidalis* (Brown Armoured Corncricket). Right: *Chilades trochylus* (Grass Jewel Blue). **Bottom:** Left: *Acmaeodera viridaenea* (Glittering Jewel Bug). Right: *Uroplectes carinatus* (Common Lesser-thicktail).	**Species**	**Discussion**	**Threat Status**	**POC**
	*Pterinochilus* spp	Species of this genus dig vertical burrows in sandy soil where the either lay in wait for prey species or come out at night and hunt. Suitable sandy substrate for burrowing activities was observed along the Railway Line Link Project route.	Specially Protected – NCNCA	M
	Ceratogyrus spp and *Harpactira* spp	Although there are no records of species from either genus occurring within the focus are or surrounds, there remains a possibility that individuals may still occur along the Railway Line Link Project.	Specially Protected – NCNCA Protected - TOPS	L
	Hadogenes spp and *Opisthacanthus* spp	Although there are no records of species from either genus occurring within the focus are or surrounds, there remains a possibility that individuals may still occur along the Railway Line Link Project.	Protected – NCNCA Protected - TOPS	L
	Opistopthalmus spp	Species from this genus have been recorded in the region of Postmasburg. Similar habitat presents within the Railway Line Link Project and as such there is an increased likelihood that species from this genre may occur within the focus area.	Protected – NCNCA Protected - TOPS	M

General Discussion

Although the Railway Line Link Project is located in the more arid, western portion of South Africa, a relatively high abundance of invertebrates was observed. Insect species of the Orders Coleoptera, Orthoptera and Lepidoptera were observed along the entire length of the Railway Line Link Project, though the overall diversity therein was not notably high. The extended dry period which has recently been experienced may have led to the deaths and under-recovery of the more sensitive / niche insect species, leaving the generalist species to proliferate. Generalist species observed have the ability to utilize various plants as food resources, an important adaptation for arid environment survival. Insects are generally the most abundant macro-organisms within landscapes and often perform services vitally important for ecosystem functioning. Therefore, high insect abundance and diversity can indicate a healthy landscape. Insects serve as pollinators, remove detritus material, bury dung and associated parasites below the surface helping to cycle nutrients back into the soil while decreasing the parasitic load within an environment, reducing the risk of disease. Additionally, insects serve as a food resource for various fauna within the focus area, and as such an increased insect diversity and abundance within the focus area buffers forage sustainability for other faunal species as well as helps to maintain ecosystem functioning.

Several Nymphalidae (Monarch butterflies) and Lycaenidae (Coppers and Blues), which are all protected within the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) are known to occur within the area. The habitat integrity of the study area for insects is considered moderately high. Although habitat transformation has occurred the remaining habitats are largely still inhabitable for insects with food resources varying for different insect orders in accordance with the vegetation and season.

Arachnid species are notoriously hard to detect over a relatively short period of time, which can often lead to the under estimation of diversity and abundance. Taking this into consideration, habitat conditions for arachnids as well as available resources were analysed, whilst additional information on arachnid occurrences and species diversity for the QDS was collected from databases such as iNaturalist and the Animal Demography Unit (ADU). During the site assessment, only a small number of arachnid species were observed, considering the apparent suitability of the habitat. The relatively similar landscape of the Railway Line Link Project provides suit bake habitat for several common arachnids and potential SCC. Many arachnid species only venture out during the safety of night when they can avoid desiccation from the sun, opting to seek refuge under rocks, bark and dead trees during the day. Arachnid species are predatory, preying predominantly on invertebrates and in some instance small reptiles and rodents. Although the Railway Line Link Project was abundant in insect species, many of these were flying and largely arboreal species, limiting actual food availability to ground dwelling arachnids such as scorpions and ground hunting spiders. Further, such food resources are cyclical in nature, commensurate with the seasons, which will, to a degree, inhibit arachnid populations in the focus area. Arachnids observed, apart from those listed above, include Family Agelenidae (Funnel Weaving Spiders), *Argiope australis* (Common Garden Orbweb Spider) and Genus *Thanatus* (Spider).

Conclusion
The proposed Railway Line Link Project will likely support an abundance of invertebrate species, however, due to the arid nature of the region, the diversity thereof will be limited to species that are well adapted to such conditions. Due to the extended dry period experienced up until late 2020, invertebrate assemblages, although well represented for the region, likely still have to fully recover. The proposed Railway Line Link Project construction will impact invertebrates as a result of habitat loss and species displacement. The railway may also lead to increased vibration disturbances in surrounding habitats, which may be unfavourable to ground dwelling arachnids who rely on subtle vibrations to detect prey. Such hinderances to hunting may result in these species relocating to more suitable areas further away, decreasing species abundances and diversity in the surrounding habitat. Overall, although the habitat supports an abundance of invertebrates, the proposed Railway Line Link Project development is unlikely to pose a significant negative impact to vertebrate species.

2.e.iii.5.m Faunal Sensitivity Mapping

The following figures conceptually illustrate the faunal ecological sensitivity for the various areas. The areas are depicted according to their sensitivity in terms of the presence or potential for faunal SCC, habitat integrity, levels of disturbance and overall levels of diversity. Please refer to Section 4 of Part C, in Annexure 7 for the detailed assessment of the Mine Optimisation Project and Section 6 of the Railway Line Ecological Study, in Annexure 7.

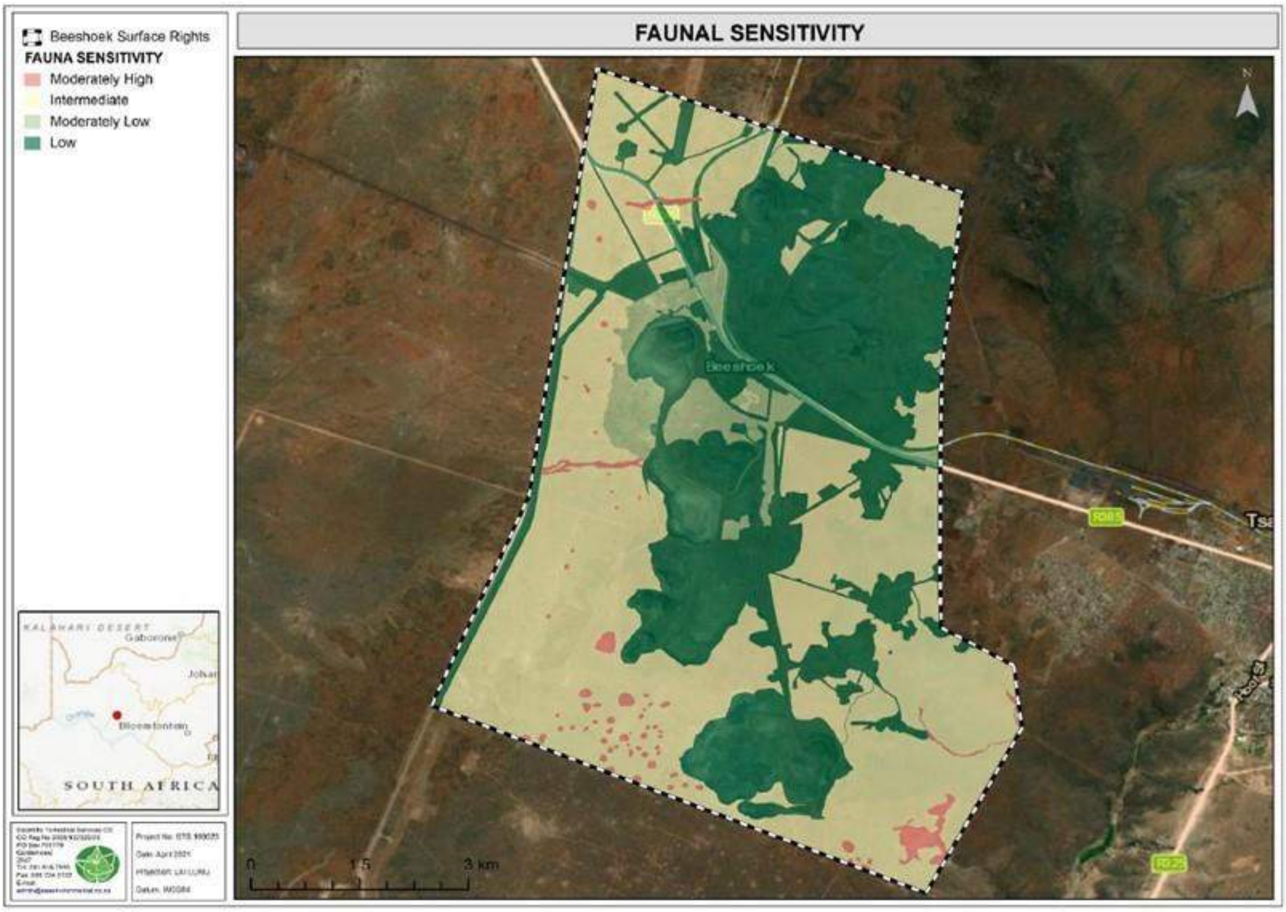


Figure 70: Faunal sensitivity map for the Beeshoek Mine

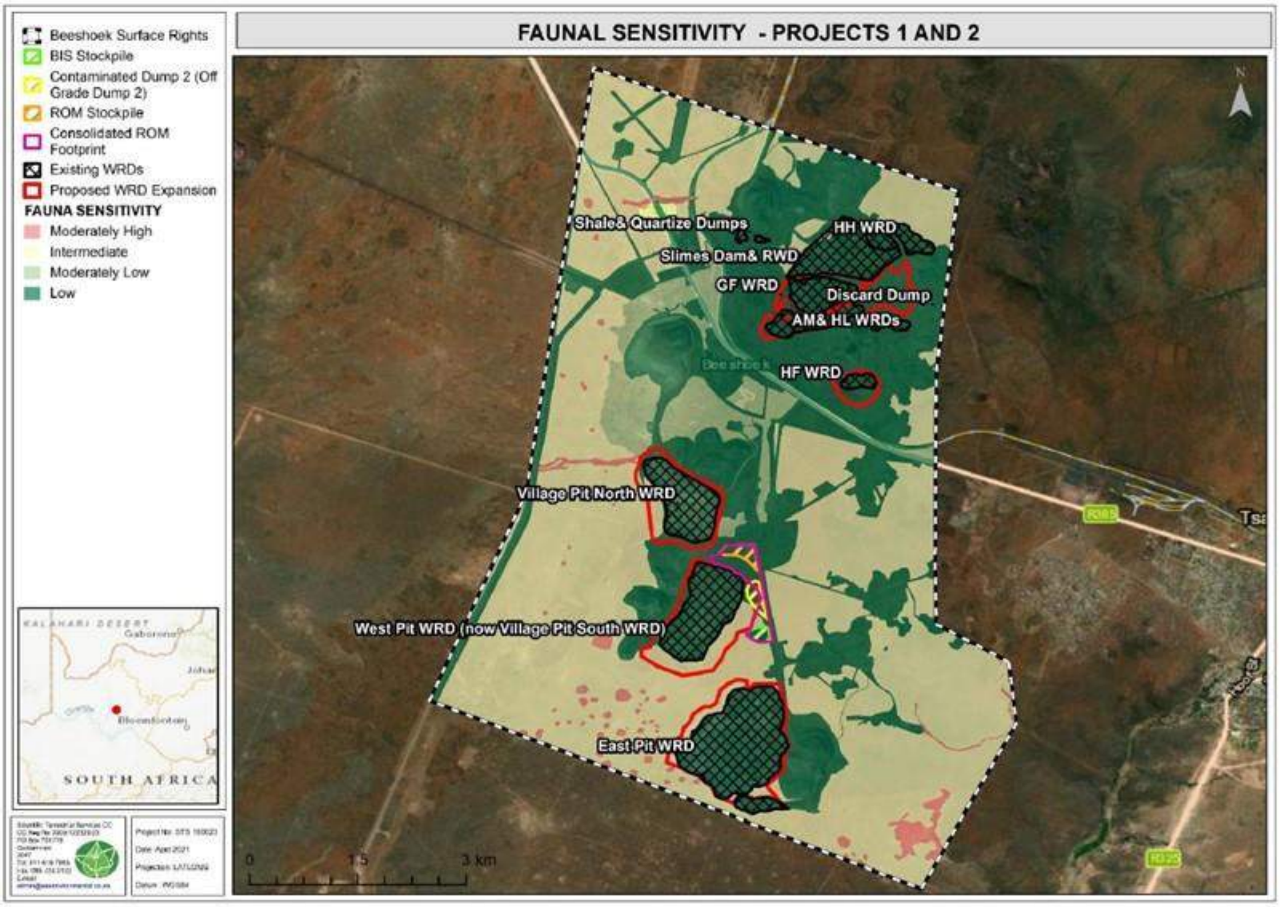


Figure 71: Faunal sensitivity map for the Beeshoek Mine with the proposed Projects 1 and 2 superimposed on the habitat sensitivities

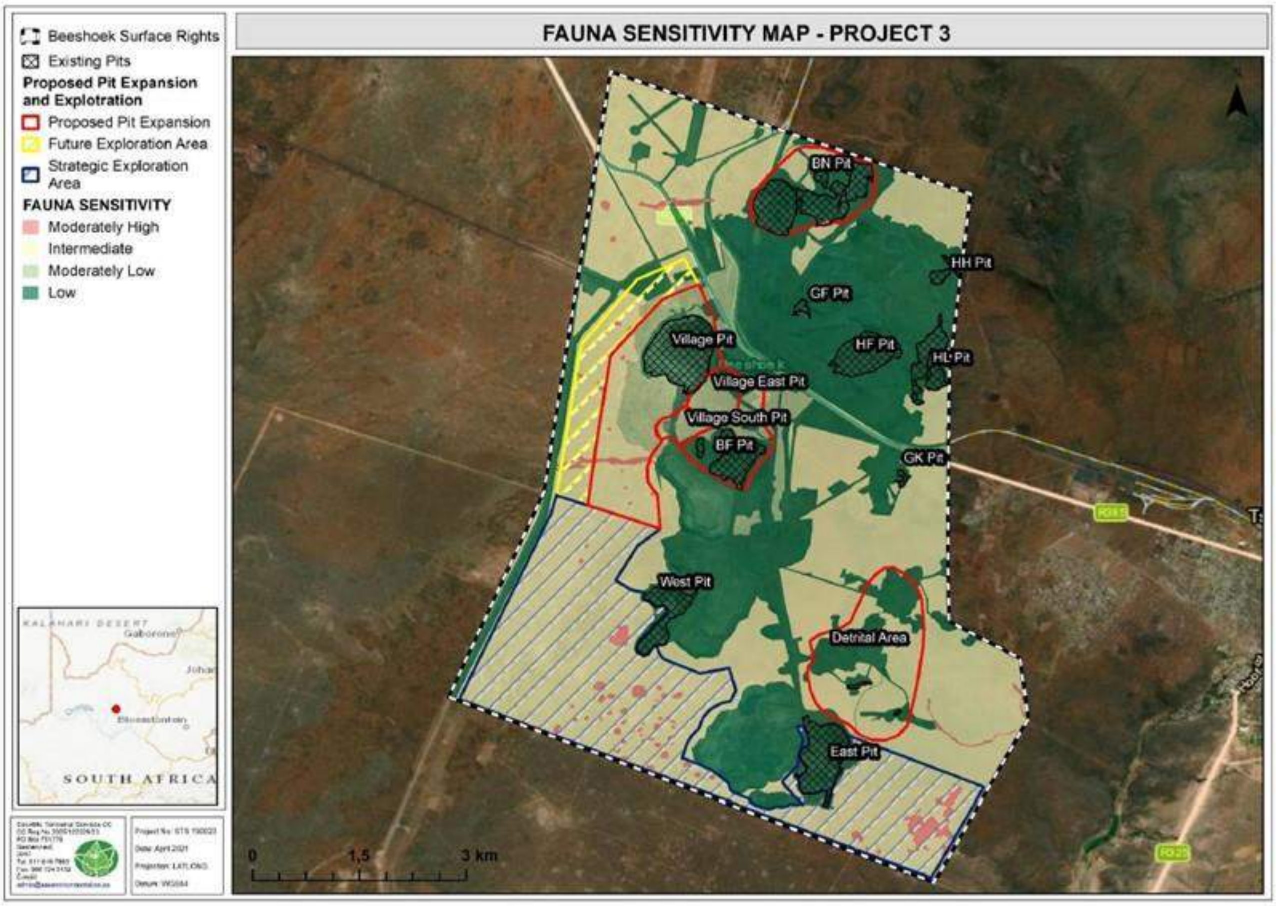


Figure 72: Faunal sensitivity map for the Beeshoek Mine with the proposed Project 3 superimposed on the habitat sensitivities

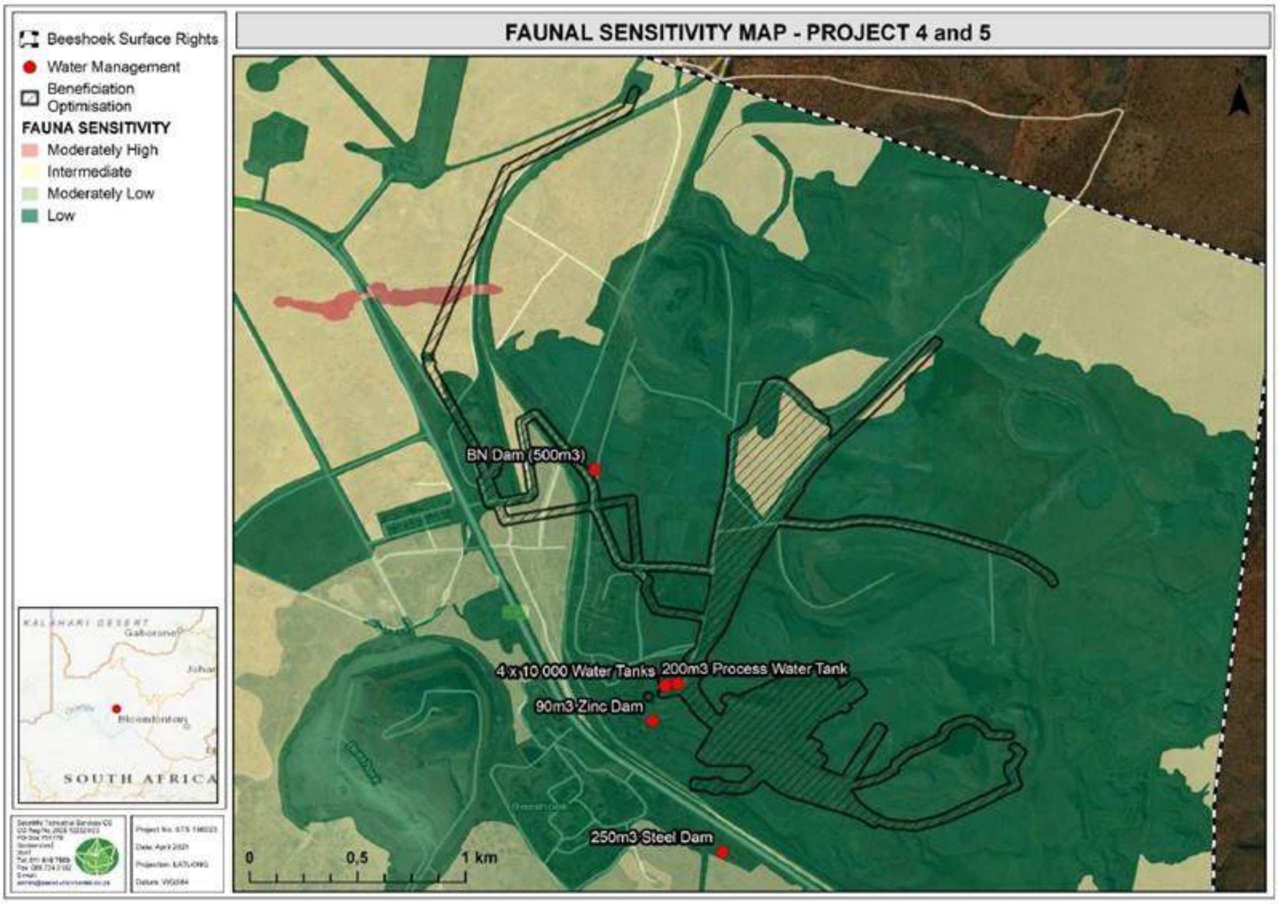


Figure 73: Faunal sensitivity map for the Beeshoek Mine with the proposed Projects 4 and 5 superimposed on the habitat sensitivities

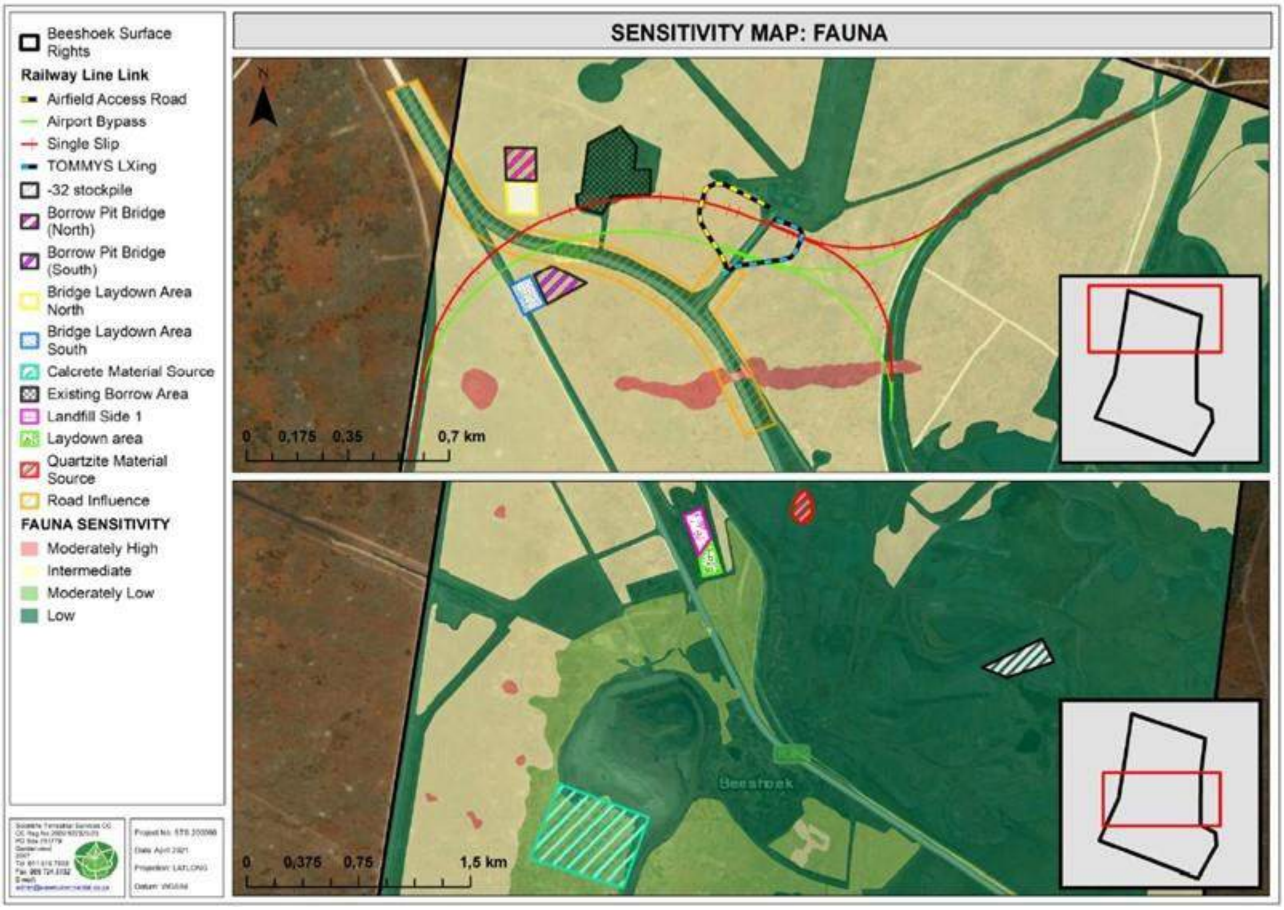


Figure 74: Faunal sensitivity map for the Beeshoek Mine with the proposed Projects 6 superimposed on the habitat sensitivities

2.e.iii.6 Freshwater Ecosystems

The freshwater ecosystem assessment was undertaken by Scientific Aquatic Services cc (SAS). Please refer to Annexure 8 for the detailed report.

2.e.iii.6.a Ecosystem Character

The Beeshoek Mine Boundary and railway line are situated within a subWMA considered a Freshwater Ecosystem Priority Area (FEPA). River FEPAs achieve biodiversity targets for river ecosystems and threatened fish species, and were identified in rivers that are currently in a good condition (A or B ecological category). Although the FEPA status applies to the actual river reach, shading of the whole sub-quaternary catchment reach indicate that that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition of the river reach.

According to the National Freshwater Ecosystem Priority Areas (NFEPA) Database there are numerous natural wetland features situated within the Beeshoek Mine boundary. The majority of these wetlands are classified as depressions, although one unchanneled valley bottom wetland is indicated within the Beeshoek Mine. The wetlands situated within the Beeshoek Mine boundary are considered either in a natural or good condition (Class AB) or moderately modified (Class C).

In terms of the wetland type vegetation the majority of the Beeshoek Mine boundary falls within the Eastern Kalahari Bushveld Group 3, although a portion of the eastern section of the mine falls within the Eastern Kalahari Bushveld Group 4 WetVeg type, both of which are considered Least Threatened (Mbona *et al.* 2015) (refer to figure below).

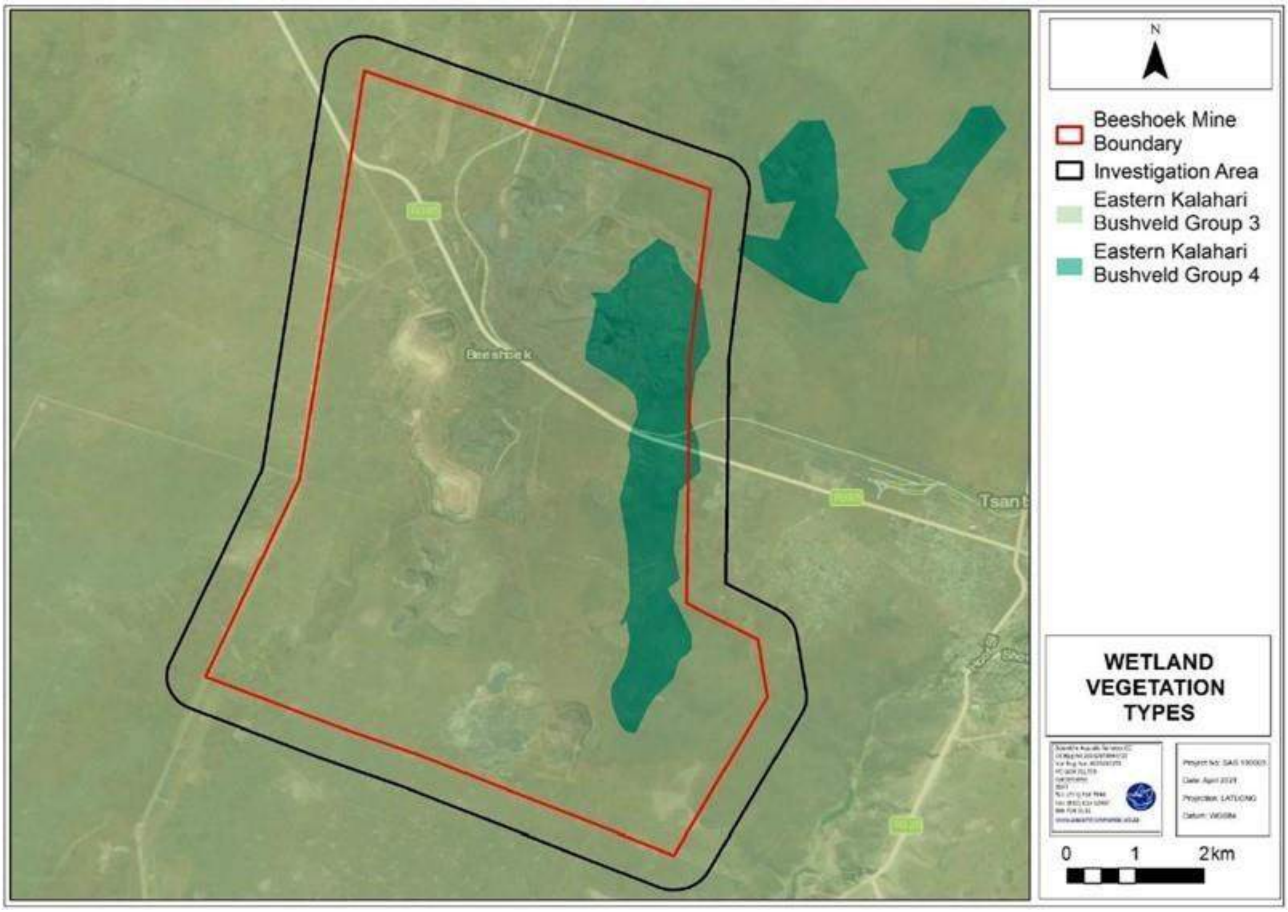


Figure 75: The WetVeg Types applicable to the Beeshoek Mine according to NFEPA (2011)

In terms of the railway line, according to the NFEPA database there are no wetland features associated with the Railway Line Link Project, however a natural depression feature is indicated within the investigation area associated with the Calcrete Material Source Infrastructure Area. At the time that the database was collated, the depression feature was considered in a natural or good ecological condition (Class AB). The field assessment verified that the feature is a "cryptic wetland".

The Groenwaterspruit is situated approximately 1.5km southeast of the Beeshoek Mine. Additionally, an unnamed tributary of the Soutloop River is situated approximately 1.3km south of the Beeshoek Mine. According to the NFEPA Database these rivers are FEPA rivers and are considered in a natural or good (Class AB) ecological condition, while the

PES 1999 Classification indicates both to be largely natural (Class B). There are no river features associated with the Railway Line Link Project, nor are there any river features located within a 5km radius thereof.

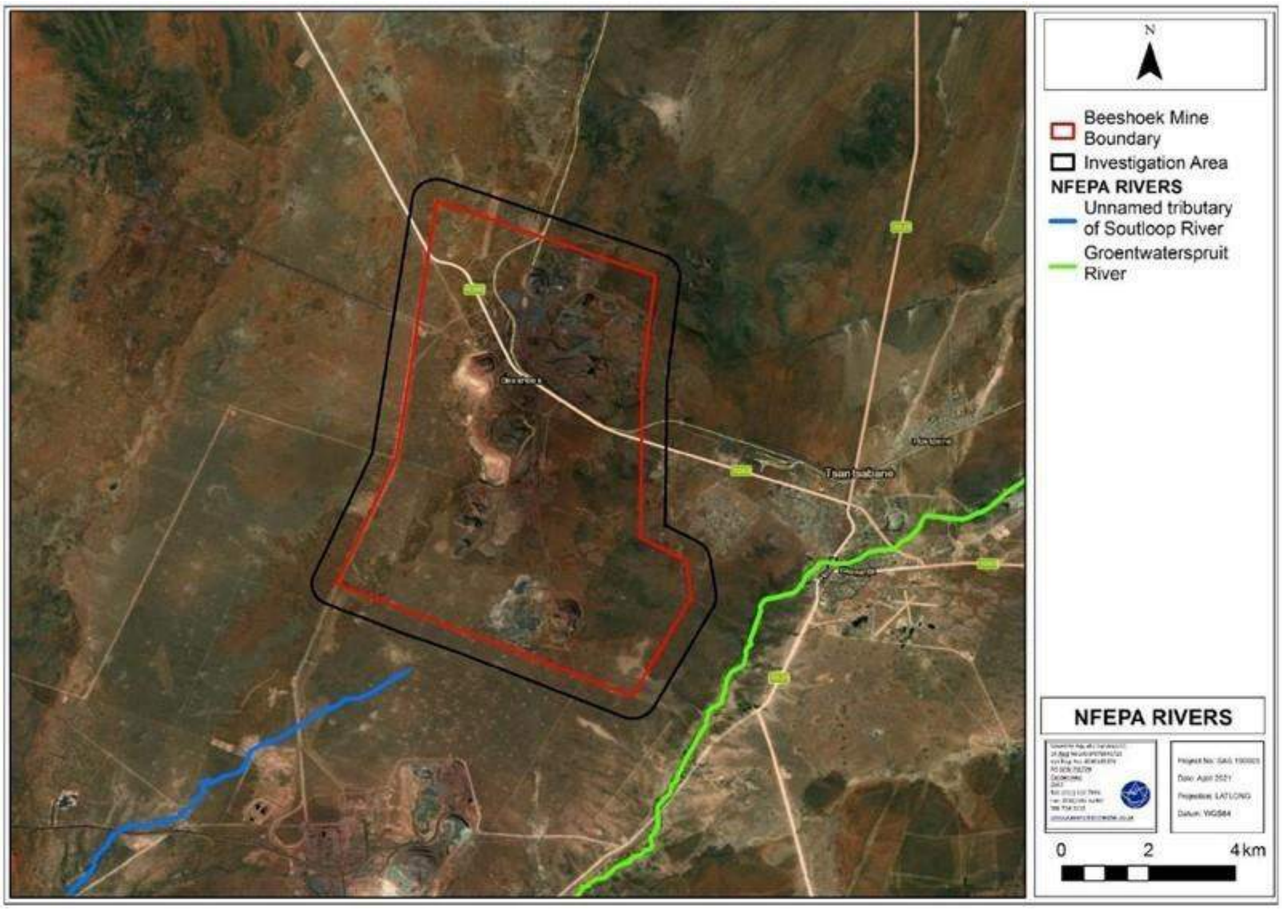


Figure 76: Rivers associated with the Beeshoek Mine property according to NFEPA (2011)

2.e.iii.6.b Ecological Support and Other Natural Areas

Portions of the northern, eastern and southern sections of the mine fall within an Ecological Support Area (ESA). According to the Technical Guidelines for Critical Biodiversity Area (CBA) Maps document ESAs are areas which must retain their ecological processes in order to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for representation of ecosystem types or Species of special concern when it's not possible to meet them in CBAs; support ecological functioning of protected areas or CBAs or a combination of these (SANBI, 2017).

The western portion of the Mine falls within the Other Natural Area (ONA) category. According to the Technical Guidelines for CBA Maps document, an ONA consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs (SANBI, 2017).

The eastern portion of the Railway Line Link and the central portion of the Calcrete Material Source Infrastructure Area is identified as an ESA. According to the Technical Guidelines for Critical Biodiversity Area (CBA) Maps document ESAs are areas which must retain their ecological processes in order to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for representation of ecosystem types or Species of special concern when it's not possible to meet them in CBAs; support ecological functioning of protected areas or CBAs or a combination of these (SANBI, 2017).

The majority of the Railway Line Link Project falls within the ONA category. According to the Technical Guidelines for CBA Maps document ONA consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs (SANBI, 2017).

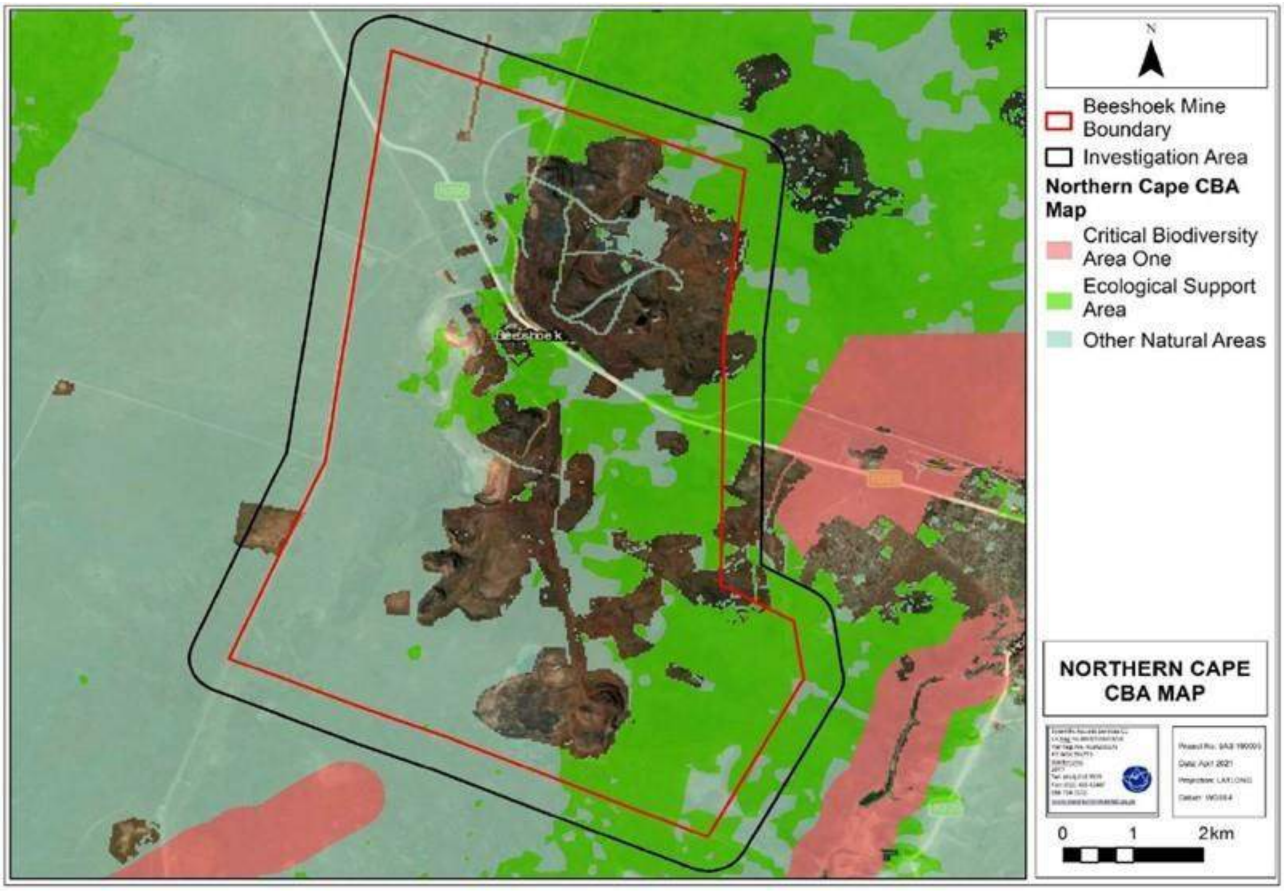


Figure 77: Critical Biodiversity Areas associated with the study area as per the Northern Cape Critical Biodiversity Area dataset (2016)

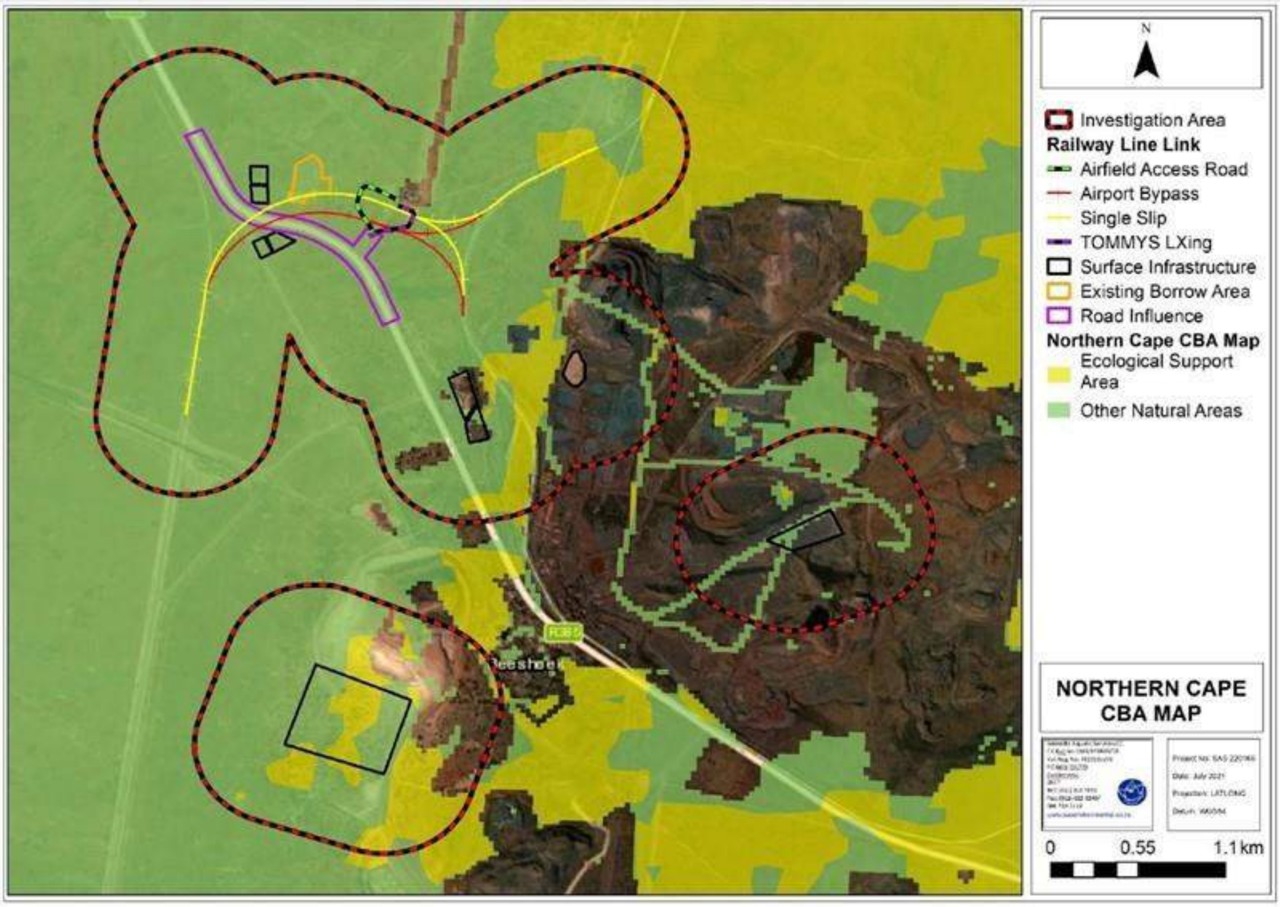


Figure 78: Ecological Support Areas and Other Natural Areas indicated by the Northern Cape Critical Biodiversity Areas (2016)

2.e.iii.6.c Mining and Biodiversity Guidelines

The Mine is situated within an area currently not ranked under the Mining and Biodiversity Guidelines, 2013.

2.e.iii.6.d National Web Based Environmental Screening Tool

According to the screening tool the overall aquatic sensitivity of the mine and surrounds is **very high** due to the area being classified as a FEPA catchment, the presence of wetlands and the Beeshoek Mine falling within a strategic water source area. The FEPA catchment and numerous wetlands corresponds with the NFEPA Database (2011) and the NBA 2018 Dataset. According to the Strategic Water Source Areas (SWSA) Database (2017) the south-eastern portion of the Beeshoek Mine boundary is located within the Southern Ghaap Plateau groundwater SWSA.

Figure 79: The Strategic Water Source Area applicable to Beeshoek Mine according to the National Biodiversity Assessment 2018

2.e.iii.6.e Inventory of Aquatic Ecosystems and Wetland Delineation

According to the NBA 2018: South African Inventory of Inland Aquatic Ecosystems (SAIIAE), 2018 there are numerous depression wetlands located within the southern portion of the mine, as well as a large seep wetland indicated within the south eastern portion of the mine boundary, associated with the Groenwaterspruit. Although the area indicated by the NBA as a seep wetland was not extensively investigated, visual observations in the area whilst travelling around the site, analyses of digital satellite imagery as well as professional experience of the general area indicates that there is no seep wetland. The NBA further indicates an open reservoir and dam within the central portion of the Beeshoek Mine.

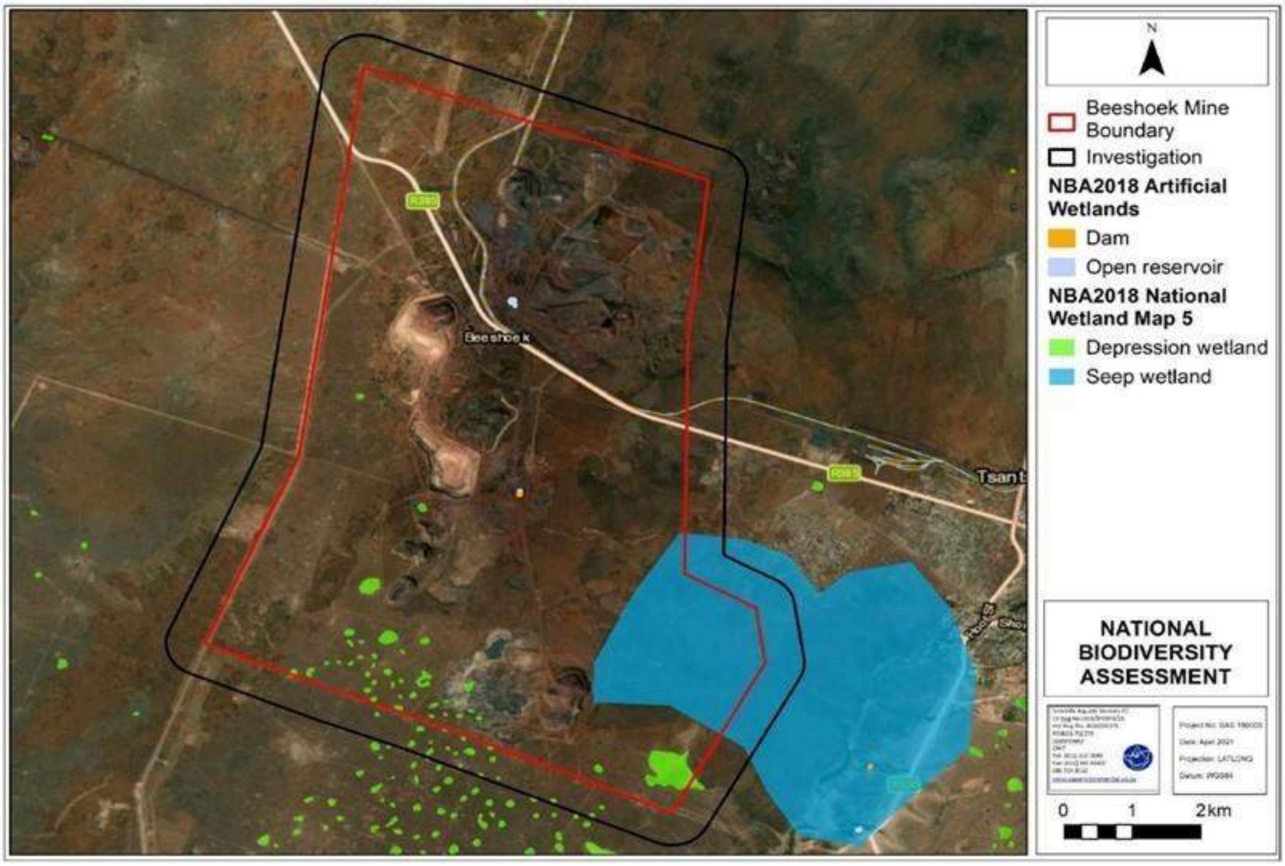


Figure 80: The National Biodiversity Assessment 2018 indicating natural and artificial wetlands associated with the study area and investigation area

The majority of the depression wetlands are in a natural or good ecological condition (Class AB), one depression is moderately modified (Class C) and three depression wetlands as well as the “seep” wetland is considered in a heavily to critically modified ecological condition (Class DEF) according to the NBA Dataset. The depression wetlands are of least concern (Ecosystem Threat Status (ETS)), and therefore poorly protected (Ecosystem Protection Level (EPL)), whereas the “seep” wetland is not protected (EPL), and is currently affected by mining activities, roads, and artificial features, therefore the “seep” wetland is indicated as critically endangered (ETS). According to the NBA Dataset the Groenwaterspruit and unnamed tributary of the Soutloop River is not protected (EPL) and considered endangered (ETS). Furthermore, at the time of the data collation for the NBA Dataset (2018), the rivers must have been dry as it was rendered data deficient.

According to the NBA 2018: SAIIAE there are no wetland features or river features associated with the Railway Line Link Project however the depression feature identified within the Calcrete Material Source Infrastructure investigation area, identified by the NFEPA Database (2011) is identified by the NBA Dataset (2018). According to the NBA Dataset the depression feature is currently affected by roads, thus it is in a heavily to critically modified ecological condition (Class DEF).

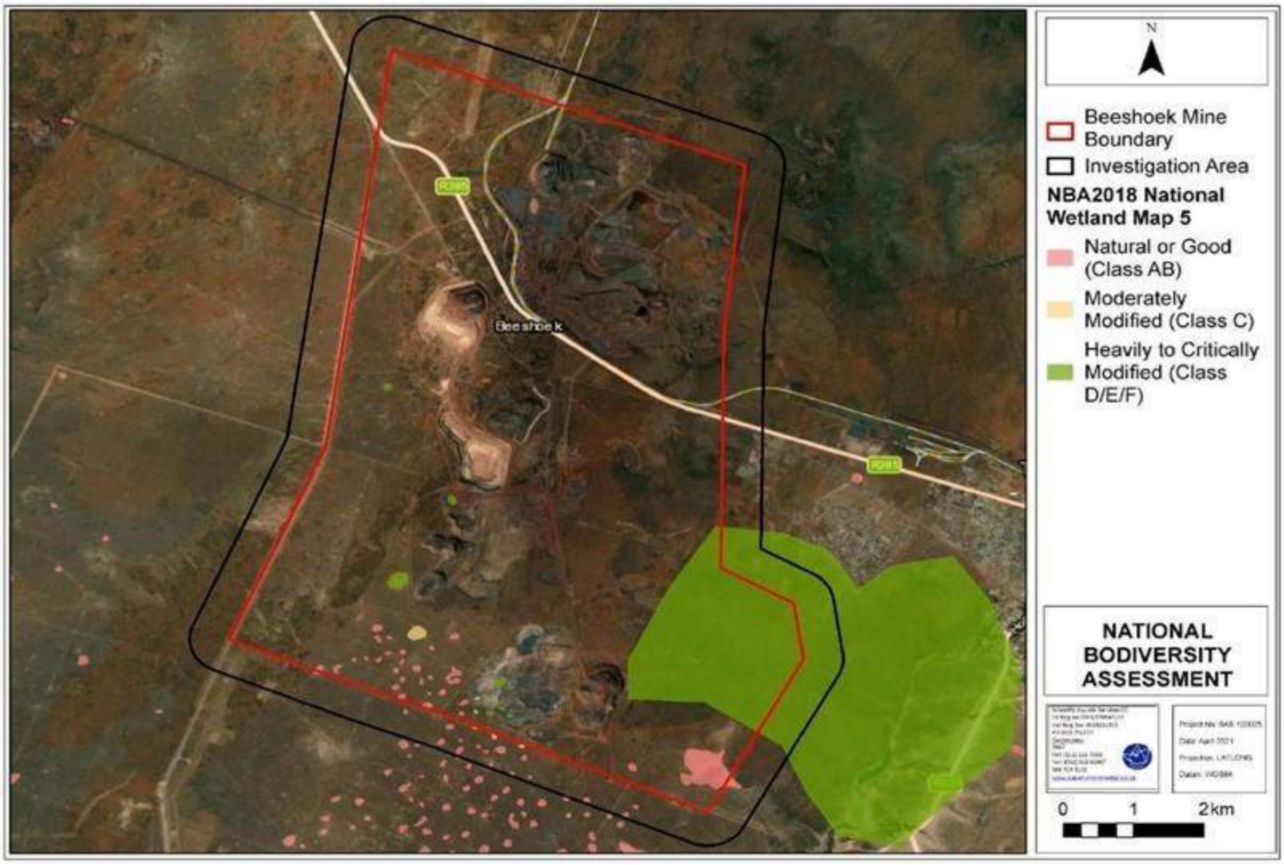


Figure 81: The condition of the wetlands associated with the study area and investigation area (NBA, 2018)

2.e.iii.6.e.1 Wetland Delineation

Whilst the presence of "vegetation typically adapted to life in saturated soil" under "normal circumstances" is the key determinant in the definition of a wetland according to the NWA, but was absent throughout the study area, 21 features identified within the study area are nevertheless defined as "cryptic" wetlands as per Day *et al*, 2010. During the field assessments undertaken in 2019 and subsequently in 2021, over 60 features were ground-truthed and defined as either cryptic wetlands, seasonal depressions, episodic drainage lines with riparian vegetation or preferential flow paths. Of these features, 21 were defined as "cryptic wetlands", 45 as "seasonal depressions", an unnamed tributary of the Groenwaterspruit as an episodic drainage line (with riparian vegetation), one fairly distinct preferential flow path (lacking in either wetland or riparian characteristics) and one recharge zone, which may be important for recharge of a small tributary of the Groenwaterspruit. In order to delineate the boundaries of the wetlands the following were considered:

- Topography/Elevation;
- Presence of microinvertebrates;
- Sediment deposits on plants;
- Soil wetness/morphological characteristics;
- Vegetation; and
- Vegetation associated with riparian zones.

2.e.iii.6.e.1.1 Cryptic Wetlands

Although the cryptic wetlands identified in the study area do not possess one of the key indicators typically associated with wetlands in South Africa, specifically, hydrophytic vegetation, they are nevertheless deemed to be potentially ecologically important and may play a significant role in the ecology of the area. Wetlands in arid areas are under-researched, particularly cryptic wetlands such as those identified in the study area, and little is known about the biodiversity associated with such systems (Henschel, unknown date, retrieved from http://fbip.co.za/wp-content/uploads/2018/08/Henschel-Abstract-2017-Small-Project.pdf, 18th March 2020). For example, cryptic wetlands such as those identified may host populations of invertebrates (mostly Branchiopods but also Phyllopods) which are considered keystone species of ephemeral pans globally, playing a pivotal role in the food web as prey (Henschel; unknown date of publication). Although it was not possible to identify to genus or species level as this would need to be undertaken in a laboratory, one of the cryptic wetlands identified was found to host a population of Anostraca (fairy shrimp), one of the four orders of crustaceans in the class Branchiopoda (please refer to Figure 85 to Figure 88 for the location of these features).

From the above, it is concluded that cryptic wetlands identified in the study area should be afforded the same protection as a wetland which meets the legislated definition thereof, and that suitable mitigation measures be implemented to minimise impacts to these features.

No additional cryptic wetlands are present for the railway line. The only cryptic wetland for the railway line is associated Village Pit expansion area, where it is intended to remove calcrete from the opencast pit footprint for the use at the railway line.

2.e.iii.6.e.1.2 Seasonal Depressions

The seasonal depressions were defined as areas which are low-lying in the landscape, usually but not always possessing closed contours and being inwardly draining. However, the floral species associated with those depressions were completely different from those depressions classified as cryptic wetlands. The seasonal depressions were dominated floristically by *Tarchonanthus camphoratus* (camphor bush) and Chrysocoma obtusata as well as *Eragrostis x pseudo-obtusa* (false tick grass). Additionally, the woody component associated with the seasonal depressions occurred throughout the depression, whereas the woody component associated with the cryptic wetlands was largely limited to the outer boundaries thereof. Furthermore, the soil characteristics differed between the two types of features, with those in the cryptic wetlands predominantly lacking in chroma whilst the soils in seasonal depressions were generally high-chroma, sandy soils (please refer to Figure 85 to Figure 88 for the location of these features).

The seasonal depressions did not meet the definitions of "cryptic wetlands" or watercourses from an ecological perspective (as defined by the NWA) and were therefore excluded from further assessment.

At the railway line, two (2) areas were identified and are best described as "seasonal depressions" (refer to the following figure). These are low-lying areas in the landscape with closed contours and therefore inwardly draining, however, the water does not remain in the features for a sufficiently long period to enable the establishment of facultative or obligate vegetation. In addition, the soil within the seasonal depressions is sandy, free-draining, high-chroma soils, lacking in morphological characteristics such as leaching of chroma and mottling. Therefore, the seasonal depressions do not meet the definition of a wetland as per the National Water Act, 1998 (Act No 36 of 1998) and were not assessed further.

The seasonal depressions did not meet the definitions of "cryptic wetlands" or watercourses from an ecological perspective (as defined by the NWA) and were therefore excluded from further assessment.

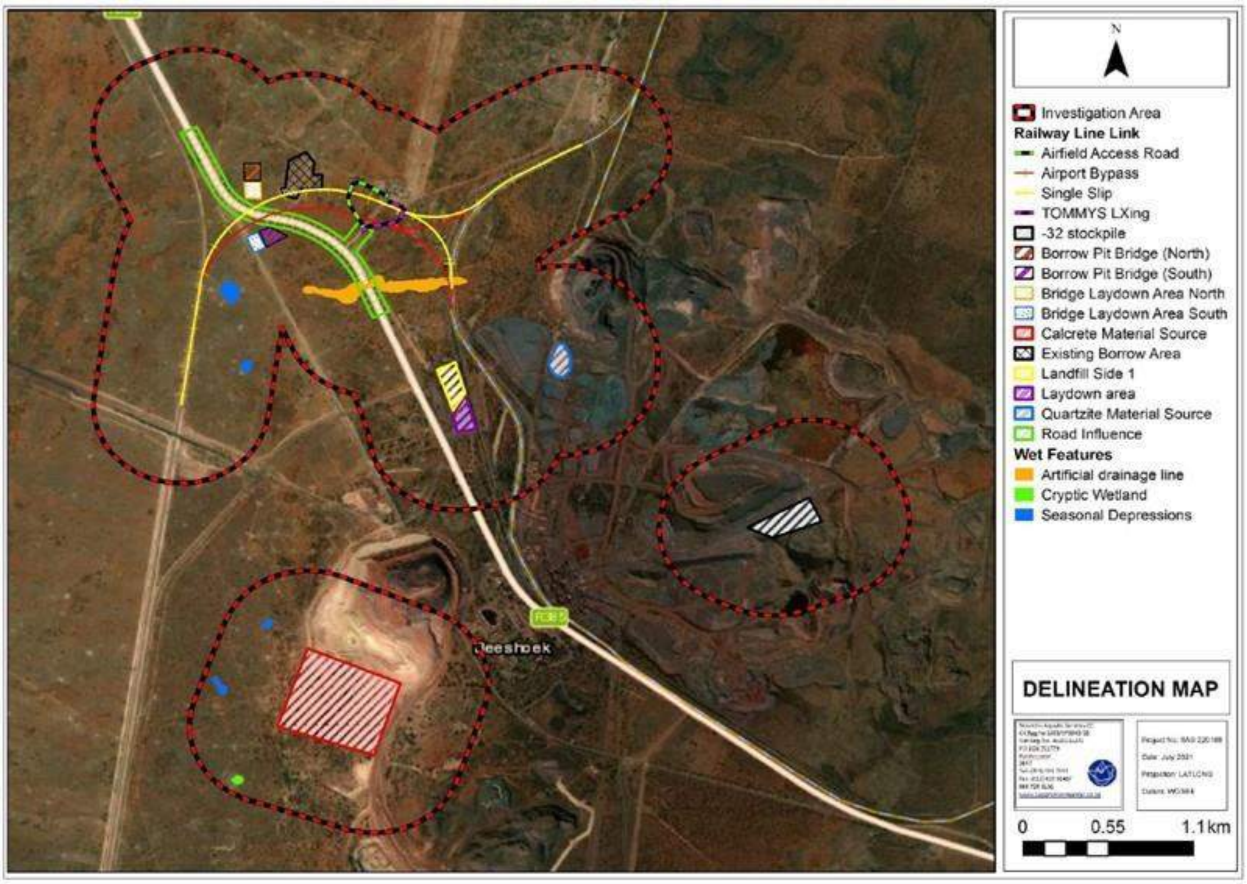


Figure 82: The location and approximate extent of the artificial drainage line, seasonal depressions and single cryptic wetland in relation to the proposed railway line and associated surface infrastructure

2.e.iii.6.e.1.3 Preferential Flow Paths

The large preferential flow path illustrated in Figure 83 and Figure 84 is defined as an area where, when present, surface water flows but is not retained in the landscape for a sufficient period to encourage the establishment of a floral community indicative of periodic saturation. Several smaller, poorly-defined preferential flow paths were identified but not mapped, as they do not meet the definition of a watercourse from an ecological perspective or from a hydrological perspective.

The preferential flow paths did not the definitions of “cryptic wetlands” or watercourses from an ecological perspective (as defined by the NWA) and were therefore excluded from further assessment.

2.e.iii.6.e.1.4 Recharge Zone

The “recharge zone” of the small unnamed tributary of the Groenwaterspruit (indicated in Figure 87 and Figure 88) does not possess well-defined characteristics indicative of either wetland or riparian conditions. Nevertheless, it is a clearly defined low-lying area, which possesses a unique digital signature and based on analysis of available digital satellite imagery, it is very likely that water from this area flows to the Groenwaterspruit and may contribute to the continued ecological functioning thereof. The importance of this feature from a hydropedological perspective in terms of its contribution to the recharge to the downstream system would need to be determined by a suitably qualified specialist. It is also recommended that the 1:100 year floodline determined by Hydrospatial (2021) (Annexure 9, also refer to Figure 93 and Figure 94) be considered during planning as the minimum extent of the area to be excluded from mining, to ensure that no adverse impact to the downstream system occurs.

The recharge zone did not meet the definitions of “cryptic wetlands” or watercourses from an ecological perspective (as defined by the NWA) and were therefore excluded from further assessment.

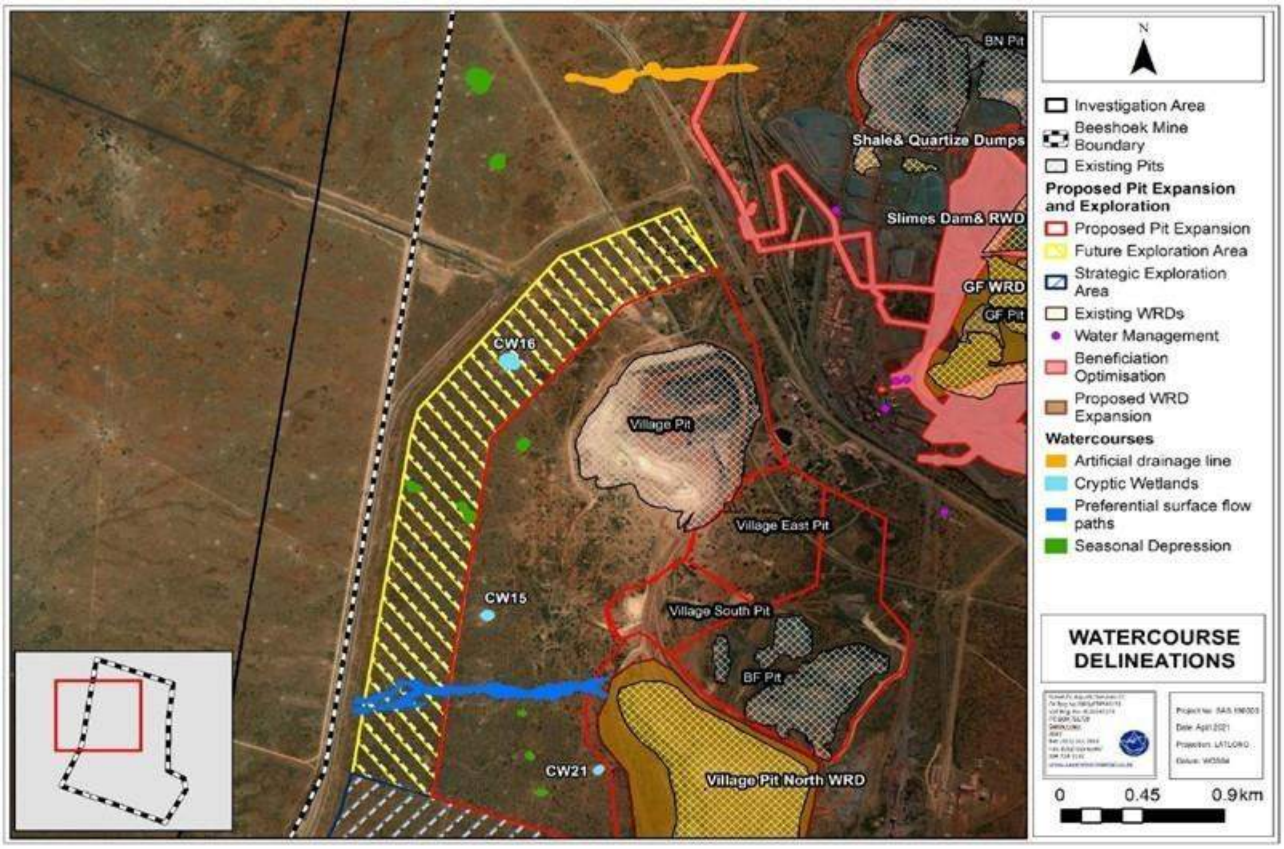


Figure 83: The location of the delineated cryptic wetlands (CWs), seasonal depressions and preferential flow paths within the north-western portion of the Beeshoek Mine boundary

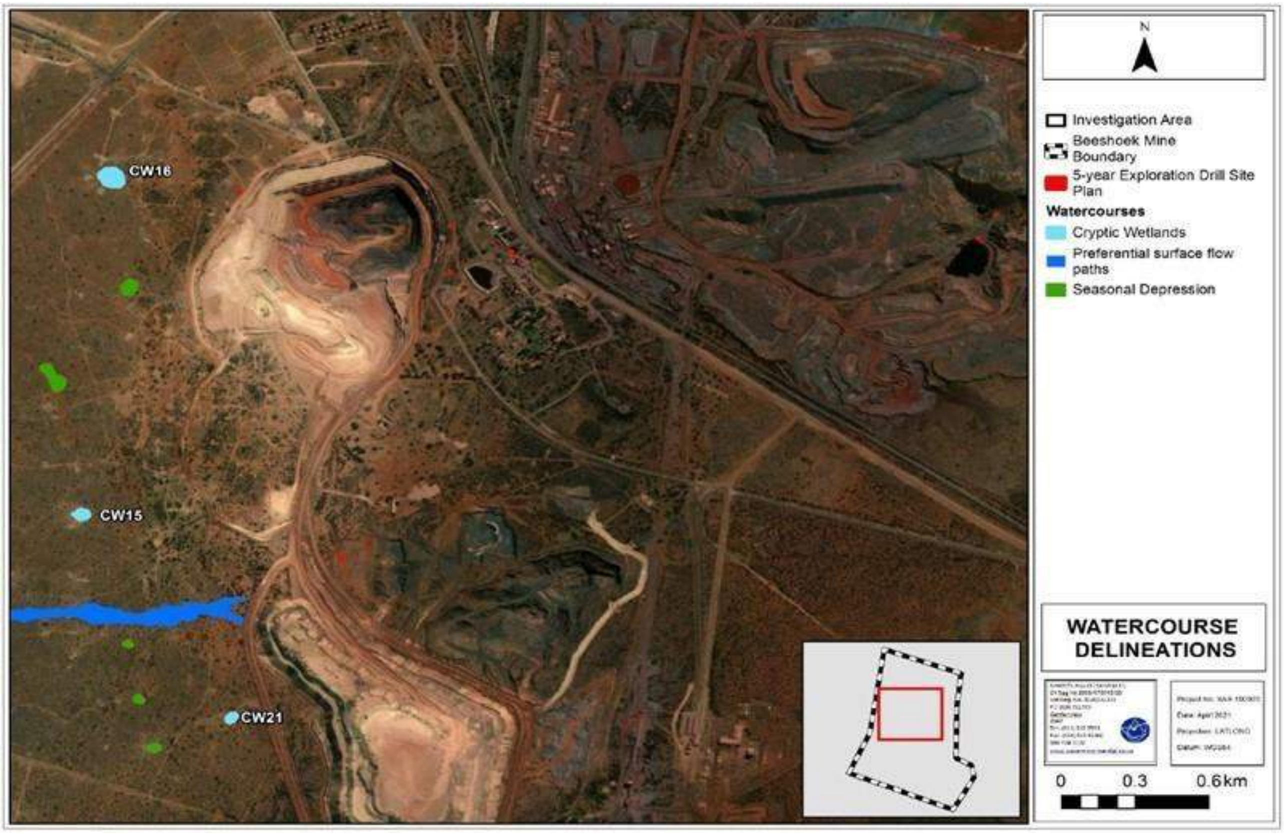


Figure 84: The location of the delineated cryptic wetlands (CWs), preferential surface flow path and seasonal depressions within the central portion of the Beeshoek Mine boundary and investigation area (five year drill programme considered)

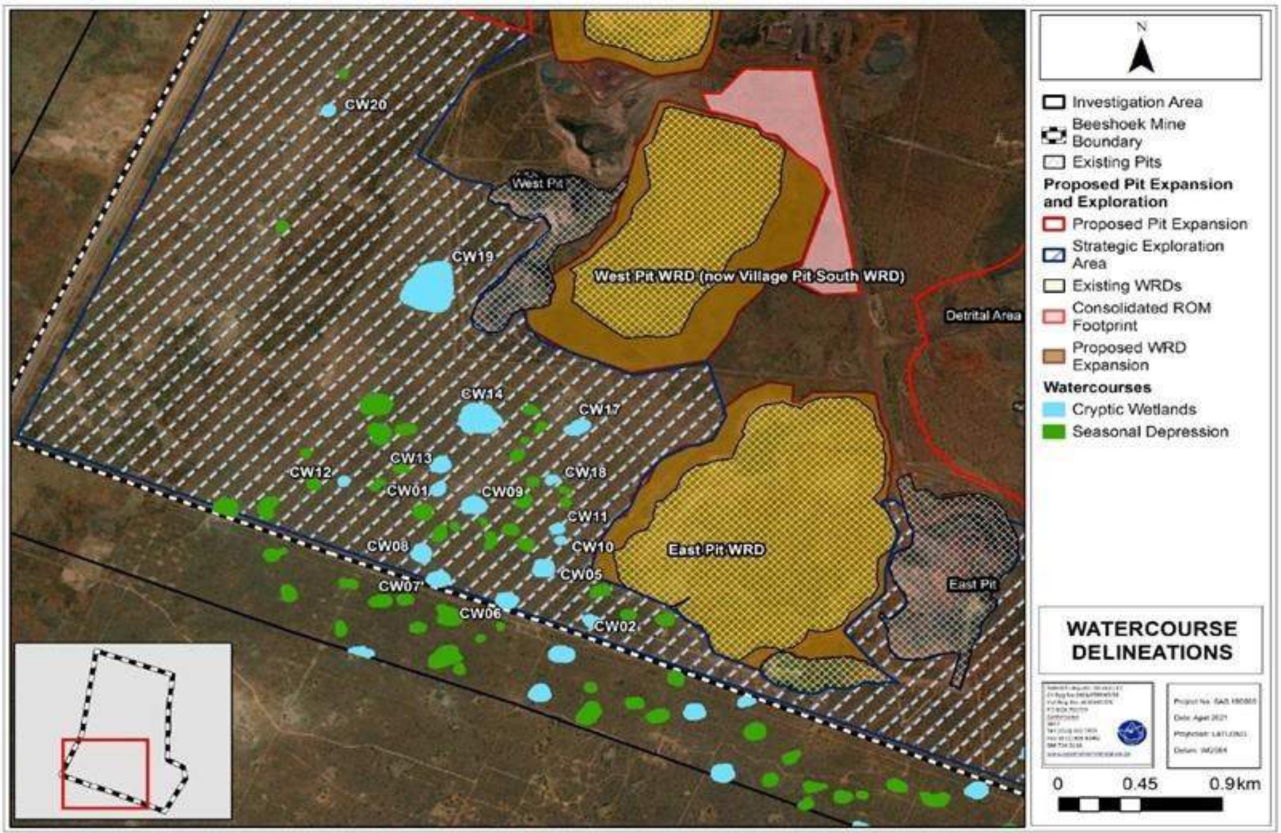


Figure 85: The location of the delineated cryptic wetlands (CWs) and seasonal depressions within the south-western portion of the Beeshoek Mine boundary and investigation area

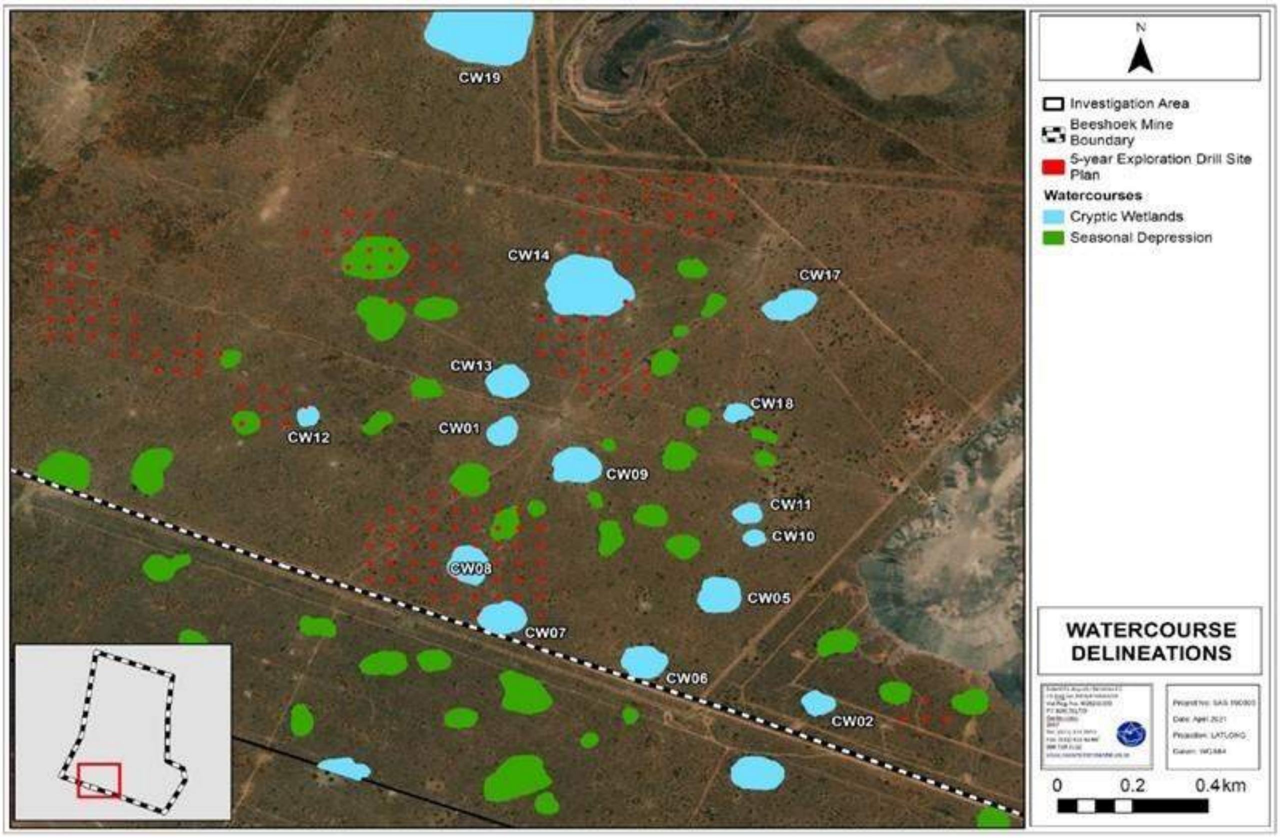


Figure 86: The location of the delineated cryptic wetlands (CWs) and seasonal depressions within the southern portion of the Beeshoek Mine boundary and investigation area (five year drill plan considered)

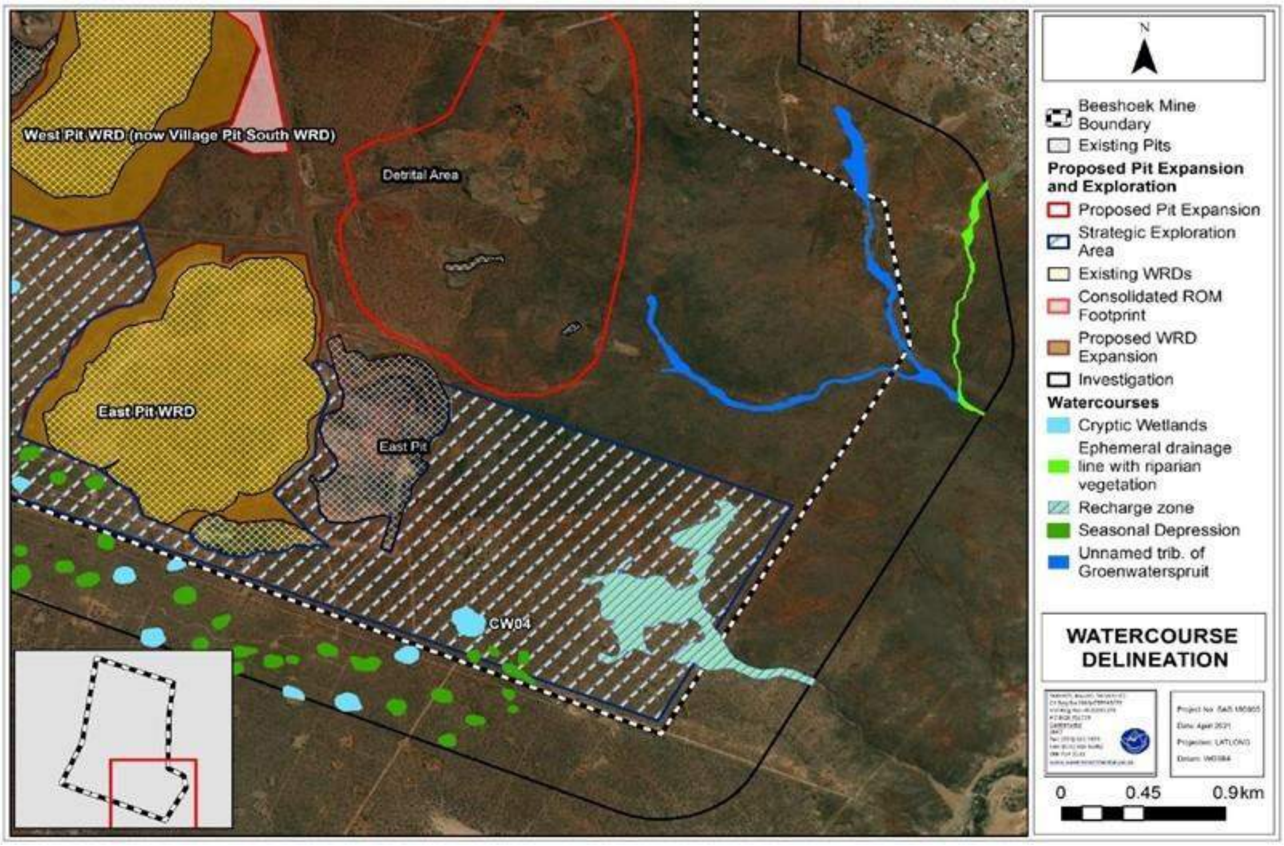


Figure 87: The location of the delineated cryptic wetlands (CWs), episodic drainage line, seasonal depressions and 'recharge zone' within the south-eastern portion of the Beeshoek Mine boundary and investigation area

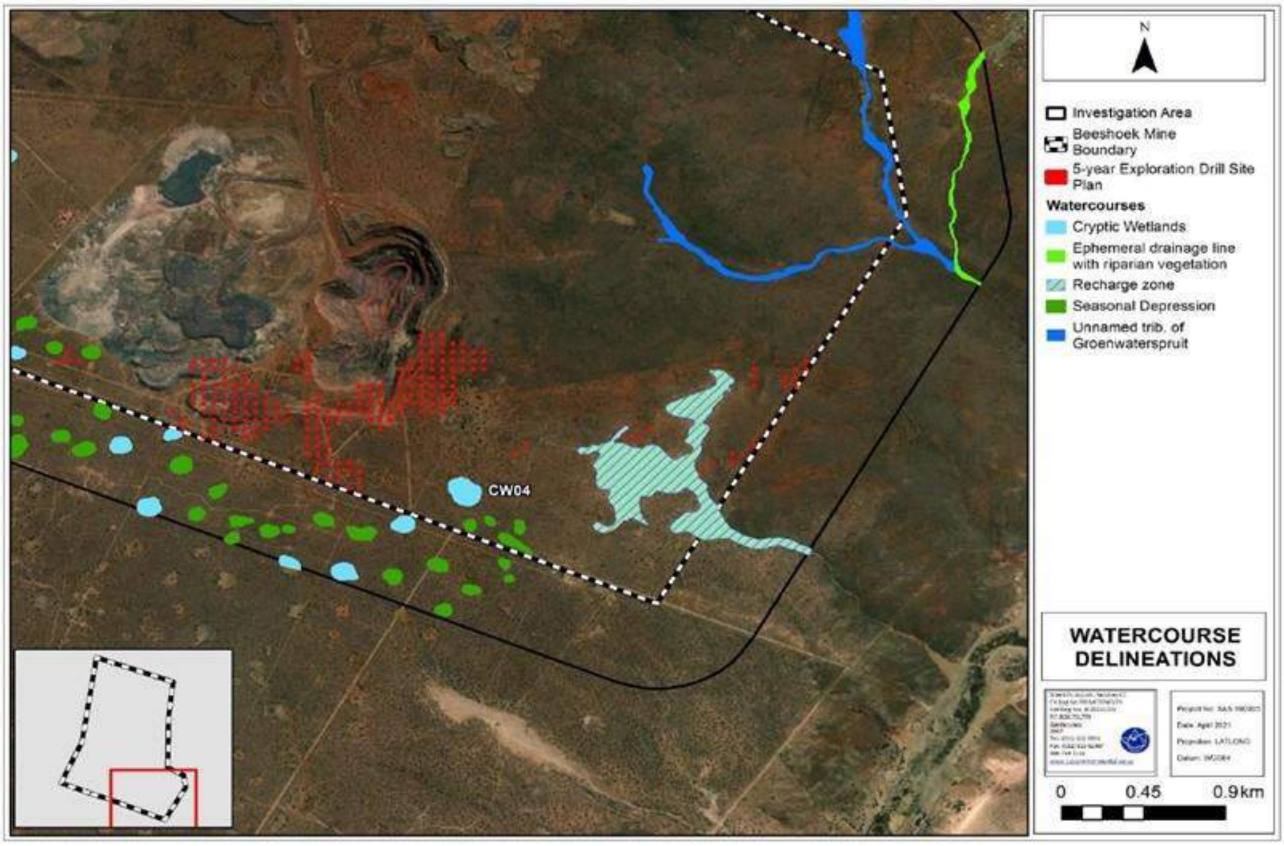


Figure 88: The location of the delineated cryptic wetlands (CWs), episodic drainage line, seasonal depressions and 'recharge zone' within the south-eastern portion of the Beeshoek Mine boundary and investigation area (five year drill plan considered)

2.e.iii.6.e.2 Weland Classification

The cryptic wetlands and the episodic drainage lines (tributary of the Groenwaterspruit) were classified as Inland Systems falling within the Southern Kalahari Aquatic Ecoregion and the Eastern Kalahari Bushveld Group 3 Wetland Vegetation (WetVeg) group, considered "least threatened" by SANBI (2012) and Mbona et al (2015). The table below presents the further classification of these cryptic wetlands and episodic drainage lines at Levels 3 and 4 of the Classification System (Ollis et al, 2013).

Table 51: Characterization of the "cryptic wetlands" identified within the study area, according to the Classification System (Ollis et al., 2013)

Drainage System	Level 3: Landscape Unit	Level 4: Hydrogeomorphic Unit
		HGM Type
Cryptic Wetlands	**Plain**: an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land.	**Depression**: a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates.
Episodic Drainage Lines with riparian vegetation	**Valley floor**: The base of a valley, situated between two distinct valley side-slopes.	**River**: a linear landform with clearly discernible bed and banks, which permanently o periodically carries a concentrated flow of water.

2.e.iii.6.e.2.1 Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The indices used to determine the PES and EIS was applied collectively to all CWs which are under 1 ha in extent, and separately to CWs 4, 14 and 19 as those are greater than 1 ha in extent, are more likely to hold water for longer periods, and are therefore considered to be of greater ecological significance.

Table 52: PES and EIS Discussion

System Assessed	PES/ discussion	EIS discussion	Ecoservice provision	REC, RMO & BAS Category (All CWs)	Watercourse drivers and receptors discussion (hydraulic regime, geomorphological processes, water quality and habitat and biota):
18 smaller (< 1 ha) "cryptic wetlands" (CW 1-3, 5-13, 15-18) (Figure 83 to Figure 88)	**PES Category: A (0.78)** The majority of the smaller CWs within the proposed mining expansion areas have been subjected to few impacts, and the extents thereof are relatively minor. No significant impacts to the hydraulic regimes were discerned during the two site assessments, with the exception of reduced surface roughness, attributed to a reduction in vegetation cover (usually due to grazing pressure). Some of the CWs identified in the south-western portion of the Beeshoek Mine property were noted to have been trampled, either by cattle or wildlife, leading to disturbed soil profiles and possible sedimentation when surface water is present. Sedimentation may be problematic, as the inward-draining character of the CWs will lead to accumulation of sediment, in turn potentially leading to reduced capacity for retention of surface water, which in turn may impact on ecological service provision. However, aside from slight disturbances to soils within the CWs, no significant alterations to geomorphological processes were noted. The floral communities tended to be homogenous, with the same floral species observed throughout. 	**EIS Category: Moderate** The pans are deemed important both in terms of biodiversity maintenance and on a landscape scale. They may provide important habitat, refugia, foraging and migratory sites for various faunal species on a seasonal basis. Additionally, whilst no floral SCC were confirmed during the site assessment, the possible occurrence of N. laticoma was recorded within one of the CWs and many flora in this region, particularly geophytic species, have restricted growth and flowering periods.	**Moderately low** geomorphological setting, ecological service provision is generally of low levels, with the exception of biodiversity maintenance, which is deemed 'high'. A potential floral Species of Conservation Concern (SCC) observed directly within one of the cryptic wetlands included Nerine laticoma (protected under the Northern Cape Nature Conservation Act, 2009 (Act No 9 of 2009), however the absence of inflorescences precluded positive identification. Although no other SCC were noted at the time of either assessment, the limitations posed by the duration of the assessments present a "snap shot" of conditions, and further detailed studies would need to be undertaken over a greater period of time to ascertain the occurrence of floral and/or faunal SCC. However, suitable habitat for certain species is present within some of the CWs, and therefore in line with the precautionary principle, it was considered likely that other SCC may occur within, or utilise, the cryptic wetlands.	**Recommended Ecological Category (REC) Category: A** **Best Attainable State (BAS): A (Maintain)** **Recommended Management Objective (RMO): A (Maintain)** Since the majority of the CWs associated with the proposed mining expansion footprint are in a largely natural condition, ideally, they should remain as such. However, it is acknowledged that several CWs may be directly and irreversibly impacted as a result of the proposed development and therefore, maintenance of the PES will not be feasible.	Very few impacts to the hydraulic regime and geomorphological processes were observed, with the exception of the aforementioned topsoil disturbances caused by trampling of livestock and wildlife. The region is characteristically semi-arid, and although rainfall had been received between December 2020 - February 2021, at the time of conducting the assessment in March 2021, surface water only remained in two of the CWs. Nevertheless, based on the remote locality and absence of impacts such as industry, mining or cultivation, water quality, when present, will be the result of precipitation and therefore unpolluted. The vegetation communities associated with the CWs were largely limited to graminoid species (such as *Eragrostis bicolor*, and *Aristida congesta* subsp. *congesta*) and the forb *Cullen tomentosum*. Where disturbances were evident, the small shrub *Chrysocoma obtusata* were occasionally present. Many of the CWs are favoured for grazing both by domestic livestock and wildlife. The relative absence of fauna during the site assessment can be attributed to the crepuscular and secretive nature of many faunal species potentially occurring on site. Notwithstanding this, various avifauna and small antelope species were observed in the vicinity of each CW, indicating potentially increased faunal activity when surface water is present. Whilst few to no faunal species were observed within the assessed CWs during the site visit, features such as those identified in the study area are noted to be important habitat for various *Branchiopod* species in the region, which are able to withstand extended periods of desiccation. Confirmation of the presence of these invertebrates by means of hatching out eggs under laboratory conditions did not form part of the scope of work thus their presence or absence in this group of CWs cannot be ruled out without further investigation; however, Branchiopods and tadpoles were found in CW 14 (discussed in further detail below), inferring that they may be present in the other CWs assessed. It is therefore strongly recommended that

System Assessed	PES/ discussion	EIS discussion	Ecoservice provision	REC, RMO & BAS Category (All CWs)	Watercourse drivers and receptors discussion (hydraulic regime, geomorphological processes, water quality and habitat and biota):
					sampling of the cryptic wetlands to determine the presence (or absence) of macroinvertebrates be undertaken. Should invertebrate taxa be present, a detailed rescue and relocation plan should be developed by a suitably qualified specialist, to relocate egg banks, either to cryptic wetlands that will be undisturbed, or to recreated wetlands (refer to the figure below for a concept diagram). Such a rescue and relocation plan could potentially form part of an offset initiative, should it be required by the relevant authority.
CW 4 (Figure 87 and Figure 88) (south eastern boundary of the mine)	**PES Category: A (0.92)** Few discernible impacts to the hydraulic and geomorphological regimes were noted, although faunal utilisation has resulted in the disturbance of topsoil (trampling and burrow excavations). Grazing pressure resulted in reduction in surface roughness, affecting the hydraulic regime marginally as water retention time may be slightly reduced as a result of exposure. However, overall the CW is deemed to be in a largely natural condition. 	**EIS Category: Moderate** The CW is deemed important both in terms of biodiversity maintenance and on a landscape scale. Although no fauna was observed at the time of either assessment, spoor, scat and burrows around the outer perimeter indicate that the CW is utilised regularly by various fauna. The occurrence of Branchiopods within this system cannot be discounted, and if present, the wetland may be important on a seasonal basis for migratory avifaunal species.	**Marginally low** The inward-draining and highly ephemeral character of the CW minimises the degree to which it can perform various ecological functions, although it is apparent that biodiversity maintenance is one of the important functions performed by the wetland.	**REC Category: A** **BAS: A (Maintain)** **RMO: A (Maintain)** Ideally, CW 4 should remain in a largely natural condition. No mining activities are currently planned in this area as the area surround this project is earmarked for exploration only.	Very few impacts to the hydraulic regime and geomorphological processes were discerned during the site assessment, with the exception of the aforementioned topsoil disturbances caused by trampling of livestock and wildlife. As illustrated above, no surface water was present during either assessment. Based on the relatively remote location, surface water, when present, is likely to be mostly unimpaired, although proximity to the East pit may result in wind-borne sediment reaching the CW and potentially causing some turbidity. The vegetation community is largely limited to a graminoid layer, with the forb C. tomentosum present at the time of the 2021 assessment. The woody layer surrounding the CW consisted almost solely of *Zizphus mucronata*. As discussed above, faunal utilisation, particularly by small mammals, was apparent and infers that when surface water is present, a more diverse faunal component is expected, particularly if macroinvertebrates occur.
CW 14 (Figure 85 **and**	**PES Category: A (0.79)** With the exception of some disturbance to soil and vegetation as a result of trampling and grazing	**EIS Category: High** The presence of surface water, macroinvertebrates	**Marginally low** Whilst surface water was present at the time of assessment, the highly ephemeral and endorheic	REC Category: A BAS: A (Maintain)	As illustrated above, the cryptic wetland is driven primarily by surface water (precipitation). No discernible impacts to the hydraulic regime such as barriers restricting surface water runoff which may

System Assessed	PES/ discussion	EIS discussion	Ecoservice provision	REC, RMO & BAS Category (All CWs)	Watercourse drivers and receptors discussion (hydraulic regime, geomorphological processes, water quality and habitat and biota):
Figure 86) **(south west of Village Pit South WRD)**	respectively by livestock, no significant impacts to CW were discerned during the 2021 assessment. 	and amphibians at the time of assessment contributed to the increased EIS score for this CW, as it is clear that it is an important system for migratory fauna, as well as for populations of unique aquatic species particularly in the context of the greater region. It is also considered important on a landscape scale and the biota (macroinvertebrates) may be susceptible to changes in water quality or to the sediment regime.	nature of the CW is a limiting factor in its ability to perform various ecological functions. Biodiversity maintenance is the most important function provisioned by this CW, as evidenced by the populations of macroinvertebrates (Astrocoda and Ostracod), and tadpoles which were sampled in this cryptic wetland:  Aquatic plants (*Marsilea sp*)  *Ostracod*	RMO: A (Maintain) Ideally, CW 14 should remain in a largely natural condition. However, it is located within the proposed future opencast mining area, and should the activity be authorised and proceed, maintenance of the PES will not be feasible. Please refer to the discussion below pertaining to impacts and mitigation measures.	recharge the wetland, were observed. Some trampling was noted around the perimeter of the wetland however no turbidity was noted indicating that sediment settles quickly. However, the macroinvertebrates present may be sensitive to changes in the sediment balance, specifically increased sediment volumes entering the system. Basic water quality parameters were measured, and indicated that the water quality was unimpaired, although Dissolved Oxygen (DO) was not measured (pH 8.75, Electrical Conductivity [EC] 16mS/m and temperature 28.8˚C). Changes in water quality as a result of increased hydrocarbons or other pollutants are also likely to have an adverse effect on the biota present. These values may be attributed to biological processes. Unlike all other CWs assessed, facultative vegetation was present at the time of assessment, although the presence thereof is thought to be strongly related to the presence of surface water. Although no floral SCC were observed at the time, their presence cannot be discounted as it is possible that their occurrence correlates with the absence of surface water. Whilst faunal utilisation was limited to avifauna during the time of sampling, the presence of small burrows around the slightly raised perimeter of the CW infers use by small mammals during times when less surface water is available.

System Assessed	PES/ discussion	EIS discussion	Ecoservice provision	REC, RMO & BAS Category (All CWs)	Watercourse drivers and receptors discussion (hydraulic regime, geomorphological processes, water quality and habitat and biota):
			 *Anostraca* (fairy shrimp)		
CW 19 (Figure 85 **and** Figure 86) **(west of Village Pit South WRD)**	**PES Category: B (1.42)** The proximity of mining activities to this cryptic wetland have likely contributed to the altered ecological state thereof, primarily through wind-borne sediment deposition. It is likely that increased sediment volumes entering the depression have resulted in reduced capacity to retain surface water and may potentially be partially responsible for the erosion noted around the northern perimeter. Vegetation has been lost, either through grazing and/or trampling, and through smothering.	**EIS Category: Moderate** The slightly reduced ecological integrity of the CW plays a role in reducing the ecological importance thereof, although the confirmed presence of macroinvertebrates increases its relative importance as a foraging site for various fauna, especially migratory birds.	**Moderately low** Although CW19 is the largest of all the assessed cryptic wetlands, ecological service provision is limited, primarily due to the ephemeral character of the wetland. Nevertheless, it is considered important for sediment trapping (largely due to opportunity and not necessarily due to capacity to trap sediment) and may provide a 'sink' for various wind-borne toxicants. Biodiversity maintenance is considered the most important function provisioned by the CW. Avifaunal activity was noted at the time of assessment, and various macroinvertebrates and amphibian metamorphs were present:  *Kassina senegalensis* metamorph	**REC Category: B** **BAS: B (Maintain)** **RMO: B (Maintain)** Ideally, the PES of CW19 should at minimum be maintained, and the wetland not permitted to degrade further. However, it is located within the proposed future opencast mining area, and should the activity be authorised and proceed, maintenance of the PES will not be feasible. Please refer to the discussion below pertaining to impacts and mitigation measures.	Although few discernible impacts were noted during the assessment, it was apparent that sediment deposition poses a risk to the ongoing ecological functioning of the CW. The water has a distinctly red hue, attributed to increased inputs of iron-rich sediment, most probably the result of daily disturbances (e.g. blasting, movement of vehicles) associated with the nearby mining activities. Given the semi-arid conditions of the area, this sediment is not likely to be transported to the CW in stormwater runoff, but is likely to be wind-borne. The increased volume of sediment settling in the CW, due to the high precipitation end of 2020 and early 2021, has altered the characteristics of the wetland base and may potentially be a contributing factor to the erosion noted along the northern perimeter of the CW. Measurement of basic water quality parameters indicates that water quality is relatively unimpaired, although a full suite of parameters would need to be assessed to confirm this. The EC was higher than that in CW 14 (32mS/m) and was attributed to the presence of iron-rich sediment, however, pH was similar to that at CW14 at 8.57.Water temperature at the time of assessment was 30.6˚C. Although it could not be confirmed during the assessment, it is possible that sedimentation of the system has contributed to altered macroinvertebrate assemblages, as no *Anostraca* or *Ostracod* were sampled in CW19. According to Dr Betsie Milne (Pers.

System Assessed	PES/ discussion	EIS discussion	Ecoservice provision	REC, RMO & BAS Category (All CWs)	Watercourse drivers and receptors discussion (hydraulic regime, geomorphological processes, water quality and habitat and biota):
			 Giant water bug (*Belostomatidae*)  *Coenagrionidae* (Damselfly) larvae		Comm., March 2021) many species of *Anostraca* are habitat specialists, preferring clear water. Their presence in CW14 and absence from CW19 may be attributable to the increased sediment. Nevertheless, the presence of other macroinvertebrate taxa contributes to the overall capacity of the wetland for biodiversity maintenance, as evidenced by the presence of water-dependent avifauna, and amphibians, although use by large mammals seemed to be reduced, judging by the absence of spoor and scat observed at other CWs. The floral community was notably different to that observed within the other assessed CWs, specifically, the absence of a well-established graminoid and forb layer. Although grasses were present, their distribution was sparse. This may potentially be the result of smothering by wind-borne sediment.

2.e.iii.6.f Watercourse consideration

A single watercourse, specifically a small unnamed tributary of the Groenwaterspruit, was identified approximately 162 m east of the proposed detrital area expansion (see Figure 87 and Figure 88). This watercourse was characterised as an episodic drainage line with a weakly-defined riparian zone (Figure 92) and was only assessed during the June 2019 site visit. Since the proposed detrital area expansion is located outside of the Zone of Regulation (100 m in terms of both GN 704 and GN 509 as they relate to the National Water Act, 1998 (Act No. 36 of 1998) of this watercourse, a quantitative assessment of the PES and EIS was not undertaken. Although the proposed detrital area expansion is situated outside the applicable Zones of Regulation, it is located upgradient of the watercourse, and therefore, it is considered imperative that suitable mitigation measures are implemented to ensure that no indirect impacts occur.

Although not quantitively ascertained, it is the specialist's opinion that the watercourse is in a moderately modified ecological state, and of moderate ecological importance and sensitivity. The watercourse has been subjected to few impacts; those observed included overgrazing and trampling by livestock, altered hydraulic regime particularly in the lower reaches where road crossings have resulted in concentrated flow, and in the upper reach to the east, erosion was noted on digital satellite imagery. Isolated occurrence of litter and debris was also noted within the system, which may restrict flow and impair water quality when surface water is present. It is likely to provide an important faunal migratory corridor, and some degree of ecological services such as sediment trapping, contribution to the recharge of the downstream system, and assimilation of nutrients, although the ephemeral character of the watercourse limits the opportunity to do so. The watercourse is likely to be sensitive to increased flood peaks which may alter the floral community composition, and potentially to changes in water quality.

The orange linear feature identified in figure below possesses obligate floral species (*Typha capensis* and *Phragmites australis*) in the upgradient portion. However, the downgradient portion does not possess any facultative or obligate vegetation. Furthermore, this linear feature is not visible on the historical aerial imagery, nor is it indicated on the topographic maps for the area or any of the databases consulted. Moreover, typical obligate species such as *T. capensis* tend not to persist under "normal" (i.e. reference or undisturbed state) in arid zones typical of Postmasburg as there is usually insufficient moisture to sustain them. The hydrologist confirmed that this feature is a result of a past overflow of a dewatering mine tank at the mine. As a result, this feature does not conform to the definition of a wetland as contained in the NWA.

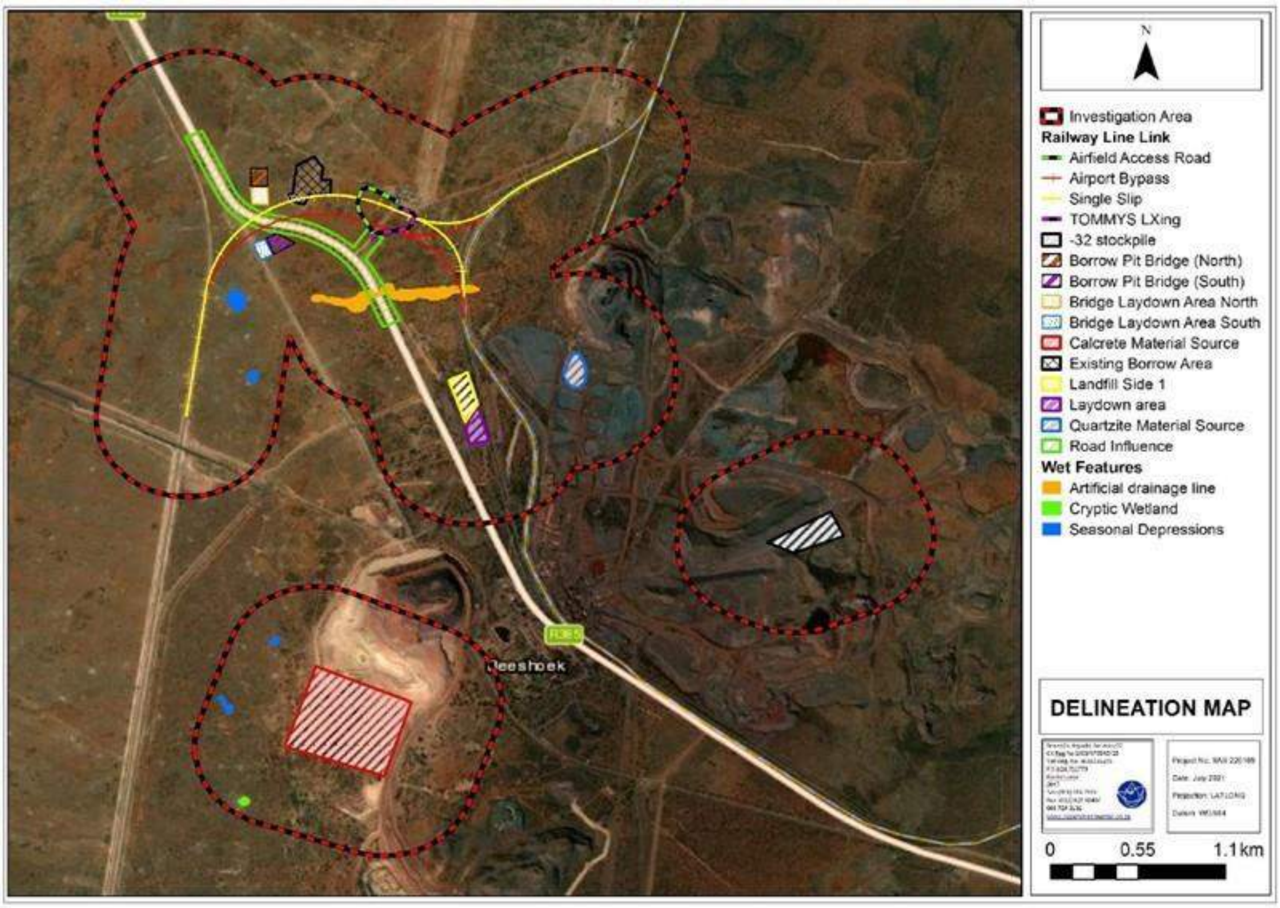


Figure 89: The location and approximate extent of the artificial drainage line, seasonal depressions and single cryptic wetland in relation to the proposed railway line and associated surface infrastructure

2.e.iii.7 Hydrological Setting

The Hydrological Assessment was undertaken by Hydrospatial. Please refer to Annexure 9 for the detailed report.

2.e.iii.7.a Regional Catchments

Beeshoek is located in quaternary catchment D73A within the Vaal Water Management Area (WMA). According to the Water Resources of South Africa Study 2012 (WR 2012), quaternary catchment D73A is endoreic, meaning that surface water runoff does not flow out of the catchment, and that water is lost to evaporation and infiltration. This is mostly due to the low rainfall and high evaporation of the area.

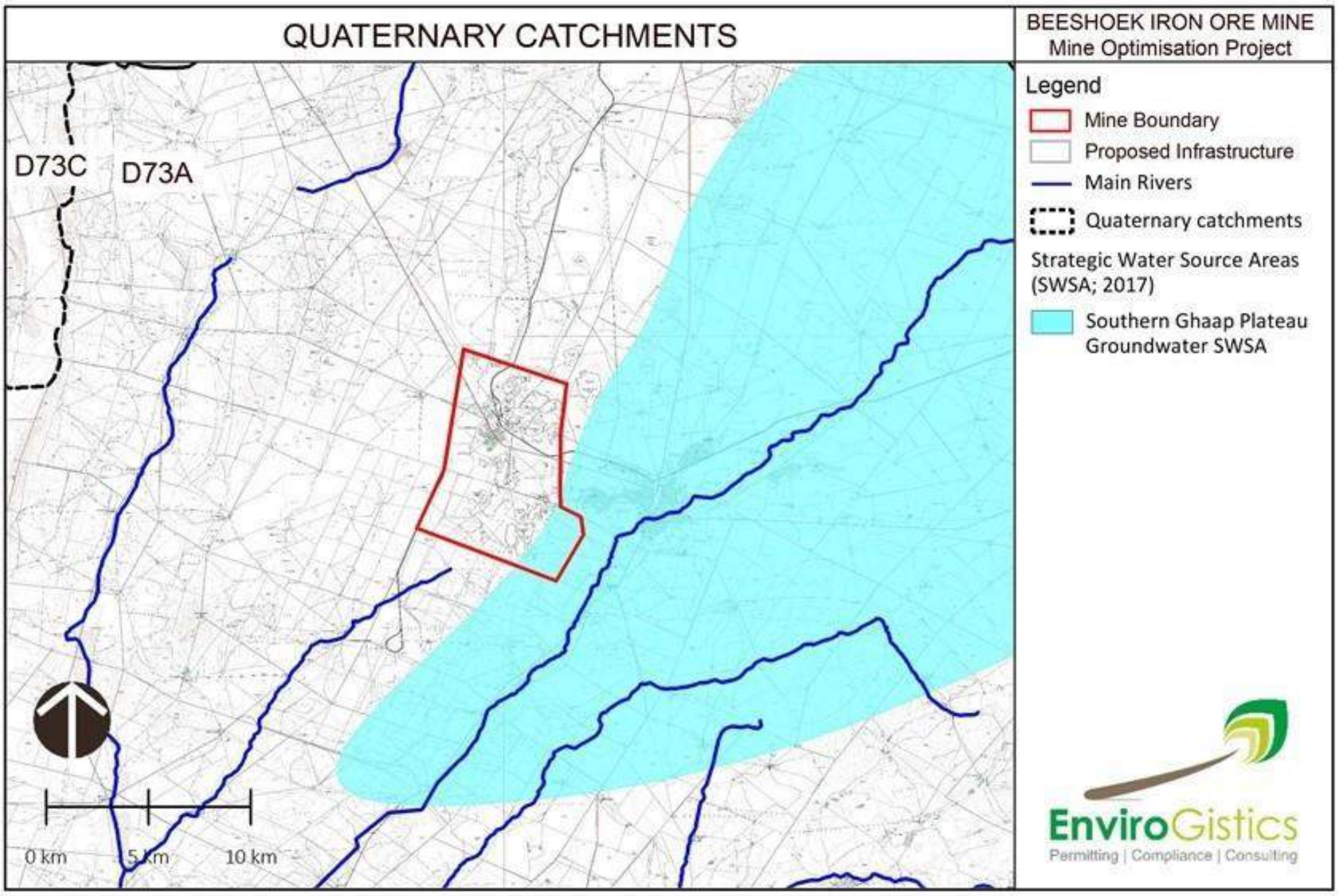


Figure 90: Quaternary Catchment

2.e.iii.7.b Topography and Drainage

An elevated ridge runs in a north to south direction along the eastern Mine boundary and reaches a maximum height of 1 480 mamsl in the north of the Mine (please refer to figure below).

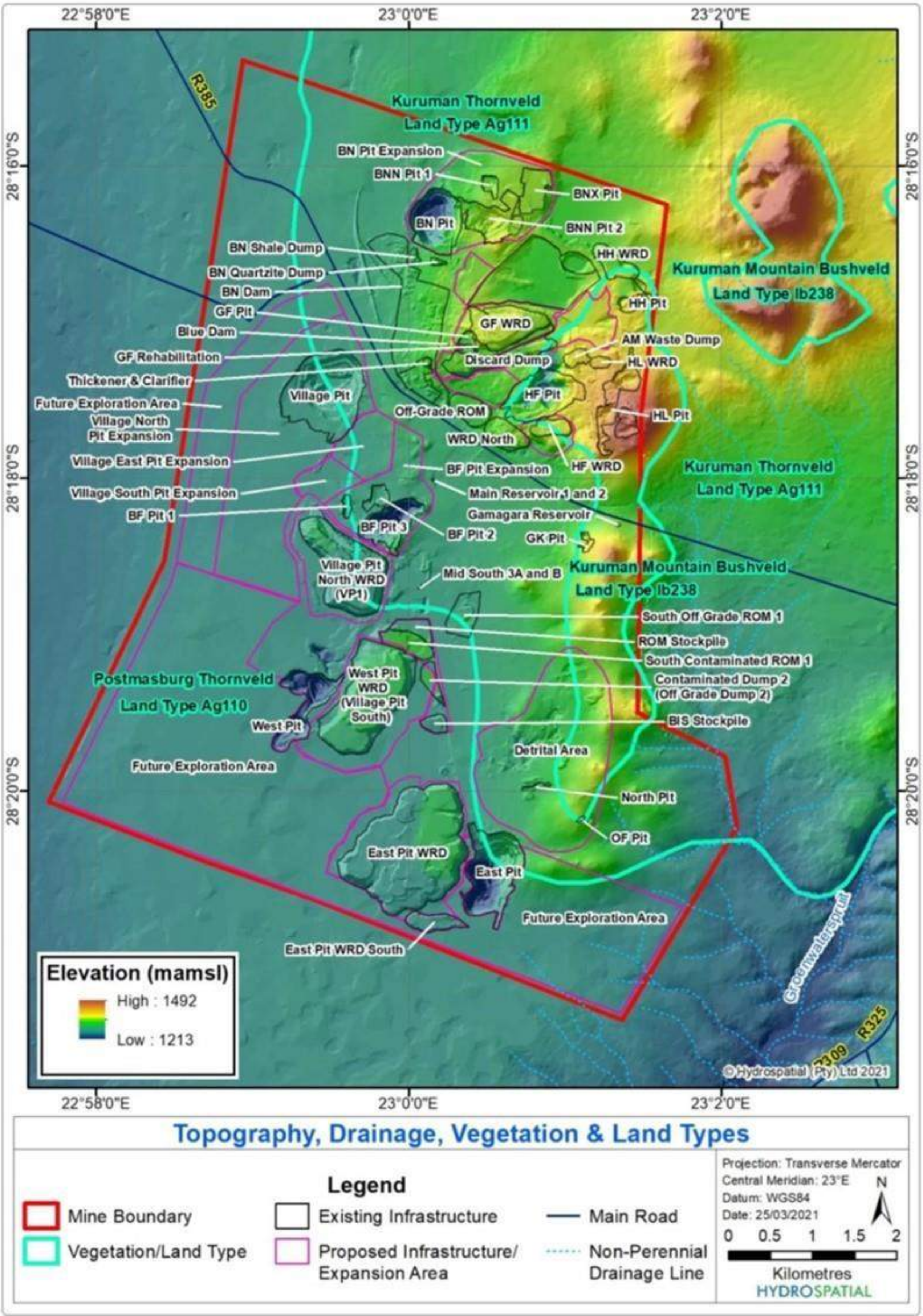


Figure 91: Mine Layout, topography, vegetation and land types

Elevation drops off gradually towards the west, reaching a height of 1 300 mamsl near the western Mine boundary. The general topography of the site can be described as flat. Water to the west of this ridge will drain in a westerly and south-westerly direction, and to the east of this ridge, water drains in an easterly and south-easterly direction towards the Groenwaterspruit. Drainage occurs via shallow channels that rarely flow and are ephemeral in nature (please refer to photo below). The flat topography, fairly permeable soils and deep groundwater levels below the bed of drainage lines do not allow for baseflow contribution. Some of these drainage lines are very shallow and would therefore act as preferential flow paths.

Photo 3: Drainage line near the south-eastern mine boundary

For the purposes of proposed railway link. a desktop assessment of contours and site investigation findings revealed the following:

- A number of man-made excavated areas that appear to be old borrow pits occur within the vicinity of the proposed railway;
- An artificial drainage channel, that begins at a culvert where the proposed railway link ties into the existing Beeshoek Railway, and flows in a westerly direction, has been created due to what appears to be a leaking pipe. Should the leak be fixed, then this drainage channel would cease to exist; and
- A seasonal / ephemeral depression is located approximately 125 m east of the point where the proposed railway link ties into the existing TFR railway line. According to the Wetland Specialist, although one floral species associated with wetlands was found, the soils did not show any morphological characteristics consistent with wetland conditions, and therefore, the depression was classified as a seasonal / ephemeral depression and not a wetland. More details can be found in the wetland assessment.

Based on the above, it can be concluded that there are no natural watercourses within the vicinity of the proposed railway link.

2.e.iii.7.c Wetlands and Depressions

Please also refer to Section 2.e.iii.6**Error! Reference source not found.** before. A number of pan/ depression-like features were noted to occur to the west and south of the Mine on the site visits. The location of these features is indicated on the figure overleaf.

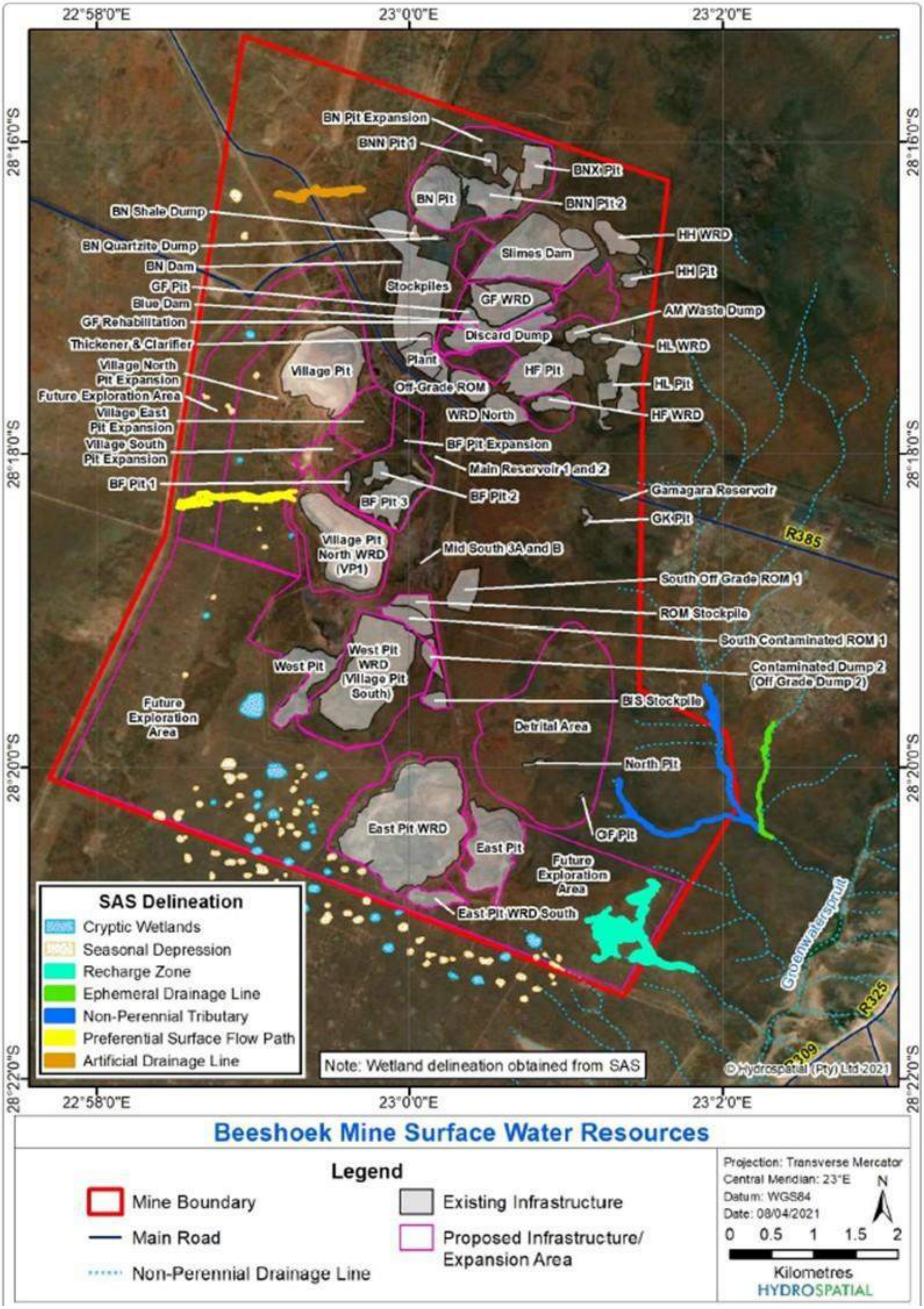


Figure 92: Surface Water Resources

The Freshwater Ecological Assessment (SAS, 2021) has delineated these features and classified them as follows:

- Cryptic wetlands – which are those which don't necessarily conform to the DWS or NWA definitions of a wetland, as they generally don't have hydrophytic vegetation. However, they can hold water for a reasonable period of time and during that time, aquatic vegetation may emerge and egg banks of various macroinvertebrates can hatch out. Cryptic wetlands have several key identifying features in common, including specific floral indicators, the fact that woody species if present tend to occur only around the perimeter of the depression, and leached soils which don't necessarily develop mottles but which are not the same well-draining, high chroma soils of the surrounding areas. Figure 3-5 indicates a Cryptic wetland located to the west of the East Pit WRD, which was visited on 3 February 2021, after the area had received high rainfall in the preceding weeks.
- Seasonal depressions – these are the features that topographically look like depression wetlands, but don't have any of the indicators. Floral species composition is usually very different, and woody species tend to occur within them, rather than just lining the outer perimeter of the depression. Additionally, they usually have similar soils to the surrounding upgradient areas, rather than leached soils.

Photo 4: Cryptic wetland located to the west of the East Pit WRD

In addition to the above, a preferential flow path, recharge zone and non-perennial tributaries were also delineated (figure before, Figure 91).

A seasonal/ ephemeral depression is located approximately 125m east of the point where the proposed railway link ties into the existing TFR railway line. According to the Wetland Specialist, although one floral species associated with wetlands was found, the soils did not show any morphological characteristics consistent with wetland conditions, and therefore, the depression was classified as a seasonal / ephemeral depression and not a wetland.

2.e.iii.7.d Surface and Groundwater Quality

Due to the high evaporation and low rainfall of the area, the generation of surface water rarely occurs, and is therefore only monitored at the tanks, pits and pipelines. According to Aquatico (2021), the general surface water quality during the 2020 period was classified as being neutral, saline and very hard. Low salt concentrations, metal concentrations and nutrient concentrations were detected at all of the sampling locations.

2.e.iii.7.e Floodlines

Only one defined non-perennial drainage channel was evident on the site visit and is indicated in the following figure. The drainage channel is located in the south-eastern corner of the Mine and is an ephemeral tributary of the Groenwaterspruit. It is unlikely that this tributary will result in any flood hazard, however, a floodline determination was undertaken, as future exploration in the form of prospecting activities is proposed in this area. According to regulation 4 (b) of GN704, prospecting should not take place within the 1:50 year floodline or within a 100 m horizontal distance of a watercourse, unless exemption is obtained from the DWS.

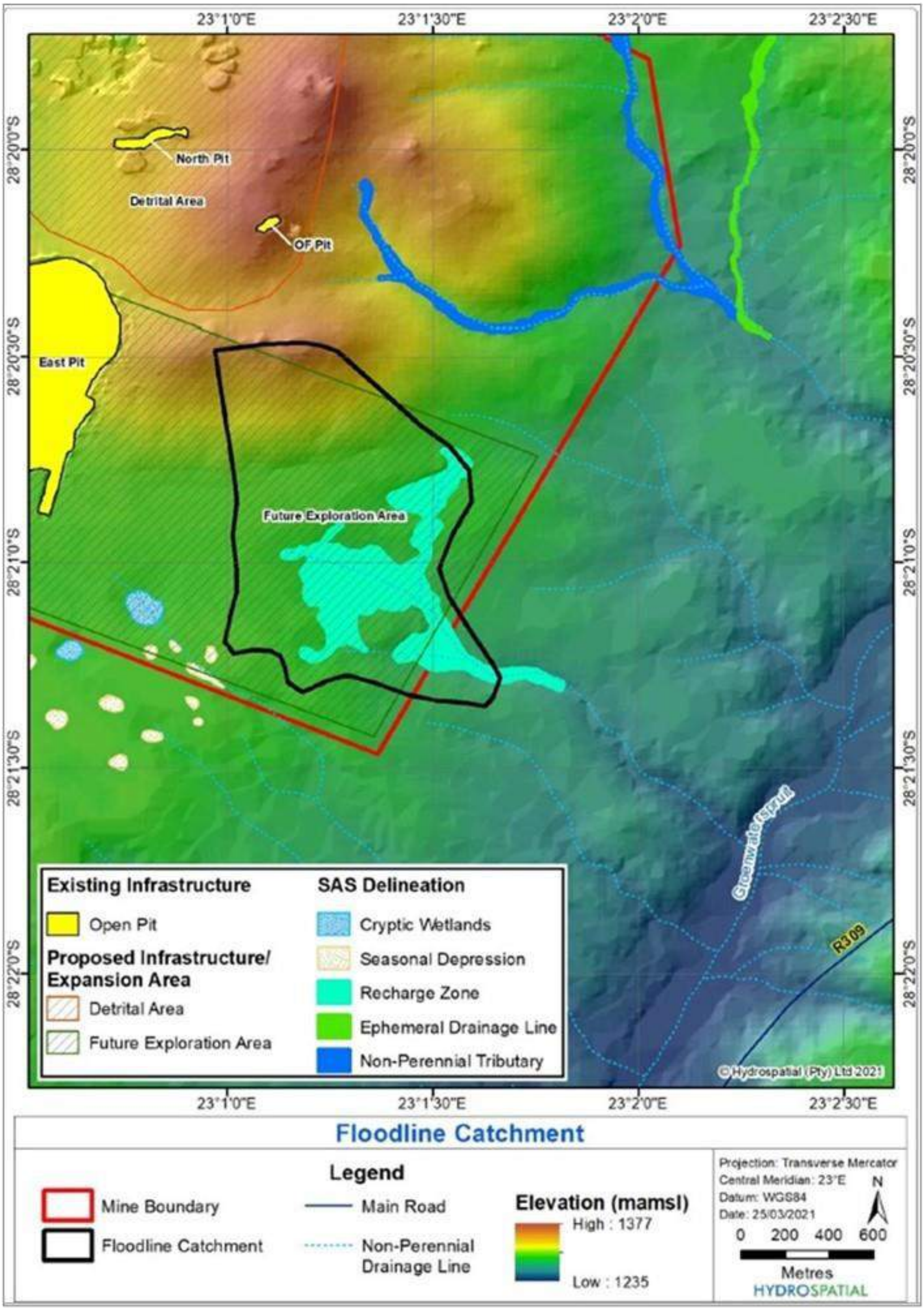


Figure 93: Floodline Catchment

Figure 94: Floodline Determination

When considering the railway line area, the nearest defined watercourse to the Mine is the Groenwaterspruit (EnviroGistics, 2018), which is located approximately 1.5 km east of the south-eastern MRA boundary. As previously mentioned, Beeshoek falls within an endoreic quaternary catchment, and therefore, very little to no surface water is expected to be generated.

Groundwater levels in the vicinity of the railway link vary from 1 290 mamsl to 1 310 mamsl (GPT, 2021), which is approximately 10 m to 30 m below ground level.

The desktop assessment of contours and site investigation findings revealed the following:

- A number of man-made excavated areas that appear to be old borrow pits occur within the vicinity of the proposed railway;
- An artificial drainage channel, that begins at a culvert where the proposed railway link ties into the existing Beeshoek Railway, and flows in a westerly direction, has been created due to what appears to be a leaking pipe. Should the leak be fixed, then this drainage channel would cease to exist; and
- A seasonal / ephemeral depression is located approximately 125 m east of the point where the proposed railway link ties into the existing TFR railway line. According to the Wetland Specialist, although one floral species associated with wetlands was found, the soils did not show any morphological characteristics consistent with wetland conditions, and therefore, the depression was classified as a seasonal / ephemeral depression and not a wetland. More details can be found in the wetland assessment.

Based on the above, it can be concluded that there are no natural watercourses within the vicinity of the proposed railway link.

2.e.iii.7.f Current Storm Water Management

The Mine's Stormwater Management Plan (SWMP) was prepared by Storm Water Solutions (SWS, 2016). This plan was approved as part of the WUL, 2018.

Clean and dirty areas were delineated and are indicated on the following figures. The green areas indicate the dirty areas and are associated with those areas where the natural surface has been altered by mining activities. These include:

- Open pits;
- Slimes Dam;
- Workshops;
- Crushers; and
- Plant area.

The light blue areas indicate the clean areas (Figure 95), which are still natural and generally in the same state as before mining occurred (SWS, 2016).

Current stormwater measures include the following:

- Safety berms have been placed around the pits and ensure that no clean water flows into the pits;
- Dirty water is contained within the Slimes Dam and water levels are monitored to ensure that there is sufficient freeboard at all times in line with GN704 regulations;
- Dirty water generated at the workshops is captured within lined channels and sumps;
- Dirty water generated at the crushers is recycled and reused or evaporated at the evaporation ponds; and
- Dirty water generated at the plant is captured within lined sumps and either recycled and reused or gravitated to the stormwater dam.

No stormwater measures to contain runoff were recommended around the WRDs due to the low rainfall, high evaporation and waste classification which indicated non-hazardous material (SWS, 2016).

Figure 95: Current storm water management measures

2.e.iii.8 Hydrogeological Setting

The hydrogeological study was undertaken by GPT (Pty) Ltd (please refer to Annexure 10).

2.e.iii.8.a Aquifers

Karoo Supergroup sediments, volcanics and karstic (dolomitic) formations are the main components of the groundwater regime in the area.

<u>Aquifers associated with sedimentary formations</u>

Diamictite and shale have very low hydraulic conductivities (about 10-11 to 10-12 $m.s^{-1}$) and low primary porosity. Boreholes in these formations are expected to be low-yielding (<1 l/s) and water occurrence is confined within secondary structures like jointing and fracturing. Shale and diamictite are expected to form extensive aquitards in outcrop areas. Breccia is often non-cohesive in outcrop or shallow areas. The development of joints, fracturing leading to breccia formation in fault zones will cause an enhancement of permeability which may be reduced by cementation.

<u>Aquifers associated with volcanic formations</u>

In solidified lavas, due to low permeability, water commonly occurs in fault zones; the dip angle of fault zones is in this way important. Fault zones commonly act as hydraulic conduits to groundwater flow connecting shallow and deeper-lying geological units, however the fault cores of many faults may act as barriers to flow, such as thrust faults which have low permeability.

<u>Aquifers associated with karstic formations</u>

The permeability structures of carbonate rocks are controlled fluid-flow conduits. These aquifers are often high yielding (>5 l/s).

Groundwater storage occurs in the rock matrix and groundwater flow occurs in secondary geological structures like lithological contacts, faults, deformational zone, joints, and fractures. These structures are often drilling targets for water supply or monitoring boreholes. These structures generally act as conduits to groundwater flow but may also have a compartmentalising effect as barriers to groundwater flow.

The Griqualand West region is characterised by major deformational events including the Namaqua orogeny which resulted in a N-S trending regional thrust fault and other deformational structures. The following observations were made:

- The N-S trending regional strike fault (west of the mine) is thought to have a compartmentalising effect as water levels are shallower in boreholes bounded by the fault in comparison to boreholes outside (east) of the thrust fault, except where the surface area has been disturbed by excavation for open pit mining.

The aquifer(s) underlying the subject area were classified in accordance with "A South African Aquifer System Management Classification, December 1995."

The main aquifers underlying the area were classified in accordance with the Aquifer System Management Classification document10. The aquifers were classified by using the following definitions:

- Sole Aquifer System: An aquifer which is used to supply 50% or more of domestic water for a given area, and for which there is no reasonably available alternative sources should the aquifer be impacted upon or depleted. Aquifer yields and natural water quality are immaterial.
- Major Aquifer System: Highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good (Electrical Conductivity of less than 150 mS/m).
- Minor Aquifer System: These can be fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large quantities of water, they are important for local supplies and in supplying base flow for rivers.
- Non-Aquifer System: These are formations with negligible permeability that are regarded as not containing groundwater in exploitable quantities. Water quality may also be such that it renders the aquifer unusable. However, groundwater flow through such rocks, although imperceptible, does take place, and needs to be considered when assessing the risk associated with persistent pollutants.

Based on information collected during the hydrocensus it can be concluded that the aquifer system in the study area can be classified as a "minor aquifer system", based on the fact that the local population is dependent on groundwater.

2.e.iii.8.b Hydraulic Conductivity

Hydraulic Conductivity measures the ease with which water will pass through the earth's material; defined as the rate of flow through a cross-section of one square metre under a unit hydraulic gradient at right angles to the direction of flow (m/d). Hydraulic conductivity varies spatially and vertically and for the purpose of this study a detailed description of hydraulic conductivities of various units were described.

Hydraulic conductivity varies spatially and vertically, and the modelled conductivities vary by at least six orders of magnitude, from 10_{-3} m/d to 10_{+2} m/d (0.001 m/d to 100 m/d).

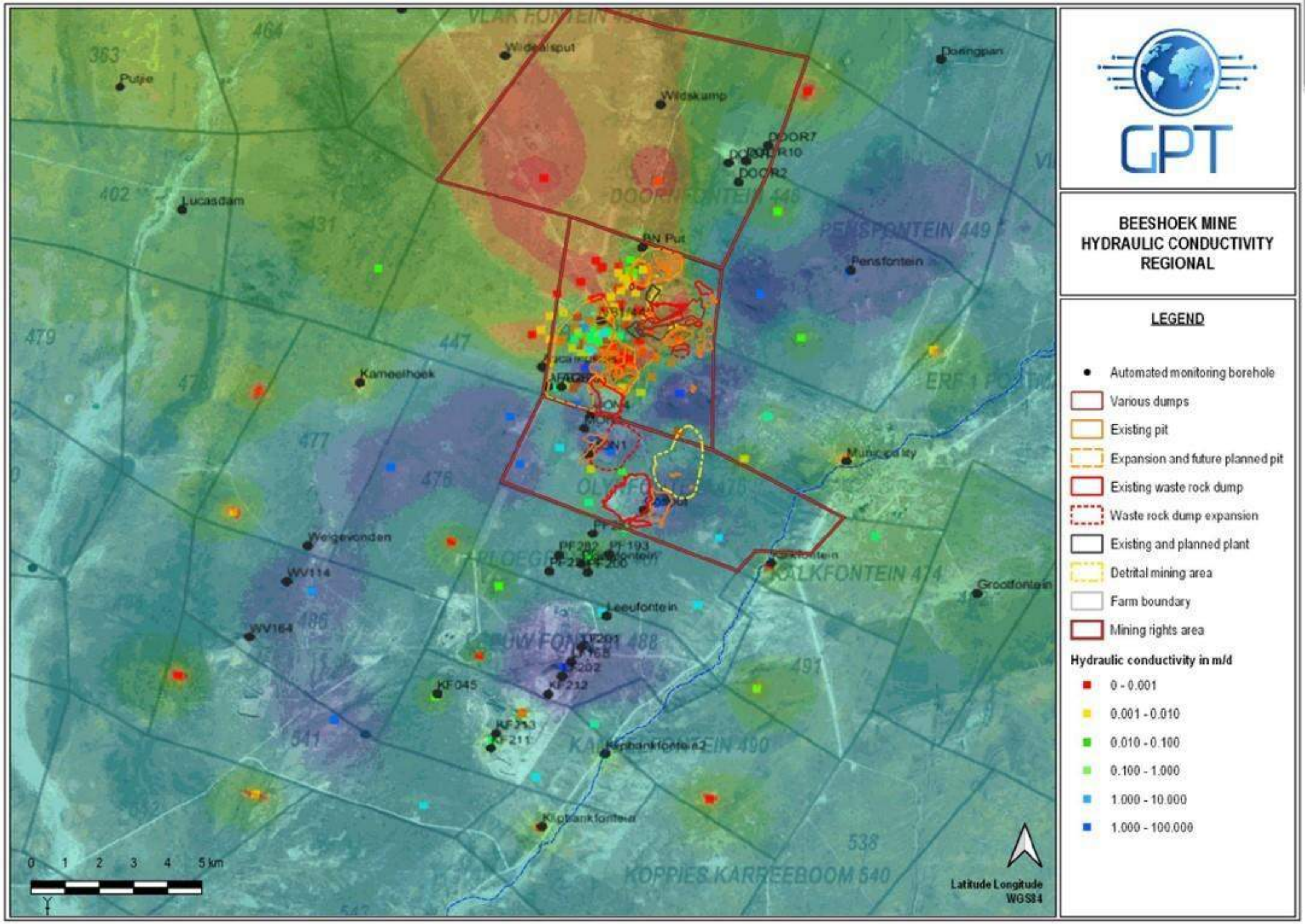


Figure 96: Calibrated Regional Hydraulic Conductivity Field

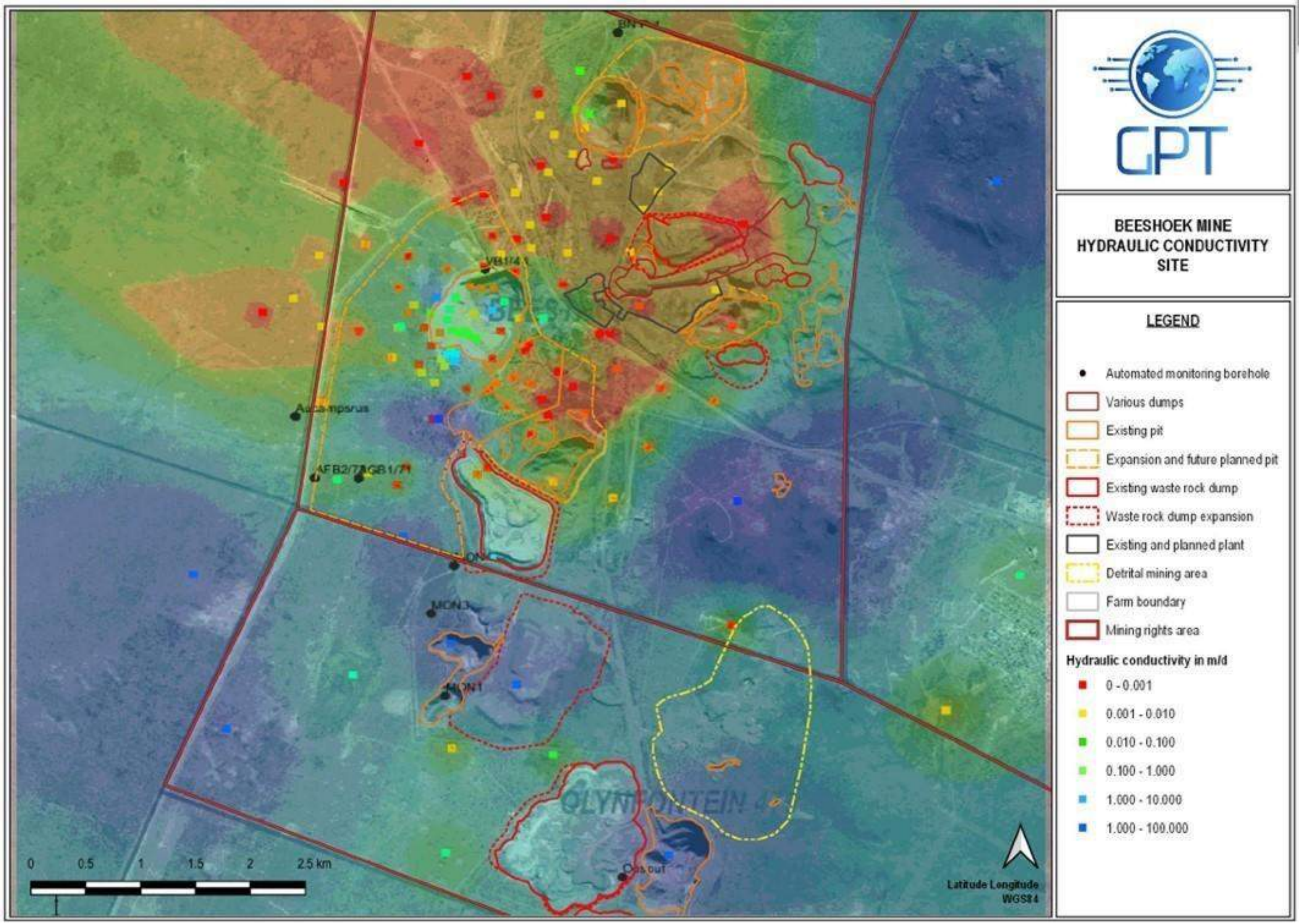


Figure 97: Calibrated Site Hydraulic Conductivity Field

2.e.iii.8.c Groundwater Flow

The direction of groundwater flow is south to south easterly from the mining area. Please refer to the following figure.

2.e.iii.8.d Water levels

Water levels are measured on a monthly basis, by the mine. Groundwater levels range between 5 metres below ground level (mbgl) in unaffected areas to 180 - 200 mbgl in dewatered areas due to groundwater abstraction for dewatering and water supply. The effect of dewatering is more pronounced to the south of the Mine (south of Olynfontein). The direction of groundwater flow is south to south easterly from the mining area (the following figure). A cone of depression has developed within the active mining area with flow directed towards the mining excavation due to the active mining areas. The groundwater monitoring network comprises of (Figure 99):

- 21 open monitoring boreholes that are monitored for groundwater level information on a monthly basis by Beeshoek, some boreholes are fitted with level loggers since 2018 which record water level fluctuation on a daily basis.
- 21 telemetric system boreholes are present in and around Beeshoek Mine from which are intended for monitoring changes in groundwater levels in and around the mine.

Therefore, it was possible to compare historic water levels with current water levels to determine any water level changes taking place. The trends in water levels can be seen in Appendix II of Annexure 10. The following observations were made:

- The majority of mine monitoring boreholes show a declining trend in water levels since 2012 for boreholes located on the farm Beeshoek, where most of the mining pits are located.
- The mine monitoring boreholes located on the farm Doornfontein, north of active mining areas show a stable trend since 2013.

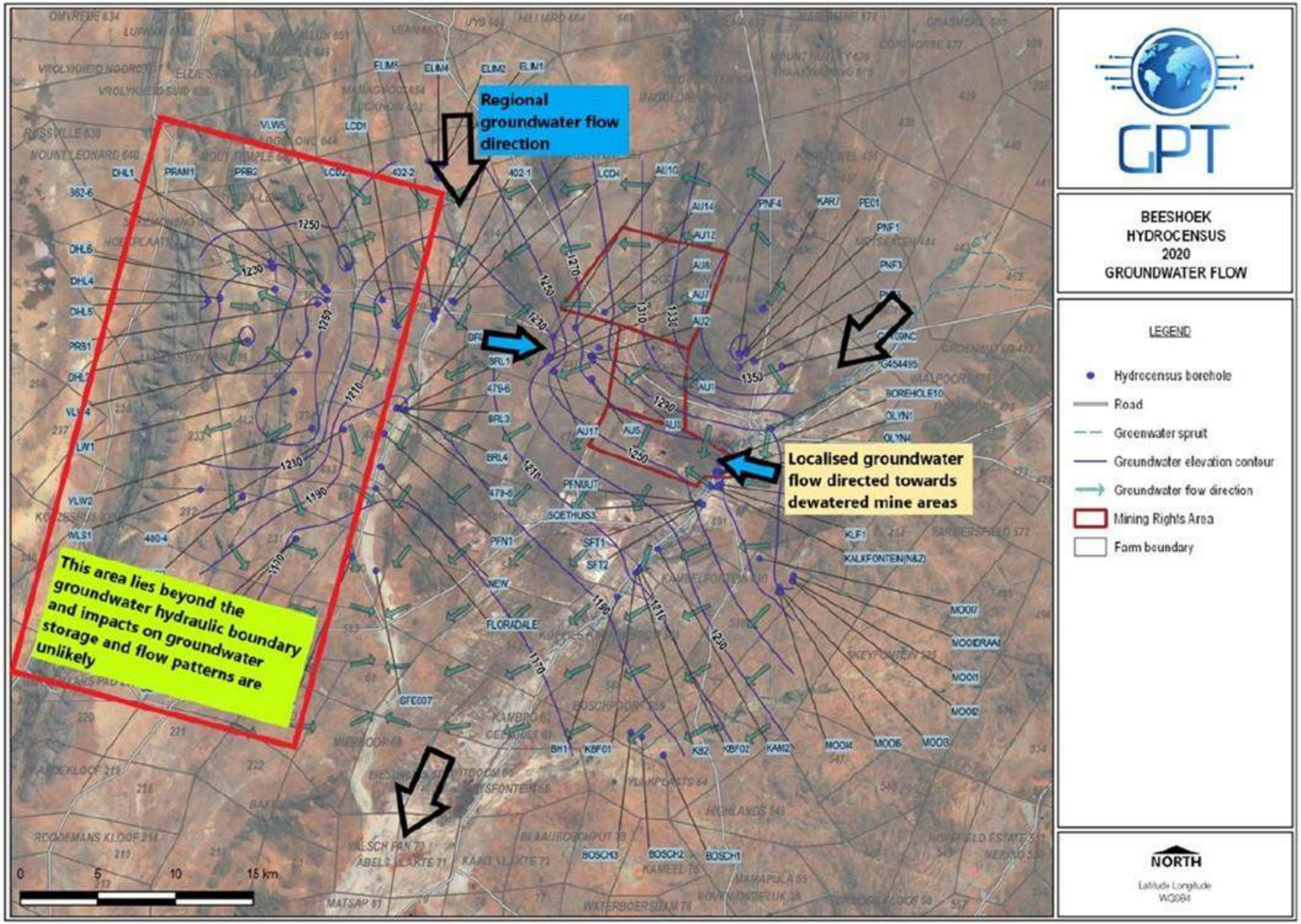


Figure 98: Groundwater flow direction (GPT, 2020)

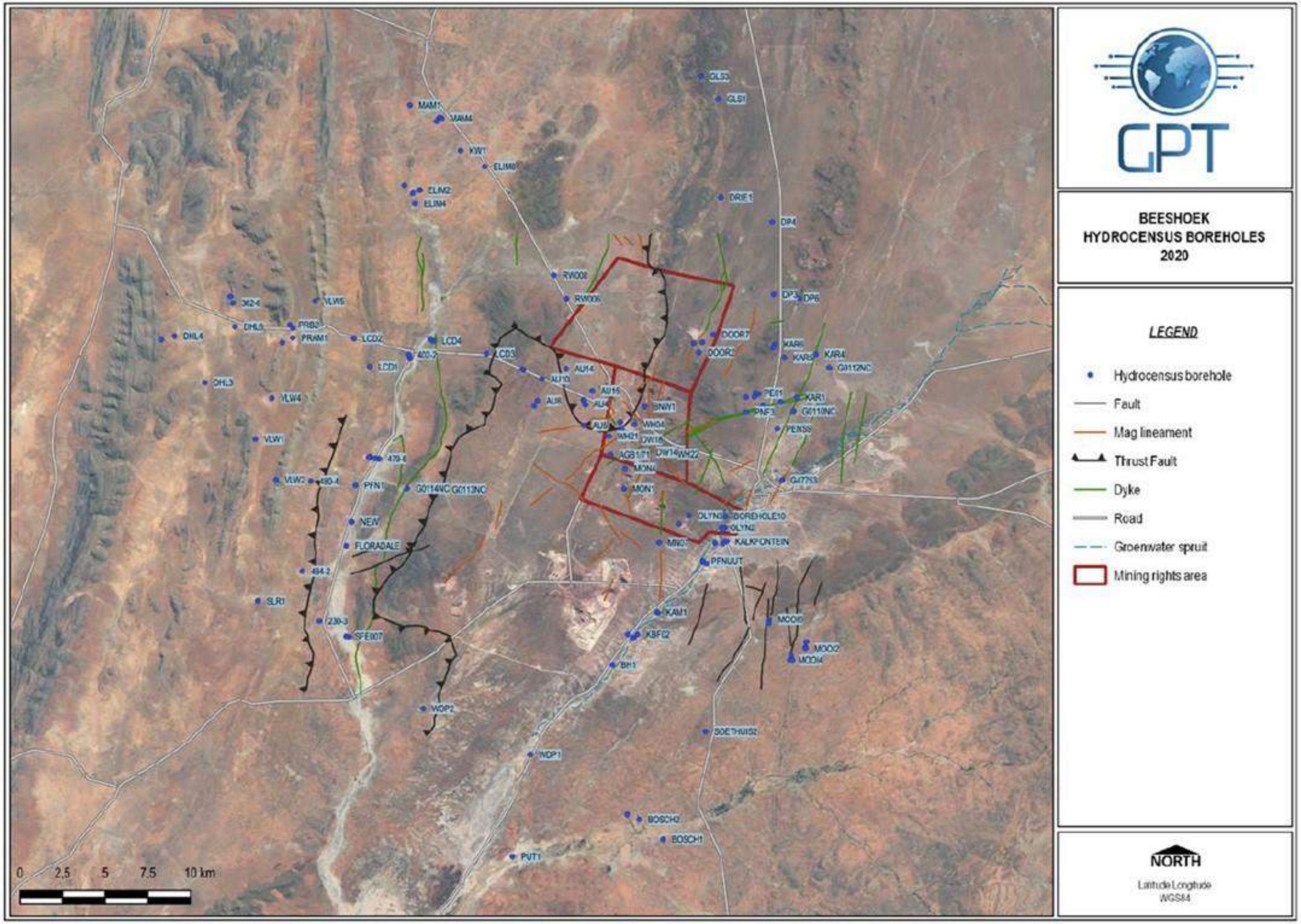


Figure 99: Groundwater Monitoring Network

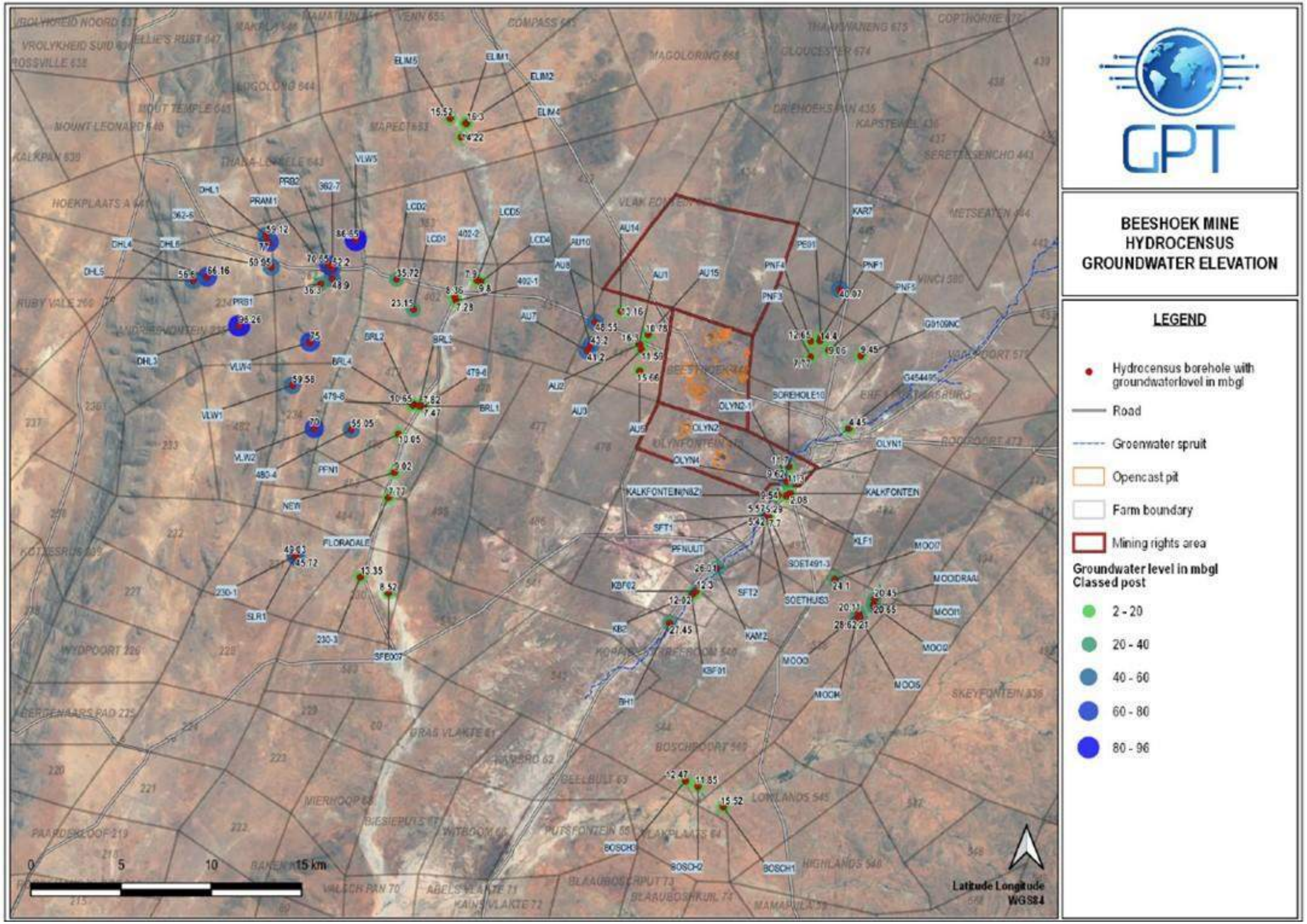


Figure 100: Water levels in mbgl recorded in July 2020 in external user boreholes

2.e.iii.8.e Mine Borehole Quality

Generally, the groundwater resources at all the sampling localities are described as being neutral to alkaline (pH levels between 7.8 and 8.0), non-saline to saline (TDS between 445.5 mg/l and 563.8 mg/l), and the hardness can be classified as very hard (> 300mg $CaCO_3$/l). Water hardness at Beeshoek mine is not unlike most other boreholes in the area, resulting from the calcareous/dolomitic underlying geology characteristic of many parts of the Northern Cape.

Metal concentrations were below detection limit or low at all the monitoring boreholes.

Nitrate as N and combined nitrate and nitrite exceed the drinking water limit in the majority of external user boreholes regardless of location. The WUL identified nitrates as a contaminant of concern in relation to mining activity due to the use of N-based emulsions for blasting. Through the analysis of N-isotopes from nitrates, a contamination assessment was conducted in 2019 and it was concluded that mine's contribution to nitrate levels in and around the mine was minimal (<1%).

From the results of water quality monitoring and various groundwater impact assessments the following observations were made:

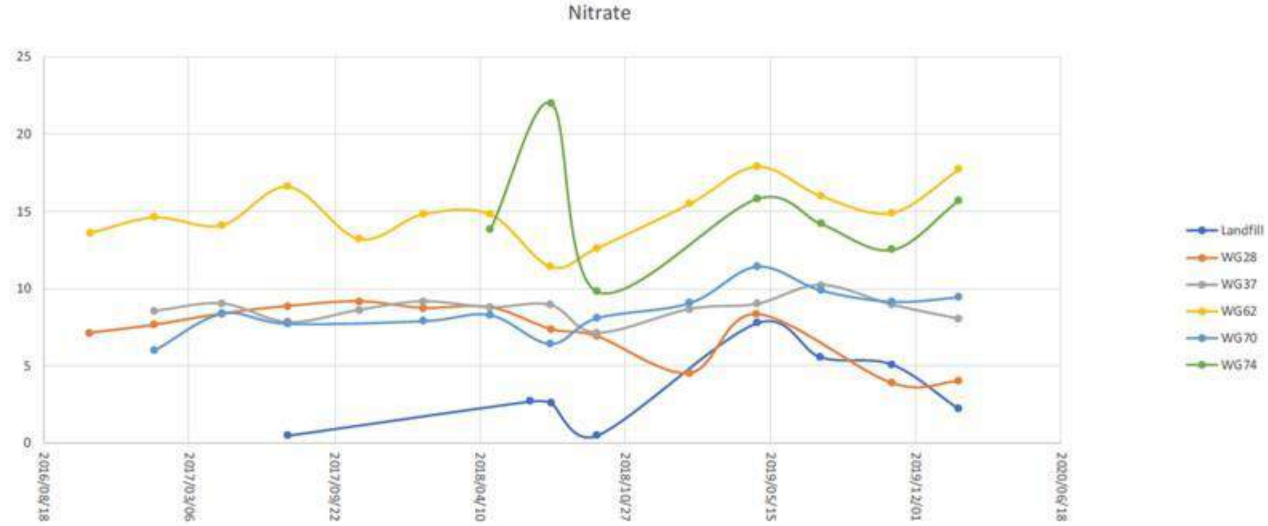
- All samples complied with the Class 2 limits set in the WUL.

Table 53: Average results of the analysis for groundwater as per WUL for January 2020

Sample Nr.	WG37	WG28	WG62	WG70	WG74	Landfill	Class 0	Class 1	Class 2	Class 3	Class 4
pH	7.46	7.09	7.80	7.64	7.80	7.74	5-9.5	4.5-5;9.5-10	4-4.5;10-10.5	3-4;10.5-11	<3;>11
EC	82.10	96.30	82.90	84.80	80.40	71.20	<70	70-150	150-370	370-520	>520
TDS	561.00	585.00	555.00	552.00	538.00	435.00	<450	450-1000	1000-2400	2400-3400	>3400
Cl	39.90	52.20	47.60	41.90	42.10	46.50	<100	100-200	200-600	600-1200	>1200
SO_4	33.40	13.10	31.40	22.40	28.30	14.80	<200	200-400	400-600	600-1000	>1000
NO_3-N	8.67	3.97	17.70	9.42	15.70	2.20	6	6.0-10	10.0-20	20-40	>40
F	-0.26	-0.26	0.27	-0.26	0.34	-0.26	<0.7	0.7-1	1-1.5	1.5-3.5	<3.5
Ca	91.70	106.00	79.80	87.80	74.20	77.20	80	80-150	150-300	>300	-
Mg	54.80	57.30	49.60	54.20	52.00	45.80	<70	70-100	100-200	200-400	>400
Na	12.60	12.20	18.80	14.30	17.00	11.20	<100	100-200	200-400	400-1000	>1000

Notes
Negative value = below detection limit of analytical technique

- All samples have a Ca^{2+}/Mg^{2+}-HCO^{3-} hydrochemical signature typical of unpolluted groundwater enriched in Ca and Mg due to the presence of dolomite [Ca.Mg(CO_3)2] in the area which can influence the carbonate concentration in the groundwater by dissolution.
- The use of N-based explosives for mine blasting is likely to contribute to elevated nitrate levels in groundwater as most explosives contain between 70 – 90% ammonium nitrate. Nitrates are highly soluble in water. The occurrence of nitrate in groundwater and the pit water indicates that nitrate is naturally occurring (outside of the mining area) with contribution from N-based explosives in the mining area. In the mining environment, the leaching of blasting residue from waste rock, tailings and mine water impoundment are also potential sources of nitrate in groundwater. The contribution of N-based-explosives to nitrate concentration in groundwater is negligible compared to background values.
- The time series graph (see below) indicates that the nitrate concentrations fluctuate over time and that concentrations in WG62 and WG74 are increasing from September 2019 onwards. The remaining boreholes reported a decreasing trend from April 2019 onwards. The average value of the NO_3 concentrations in the boreholes is 9.62mg/.



Graph 3: Time series graph of NO_3 in monitoring boreholes.

- Nitrate occurrence may be attributed to nitrogen cycling in the environment and the use of N-based explosives (for mine blasting). Nitrate circulation in water is complicated, involving multiple sources. The sources of nitrates around the mine may be attributed to either natural occurrence in soil and/or the use of N-based fertiliser on irrigated soils.

2.e.iii.8.f Contaminants of Concern

An audit of the existing monitoring network as well as a waste classification exercise was carried out to characterise contaminant sources to determine the adequacy of the monitoring network by GPT, 2018. The following findings were made:

- The leachable concentrations of solid waste were compared to the Leachable Concentration Threshold (LCT) limits to determine the leachability of the different waste types at the mine. Solid waste types were described as either "Type 4" or "Type 3" waste types which are low hazard waste types with regards to the likelihood to release contaminants in dissolved phase.
- Liquid waste (mine water) was compared to the SANS 241-1:20154 drinking water standards and the majority of constituents were found to lie within acceptable limits with the occurrence of elevated nitrate in some liquid waste handling facilities (viz. D90, 26TK01, Fine Residue Dam, Thickener and Clarifier)
- The majority of potential sources of contaminants are located within the dewatered area, directing groundwater flow towards the active mining areas. Therefore, expansion of the groundwater quality monitoring network was not deemed necessary, as the effects of potential sources on the groundwater environment are likely to be negligible and are unlikely to be observed in samples as the chemical signatures (composition) of the different mediums are similar (GPT, 2018).This was sourced from the Waste Characterisation and Groundwater Monitoring Network Audit for ASSMANG Beeshoek Iron Ore Mine. Contract Report (Reference: ASBEE-16-1987).
- The report also stated the following: "The available hydrogeochemical data (incl. solid waste, liquid waste and groundwater) were analysed using IBM.s SPSS v. 20. The corresponding chemical constituents between each of the samples were defined as chemical fingerprints, which could be correlated and cross-correlated with each other in an attempt to identify the similarities between the waste samples and background water quality. All the chemical compositions of the solid waste and liquid waste samples show a significant correlation (á = 0.01 or 0.05) with that of at least one background groundwater sample. This illustrates that contamination from these sources is likely to have the same geochemical signature as the local groundwater. This shows that contamination to the aquifer from the identified sources is unlikely."

The following constituents/chemical substances were considered as contaminants of concern in relation to mining and waste management at the Beeshoek Mine:

- Barium (Ba), Manganese (Mn) and NO_3 which were regarded as contaminants of concern in the WUL were found to be naturally occurring and meet the groundwater quality objectives as prescribed in the WUL in the form of maximum allowable concentrations. The occurrence of NO_3 in groundwater indicates that it is natural outside of the mining area with minor contribution (<1%) from using N-based explosives within the mining area for blasting (GPT, 2019). This was sourced from the Contamination Assessment at Beeshoek Iron Ore Mine in terms of Nitrate, Barium and Manganese as Contaminants of Concern. Contract Report (Reference: ASBEE-19-4097)
- The dominant ions in groundwater samples have a $Ca^{2+,}$ Mg^{2+} and HCO_{3-} typical of unpolluted groundwater enriched in Ca and Mg due to the presence of dolomite [CaMg(CO3)2] in the area which can influence the carbonate concentration in the groundwater by dissolution (GPT, 2019). This was sourced from the Contamination Assessment at Beeshoek Iron Ore Mine in terms of Nitrate, Barium and Manganese as Contaminants of Concern. Contract Report (Reference: ASBEE-19-4097).

2.e.iii.8.g Spatial Water Quality

The results from the chemical analyses were plotted on pie diagrams for mine monitoring boreholes and hydrocensus (external user) boreholes. The pie diagrams show the individual ions present in a water sample as a presentation of the total ion concentrations. The scale for the radius of the circle represents the total ion concentrations, while the subdivisions represent the individual ions. It is useful in making comparisons between waters from different sources and presents the data in a convenient manner for visual inspection.

It can be deduced from the pie diagrams (Figure 100 and Figure 101) that the water chemistry in the majority of the boreholes and surface water monitoring points are dominated by Calcium (Ca), Magnesium (Mg), Chlorine (Cl) and HCO_3, represents fresh, clean, relatively young groundwater that has started to undergo Mg ion-exchange, often found in dolomitic terrain.

Table 54: Water qualities compared to SANS 241-1:2015 guidelines for external user boreholes (2020)

Determinand	Risk	Unit	Standard limits	SOETHUIS3	OLYN2	OLYN2-1	KAM2	OLYN1
Physical and aesthetic determinands								
Conductivity at 25 °C	Aesthetic	mS/m	170	119	223	152	123	152
Total dissolved solids	Aesthetic	mg/L	1 200	834	1560	1060	862	1070
pH at 25 °C	Operational	pH units	5 to 9.7	7.32	7.23	7.31	7.48	7.38
Chemical determinands – macro-determinands								
Nitrate as N (NO_3 - N)	Acute health	mg/L	11	3.19	6.48	4.6	0	1.44
Nitrite as N (NO_2 - N)	Acute health	mg/L	0.9	0.002	0.002	0.002	0.002	0.003
Combined nitrate plus nitrite (NO_3+NO_2)	Acute health		1	14.105	28.706	20.406	0	6.389
Sulfate as SO_4^{2-}	Acute health	mg/L	500	69.5	243	153	141	86.6
Fluoride as F^-	Chronic health	mg/L	1.5	0.197	0.155	0.166	0.243	0.288
Ammonia as N	Aesthetic	mg/L	1.5	0	0	0	0	0
Chloride as Cl^-	Aesthetic	mg/L	300	77.6	238	131	79.6	171
Sodium as Na	Aesthetic	mg/L	200	45	120	70.2	26.4	109
Zinc as Zn	Aesthetic	mg/L	5	0	0	0	0	0
Chemical determinands – micro-determinands								
Barium as Ba	Chronic health	mg/L	0.7	0	0	0	0.09	0
Boron as B	Chronic health	mg/L	2.4	0.15	0.27	0.15	0.1	0.17
Iron as Fe	Aesthetic	mg/L	0.3	0	0	0	0	0
Manganese as Mn	Aesthetic	mg/L	0.1	0	0	0	0	0
Aluminium as Al	Operational	mg/L	0.3	0	0	0	0	0
pH, conductivity or Concentration deemed unacceptable for lifetime consumption								

Determinand	Risk	Unit	Standard limits	KALKFONTEIN	AU15	PNF2	KB2	AU3	AU14	AU2	230-1	480-4	BRL-3
Physical and aesthetic determinands													
Conductivity at 25 °C	Aesthetic	mS/m	170	122	91.2	97.6	129	83	86.5	101	95.3	105	101
Total dissolved solids	Aesthetic	mg/L	1 200	854	639	683	905	581	605	709	667	735	704
pH at 25 °C	Operational	pH units	5 to 9.7	7.3	7.35	7.5	7.48	7.49	7.47	7.32	7.36	7.24	7.6
Chemical determinands – macro-determinands													
Nitrate as N (NO_3 - N)	Acute health	mg/L	11	1.34	11.2	6.78	3.21	10.7	22	16.4	13.8	22.5	14.7
Nitrite as N (NO_2 - N)	Acute health	mg/L	0.9	0.004	0.002	0.002	0.002	0.002	0.004	0.002	0.002	0.003	0.002
Combined nitrate plus nitrite (NO_3+NO_2)	Acute health		1	5.942	49.406	30.007	14.206	47.406	97.212	72.608	61.006	99.711	64.908
Sulfate as SO_4^{2-}	Acute health	mg/L	500	92.4	17	16.5	115	20.4	22.3	30.8	31	24.9	46.3
Fluoride as F^-	Chronic health	mg/L	1.5	0.153	0.312	0.162	0.257	0.248	0.257	0.222	0.16	0.377	0.436
Ammonia as N	Aesthetic	mg/L	1.5	0	0	0	0.017	0.009	0	0	0	0.082	0
Chloride as Cl^-	Aesthetic	mg/L	300	114	15.4	22.8	83.6	23.9	21.4	45	53.4	26.9	59.5
Sodium as Na	Aesthetic	mg/L	200	74.5	12.4	12.9	50.8	15.8	20.1	19.1	31.9	30.7	67.2
Zinc as Zn	Aesthetic	mg/L	5	0	0	0	0	0	0	0	0	0	0
Chemical determinands – micro-determinands													
Barium as Ba	Chronic health	mg/L	0.7	0	0.18	0	0	0.18	0.18	0.21	0	0.07	0.05
Boron as B	Chronic health	mg/L	2.4	0.11	0.07	0.05	0.17	0.1	0.11	0.11	0.11	0.14	0.33
Iron as Fe	Aesthetic	mg/L	0.3	0	0	0	0	0	0	0	0	0	0
Manganese as Mn	Aesthetic	mg/L	0.1	0	0	0	0	0	0	0	0	0	0
Aluminium as Al	Operational	mg/L	0.3	0	0	0	0	0.07	0	0	0	0	0
pH, conductivity or Concentration deemed unacceptable for lifetime consumption													

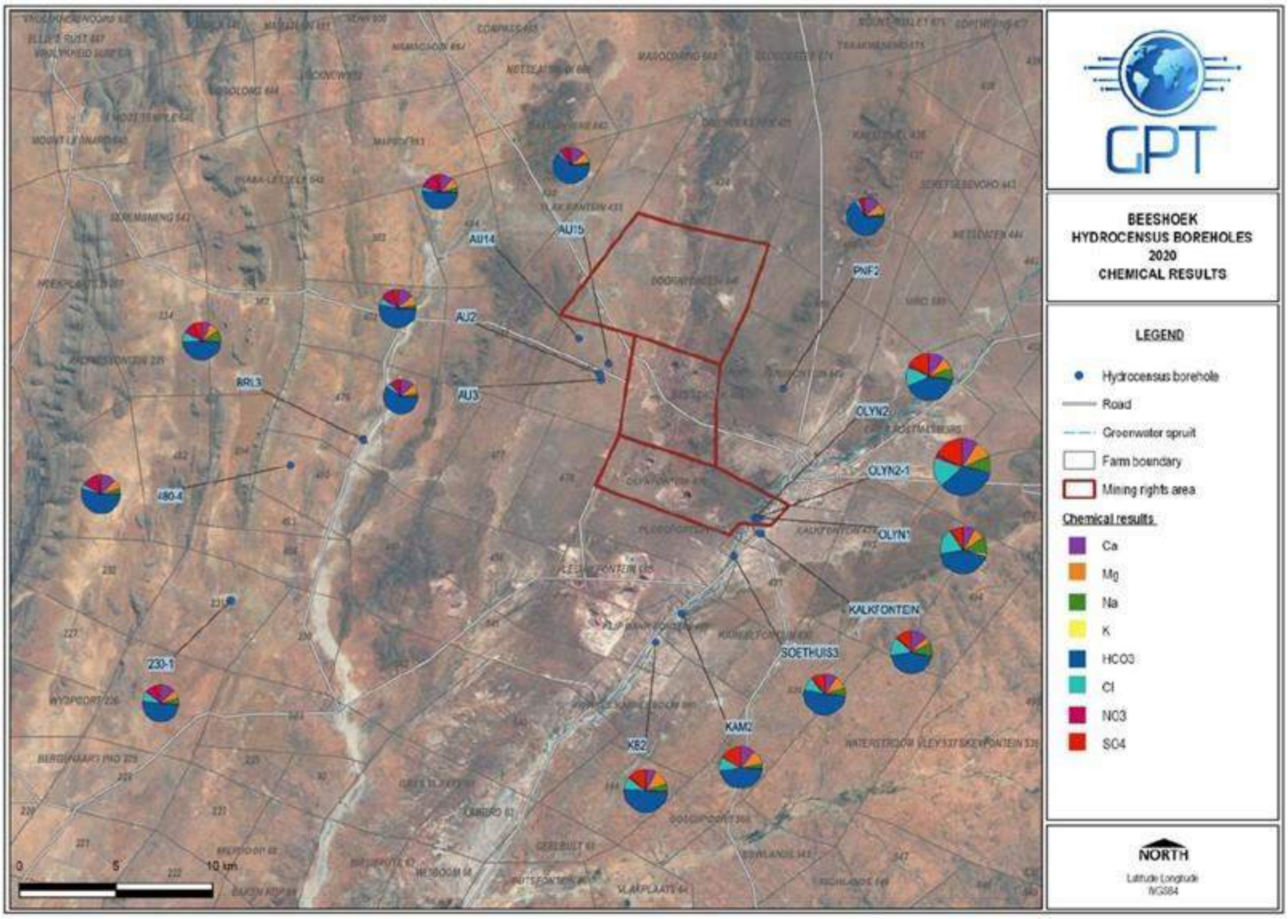


Figure 101: Pie diagrams of major cations and anions (groundwater) – external user boreholes in 2020

2.e.iii.8.h Acid/Leachate Generation Capacity

The leachable concentrations of solid waste were compared to the LCT limits to determine the leachability of the different waste types at the mine. Solid waste types were described as either "Type 4" or "Type 3" waste types which are low hazard waste types with regards to the likelihood to release contaminants in dissolved phase.

2.e.iii.8.i Aquifer Protection Classification

A Groundwater Quality Management Index of 4 was estimated for the study area from the ratings for the Aquifer System Management Classification. According to this estimate a **medium level groundwater protection** is required for the aquifer. Reasonable and sound groundwater protection measures based on the modelling will therefore be recommended to ensure that no cumulative pollution affects the aquifer, even in the long term.

2.e.iii.9 Air Quality

The Air Quality Study was undertaken by uMoya-NILU Consulting (Pty) Ltd (see Annexure 11).

Beeshoek Mine has been measuring dust fallout since 2005. Monitoring is currently done at nine sites using the SANS 1929:2005 and ASTM Standard, D1739-98: Standard Test Method for the Collection and Measurement of Dust fall (Settleable Particulate Matter). The location of the monitoring sites is shown in the following figure.

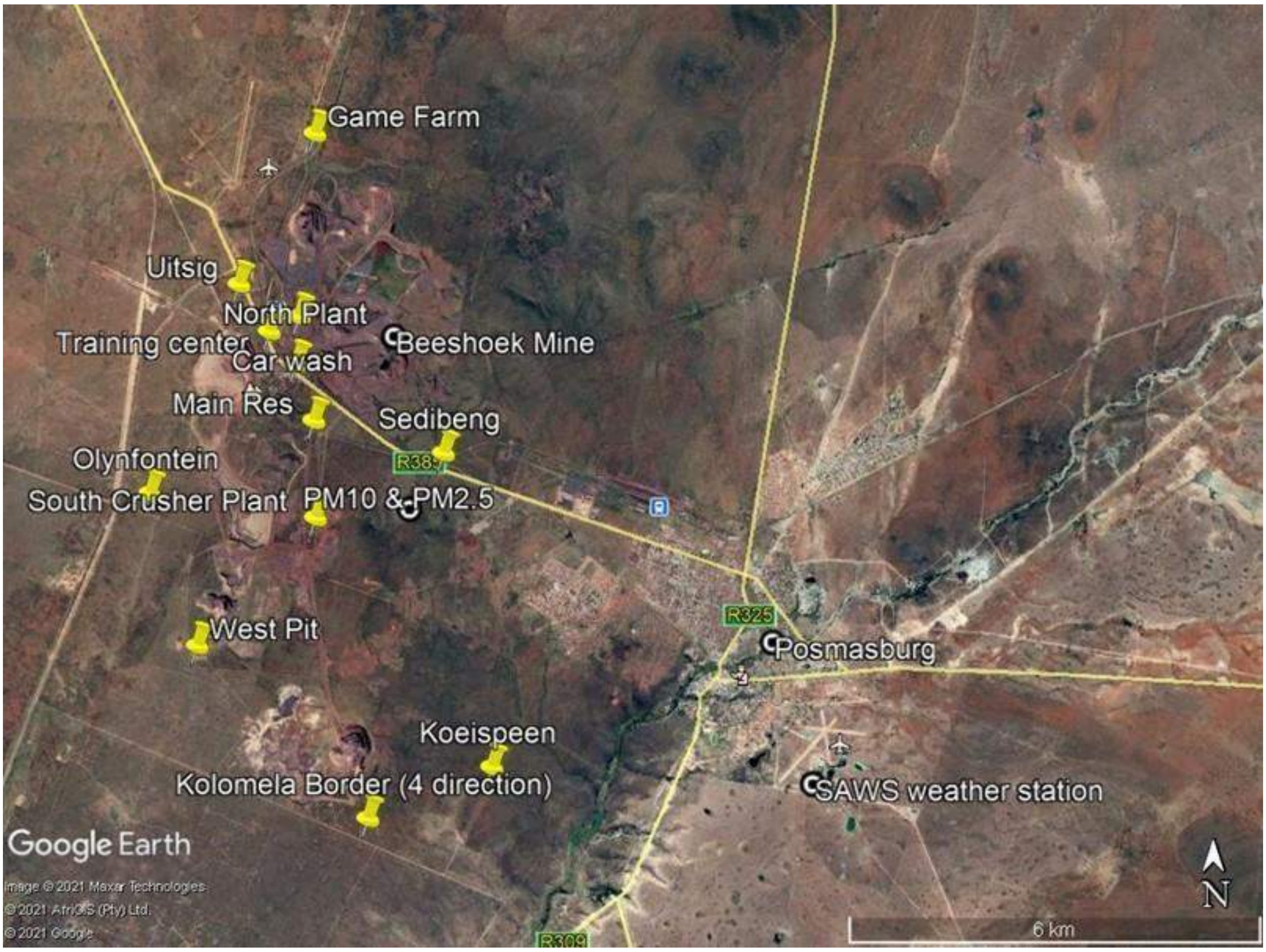


Figure 102: Location of the dust fallout buckets at Beeshoek (DustWatch, 2019), the PM10/PM2.5 sampler and the SAWS weather station

Beeshoek Mine established a PM10 and PM2.5 monitoring station on the Mine in July 2020, also measuring meteorological parameters.

Generally ambient PM10 concentrations are shown to be low relative to the 24-hour ambient standard of 75 µg/m^3. There was one exceedance of the standard in March 2021. Four exceedance are permitted per year. For PM2.5 the data appears reliable in July 2020 only (Graph 4). Ambient PM2.5 concentrations were below the ambient standard of 40 µg/m^3 except on 10 July 2020 when it was exceeded. No exceedances are permitted for PM2.5.

The total estimate emission of Total Suspended Particulates (TSP) from Beeshoek Mine activities in 2019 was 5 224 tons (see table below). The estimate emission from PM10 was 1 545 tons in 2019 and for PM2.5 was 172 tons per annum. The largest source of particulates is vehicle entrainment from the mine roads. Approximately 90% of all TSP and PM10 emissions are attributed to the entrainment of dust by vehicles, and 80% of the PM2.5 emission. Crushing and screening is the second largest source of particulate emissions at Beeshoek, but it is relatively small and accounts for only 5.4% of the total TSP and PM10 emission.

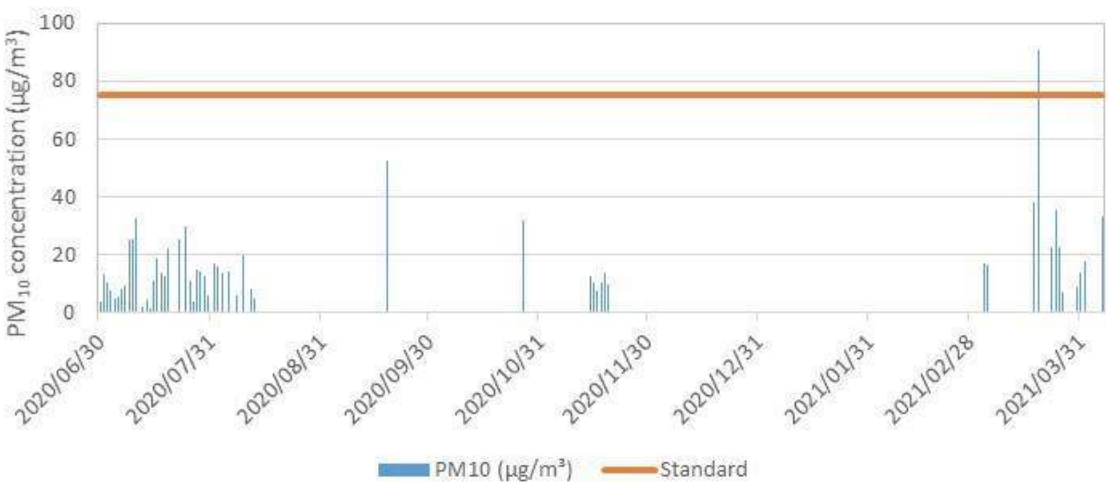
Table 55: Particulate emissions in tonnes per annum for the current year of assessment in 2019

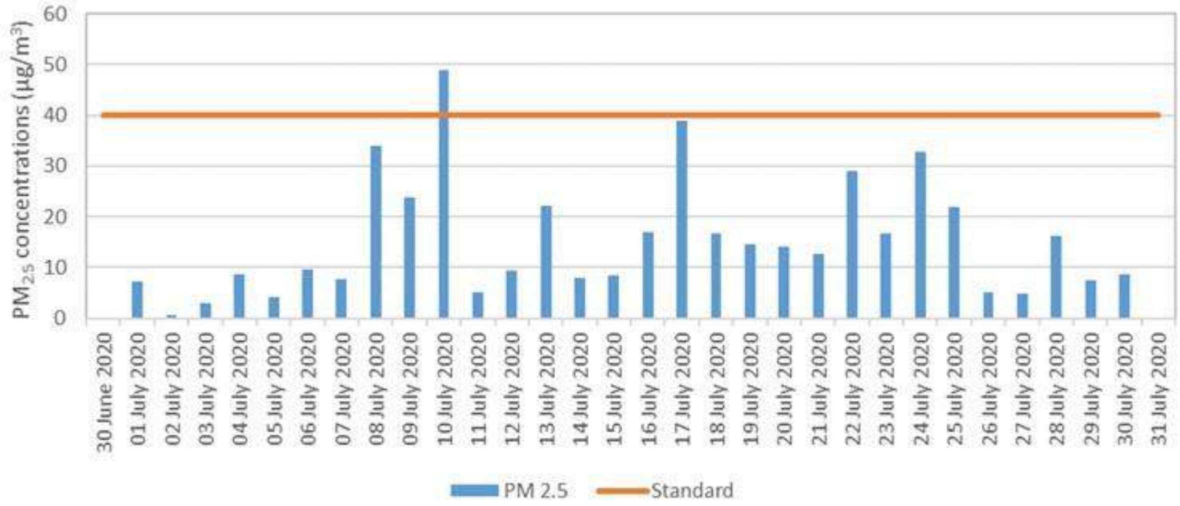
Mining activity	TSP	PM_{10}	$PM_{2.5}$
Overburden Removal	12.6	2.4	1.3
Blast Hole Drilling	14.9	7.8	7.8
Blasting	5	3	0
Crushing and screening	267.6	79.6	0.0
Wind entrainment: Stockpiles	27.7	13.8	5.5
Wind erosion: ROMS	86.9	43.4	17.4
Materials handling: Pits	10.5	5.0	0.8
Material handling: Waste rock dumps	46.4	21.9	3.3
Materials handling: Stockpiles and ROMS	4.2	2.0	0.3
Vehicle road dust entrainment	4 748	1 366	135.0
TOTAL	**5 224**	**1 545**	**172**

The 2018 emissions resulting from activities at the Beeshoek Mine were similar to those reported in 2019 (see table below).

Table 56: Particulate emissions in tonnes per annum for 2018 and 2019

Reporting year	TSP	PM_{10}	$PM_{2.5}$
2018	5 229	1 544	169
2019	5 224	1 545	172





Graph 4: Daily PM10 (top) and PM2.5 in July 2020 (bottom) concentrations measured at Beeshoek, showing the respective national ambient air quality standards

2.e.iii.10 Noise

The area in which the proposed the proposed infrastructure are to be established is characterised by the following environments:

- A rural farming community where the farmsteads are located at large distances apart;
- The existing large opencast operation at Kolomela Mine;
- The existing opencast operation at Beeshoek Mine; and
- The R385 and the railway lines that cross the area.

Areas in the proximity of mining activities will already be subjected to the noise emissions from diesel-powered equipment and other mining processes as a result of existing mining infrastructure.

The major sources of noise from the current mining operations are:

- The diesel-powered equipment, such as bulldozers, Front-end Loaders (FELs), construction and haul trucks used during both the construction and operational periods of the mine;
- The drilling of rock inside the open pit;
- The handling of material inside the pit, e.g. the loading of haul trucks;
- The hauling of ore and waste rock from the open pit to the surface;
- The dumping of ore and waste rock at the crushing plant and on the waste rock dumps respectively. During this process the use of reverse warning hooters may be audible over long distances, particularly during the night; and
- The crushing and screening of ore in the plant area.

Limited noise may result from the proposed infrastructure, although this may be considered to be insignificant as the proposed location is already surrounded by mining activities.

2.e.iii.11 Cultural and Heritage Setting

The Cultural, Heritage and Paleontological Study was undertaken by Heritage Contracts and Archaeological Consulting (HCAC). Please refer to Annexure 12.

2.e.iii.11.a Heritage Finds

Twenty seven (27) Features were identified during the surveys (see following figure), including 16 observation points where isolated Stone Age artefacts were noted. These scatters are often marked by isolated artefacts that is out of context and were recorded as Archaeological Findspots. These scatters are defined as background scatter (Orton

2016) and are of low significance, apart from mentioning in this report. Additionally, ruins of structures of unknown age and pits dug into the calcrete substrata were noted as well as cairns of unknown purpose and two cemeteries. The ruins potential to contribute to aesthetic, historic, scientific, and social aspects are non-existent, and it is therefore of little heritage significance. The stone cairns are most probably due to clearing or construction activities, but although unlikely these can represent graves. Graves and cemeteries are of high social significance and should be avoided and retained *in situ*.

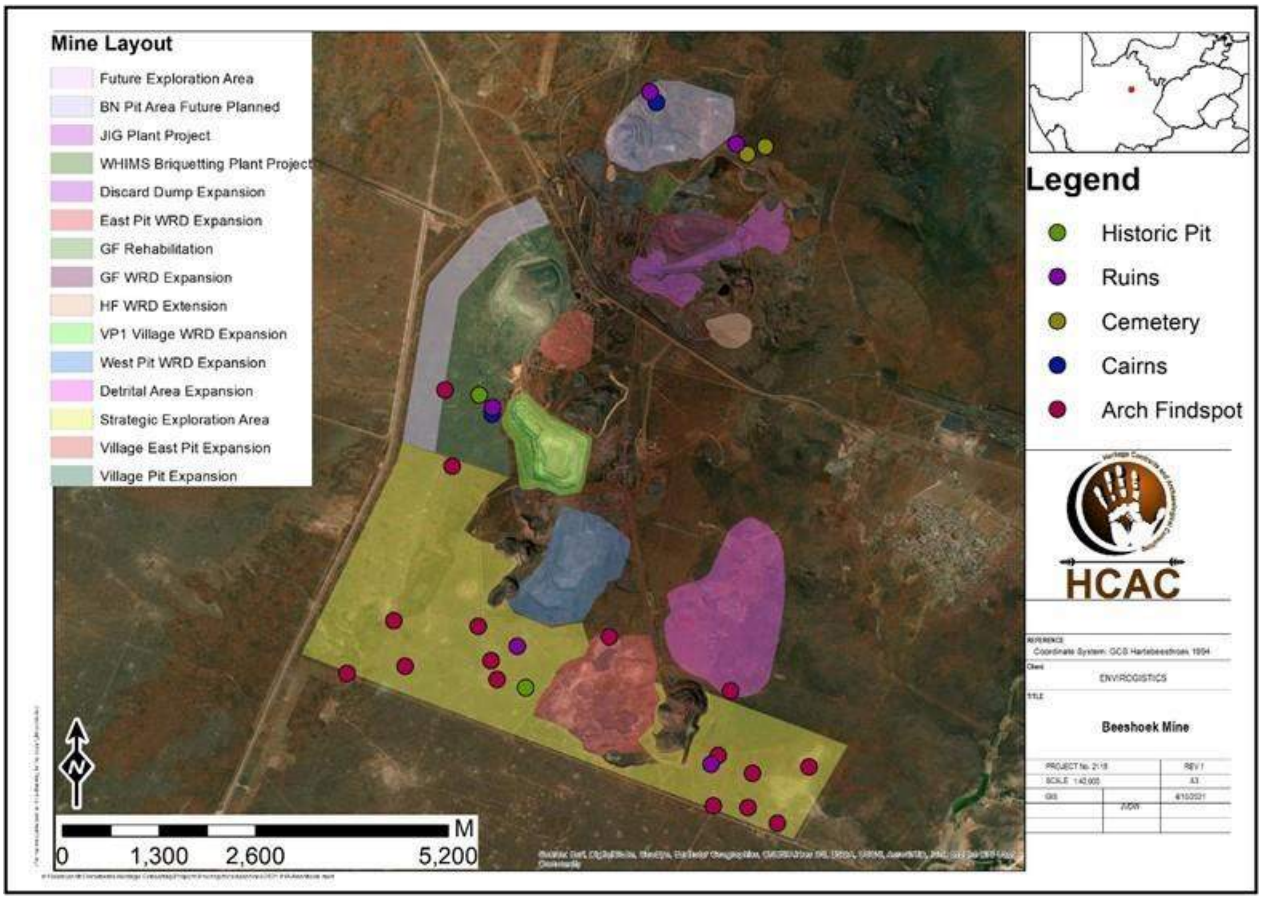


Figure 103: Distribution of heritage features recorded in the study area

Heritage features were assigned the prefix BH (for Beeshoek) and numbered numerically from 1 to 27 as described in the following table.

Table 57: Recorded heritage features

#	Longitude	Latitude	Type Site	Description
BH1	23.000449	-28.332608	Archaeological Findspot	Archaeological – Middle Stone Age (MSA), Broken flake with large bulb of percussion
BH2	22° 58' 27.0695" E	28° 19' 49.9655" S	Archaeological Findspot	Exposed calcrete with a low-density scatter of tools mostly miscellaneous flakes possibly MSA with a few cobbles with removals
BH3	22° 59' 09.5605" E	28° 20' 07.4832" S	Archaeological Findspot	Broken hornfel flake, MSA pointed flake with use wear/trampling, pebble with removal, circular scraper with retouch, miscellaneous flake. All next to large pan on top of calcrete
BH4	22° 59' 20.9977" E	28° 20' 01.2551" S	Ruin	10x8 meter modern cement slab with bricks. Circular cement slab possibly for water tank, Recent Past/Modern
BH5	22° 58' 32.0197" E	28° 20' 09.9600" S	Archaeological Findspot	MSA side scraper on quartzite
BH6	22° 58' 06.6541" E	28° 20' 13.0776" S	Archaeological Findspot	Possible Erly Stone Age (ESA) flake
BH7	22° 59' 24.6697" E	28° 20' 19.2876" S	Possibly Historic Pit	Pit dug into calcrete filled with bones from sheep etc
BH8	22° 59' 12.1884" E	28° 20' 15.7019" S	Archaeological Findspot	Broken MSA blade on banded ironstone

#	Longitude	Latitude	Type Site	Description
BH9	22° 59' 03.8255" E	28° 19' 52.4172" S	Archaeological Findspot	Low density scatter of MSA flakes with faceted platforms.
BH10	22° 58' 52.4927" E	28° 18' 42.4764" S	Archaeological Findspot	LSA end scraper on red material
BH11	22° 59' 04.3548" E	28° 18' 11.4084" S	Possibly Historic Pit	Pit in calcrete of more than 2 meters deep. Filled with rubbish
BH12	22° 58' 49.4221" E	28° 18' 09.3529" S	Archaeological Findspot and stone cairn,	Overgrown mound measuring 3x1.5. Aligned east to west. Unlikely to be grave possibly from road works. Feature is located next to a dirt track / Single platform core, MSA/LSA
BH13	23° 01' 28.3621" E	28° 20' 53.8261" S	Archaeological Findspot	Broken MSA point on banded iron stone
BH14	23° 01' 14.6063" E	28° 21' 18.4572" S	Archaeological Findspot	Broken MSA blade on banded iron stone. On calcrete ridge next to drainage line
BH15	23° 01' 01.6788" E	28° 21' 11.6099" S	Archaeological Findspot	Miscellaneous flake on quartzite
BH16	23° 01' 03.7452" E	28° 20' 56.6592" S	Archaeological Findspot and ruin	Double side scraper on blade MSA Fine grained green material Dwelling with cement bricks. Structure is a shed that was build up for a dwelling. Two rooms
BH17	23° 00' 46.6019" E	28° 21' 10.8685" S	Archaeological Findspot	End and double side scraper on yellow material
BH18	23° 00' 48.7800" E	28° 20' 48.8867" S	Archaeological Findspot	Broken MSA Flake
BH19	23° 00' 45.6264" E	28° 20' 52.7497" S	Ruin	Three room dwelling with veranda.
BH20	23° 00' 54.2160" E	28° 20' 20.6880" S	Archaeological Findspot	Large flake on Banded iron stone possibly MSA
BH21	22° 59' 10.0717" E	28° 18' 19.8323" S	Cairns	Stone and cement cairn. Can and corrugated iron. Orientation is east to west measuring approximately 2x1,7 meters. Possible grave or structure.
BH22	22° 59' 10.2156" E	28° 18' 16.9561" S	Ruin	Sun dried mud brick remains of ruin. Measuring approximately 4x4 meter. Some tin and cans.
BH23	23° 00' 18.9648" E	28° 15' 59.2344" S	Ruin	Possible stone walled site could be dumped stone as well. Overgrown cannot determine layout. Walling approximately 50cm high. Over an area of 23 meters
BH24	23° 00' 21.7333" E	28° 16' 03.8533" S	Cairns	Half circle scallop with at least 3 stone cairns. Although unlikely could be graves. On top of thick red sand. Could be dumped is located on periphery of disturbed areas.
BH25	23° 00' 56.6315" E	28° 16' 21.9289" S	Ruin	Sundried mud bricks indicating ruin. No other material or artefacts. It should be noted that features like these are often associated with the graves of stillborn children.
BH26	23° 01' 01.3592" E	28° 16' 26.3622" S	Cemetery	Located next to slimes dam. Graves are fenced and aligned east to west. Grave dressings of stone. Some have headstones with metal crosses with painted names. Cement crosses. Some discernible names are Andries Bok, Jan Bok, Sylvestien Afrikaner, Mietjie Afrikaner. Visible dates of deceased 2006, cemetery is overgrown and exact count of graves not possible but approximately 100 graves.
BH27	23° 01' 09.1920" E	28° 16' 23.0318" S	Cemetery	Possible mine workers cemetery Inscription RIP Elliot Melapu mine no 104 died 31-1-66. As well as ithers with mine numbers. Grave dressings stone with metal ate on headstone with details painted on. Cemetery is fenced. Approximately 47 graves dating 1965-1968

Photo 5: Stone Age Artefacts at BH 1

Photo 6: Stone Age Artefact on calcrete at BH2

Photo 7: Stone cairn at BH12

Photo 8: LSA Scraper at BH10

Photo 9: Ruin of three-bedroom dwelling at BH19

Photo 10: Ruin of three-bedroom dwelling BH 19

Photo 11: Remains of dwelling at BH16

Photo 12: Stone age artefact at BH16

The area around the railway line was also assessed, and resulted in two (2) occurrences of lithic scatters recorded as observation points, but no sites of significance were recorded or are expected to occur in the study area. All the known sites of significance are located along watercourses or hills of which none occur in the study area (Van der Ryst 2011 and Morris 2005). The location of the observation points recorded as field point 492 & 493 is illustrated in the following figure. Both of these site is of low heritage significance and no mitigation is required.

- Feature 492: Isolated bifacial artefact possibly Acheulean found on surface next to airfield access road and fence. The site is disturbed by these developments and no other artefacts or cultural deposit is present.
- Feature 493: Lithics found in a deflated context in a gravel layer on top of calcrete substrate. The lithics are found in low density's (less than 4 tools per m²) over a small area measuring approximately 3 x 3 meters. Few formal tools present but based on size and typological markers like raw material, faceted striking platforms possibly dating to the MSA and LSA. MSA component consists of large flakes with faceted platforms on jaspelite. LSA thumbnail scrapers with retouch - microlithic on CCS and other fine grained material.

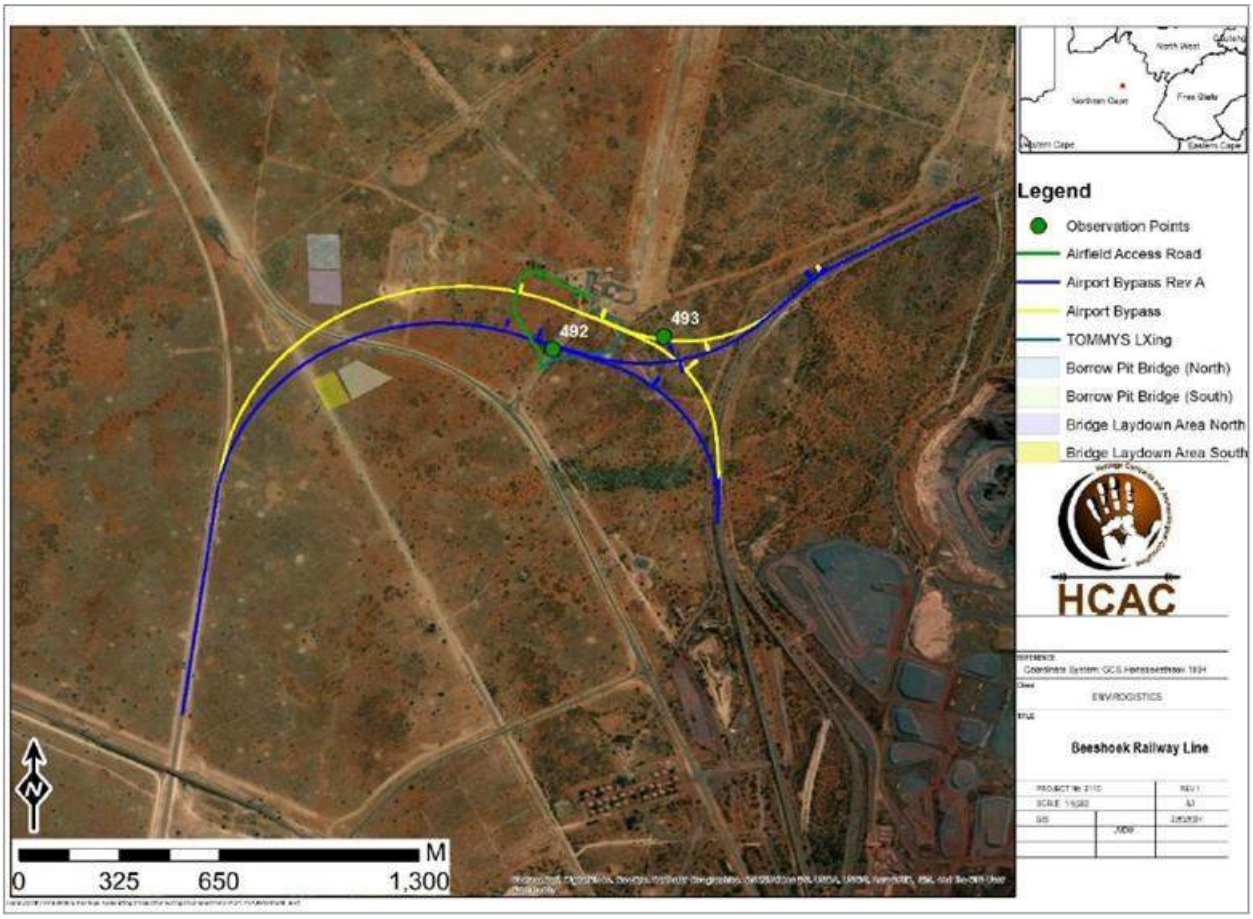


Figure 104: Heritage Observation Map, Railway line

Photo 13: Bifacial artefact at waypoint 492

Photo 14: General site conditions at waypoint 492

Photo 15: Dorsal and Ventral view of artefacts at Waypoint 493

Photo 16: Gravel layer at Waypoint 493

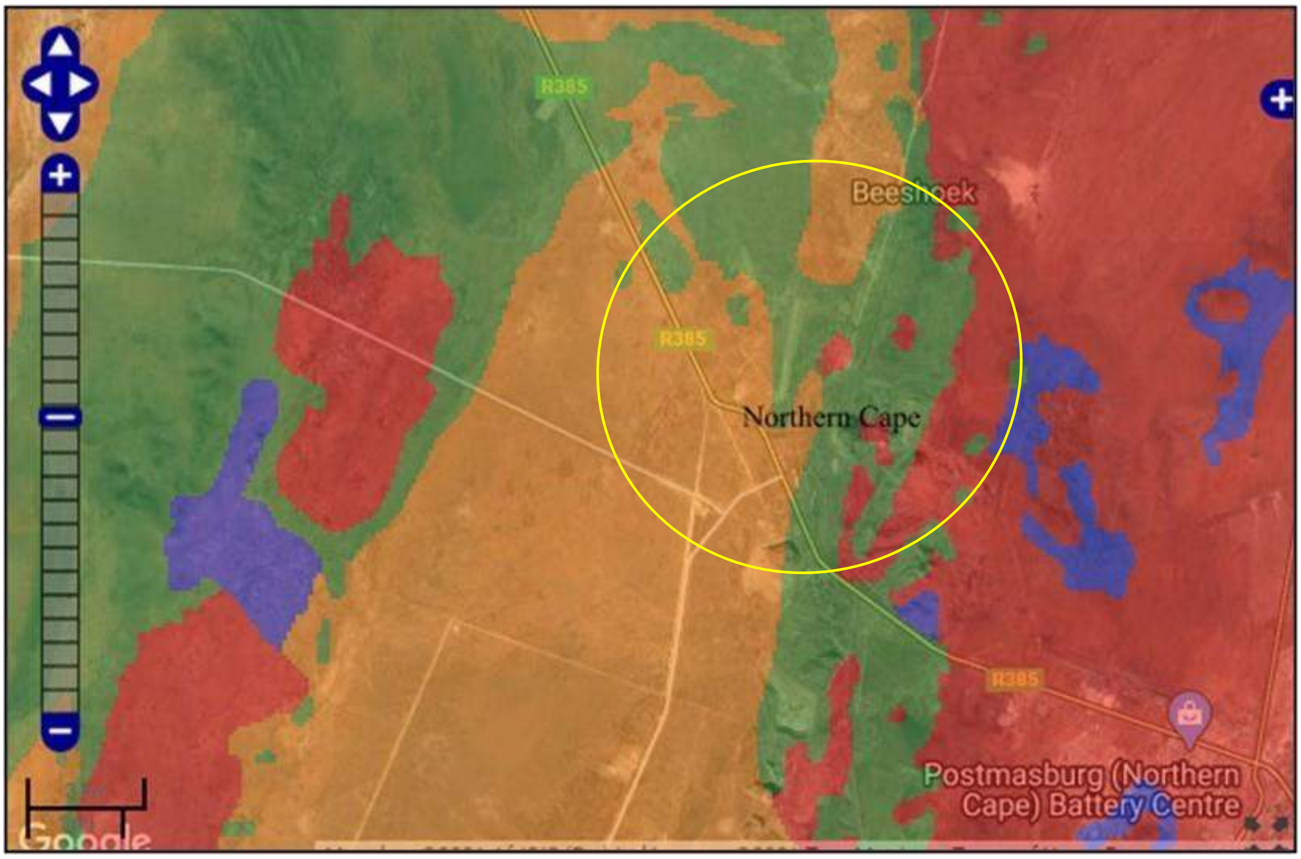
2.e.iii.11.b Paleontological Heritage

Based on the SAHRA Paleontological map the area (see the following figure) is of moderate to very high paleontological sensitivity and a separate study was conducted for this aspect (Bamford 2019).

The palaeontological sensitivity of the area under consideration is presented in the following figure. The site is on alluvium and on aeolian Kalahari sands that were derived from farther to the northwest (Goudie and Wells, 1995) and finally deposited in this region during the Quaternary. Since they are windblown the sands are not in primary context, nor do they preserve any fossils.

Plio-Pleistocene fossils have been recovered from palaeo-pans in the region, for example Kathu Pan and Townlands (Walker et al., 2017,) but there are no pans evident in the project footprint. There are palaeontological and archaeological sites in the Kuruman hills, Ghaap Group, but not in the project footprint.

This study concluded that it is extremely unlikely that any fossils would be preserved in the Campbell Rand Subgroup stromatolites or in the loose sands of the Quaternary. There is a small chance that fossil may occur in palaeopans in the ancient rocks and therefore recommended that a Fossil Chance Find Protocol should be added to the EMPr.



Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No paleontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 105: Paleontological Sensitivity of the approximate area of the project (yellow polygon) is indicated as moderate to very high

2.e.iii.12 Visual Impact Assessment

The Visual Impact Assessment was undertaken by Hydrospatial. Please refer to Annexure 13 for the detailed report.

2.e.iii.12.a Landscape Character

The landscape of the study area can be broadly divided into three main categories:

- Natural areas – consisting of natural shrubland and grassland. These areas are used for livestock and game farming;
- Mining areas – consisting of mine dumps, bare areas, open pits and mine infrastructure; and
- Residential areas – Postmasburg and its immediate surrounding area, is the only town in the study area.

2.e.iii.12.b Visual Receptors

The following visual receptors have been identified within the study area and are indicated on the following figure:

- Houses and farmsteads;
- Residents of Postmasburg;
- Aerodrome; and
- Motorists travelling on roads within the study area.

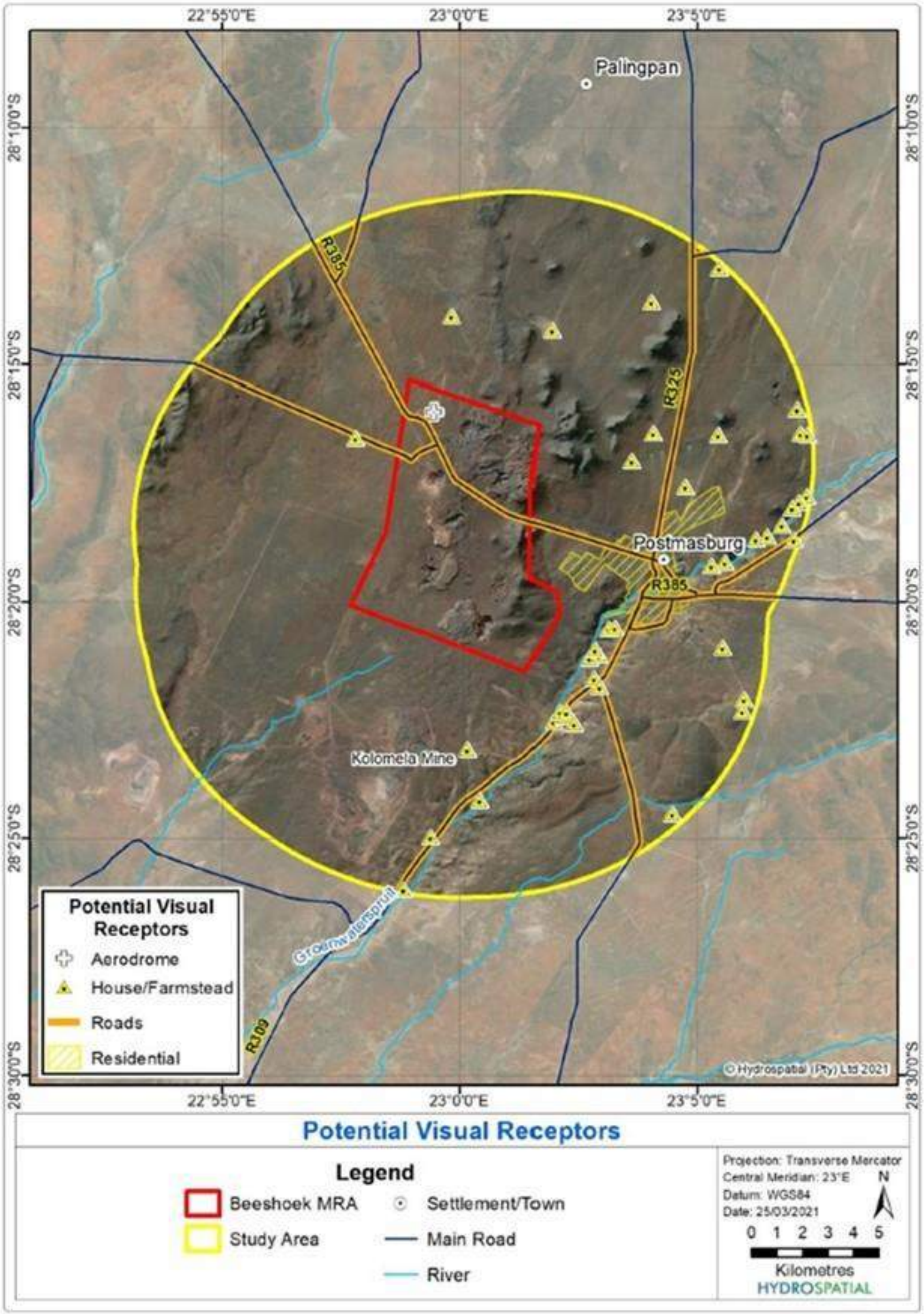


Figure 106: Potential Visual Receptors

2.e.iii.12.c Sense of Place

Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. According to Lynch (1992), sense of place is "the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid, unique, or at least particular, character of its own".

Mining activities, primarily from two large iron ore mines in the study area, namely, Beeshoek and Kolomela Mine, largely characterise the landscape to the mid-west and south-west of Postmasburg. Their large mine dumps have been constructed in a region that has flat topography, surrounded by short vegetation. Mining dominates the landscape of these areas, and the sense of place has been altered from a natural open landscape to one associated with mine dumps and bare areas.

Natural areas, particularly in the far-west, north-west, north and south-east of the study area, evoke a tranquil open bushveld sense of place.

The town of Postmasburg dominates the eastern part of the study area, and is largely dependent on the mining activities of the surrounding area. This is evident by the numerous number of people that were observed to be wearing mining attire within the town.

No protected areas fall within the study area. Beeshoek, however, is located on the western edge of the Ghaap Plateau that has been identified by the Northern Cape Nature Conservation Services as a priority for conservation in the Northern Cape, and is regarded as an ecologically sensitive habitat. Endoreic pans occur on the Ghaap Plateau and are prevalent within the Sishen/Postmasburg area (EnviroGistics, 2021). Pans are present within the MRA.

The following figure presents the current infrastructure viewshed.

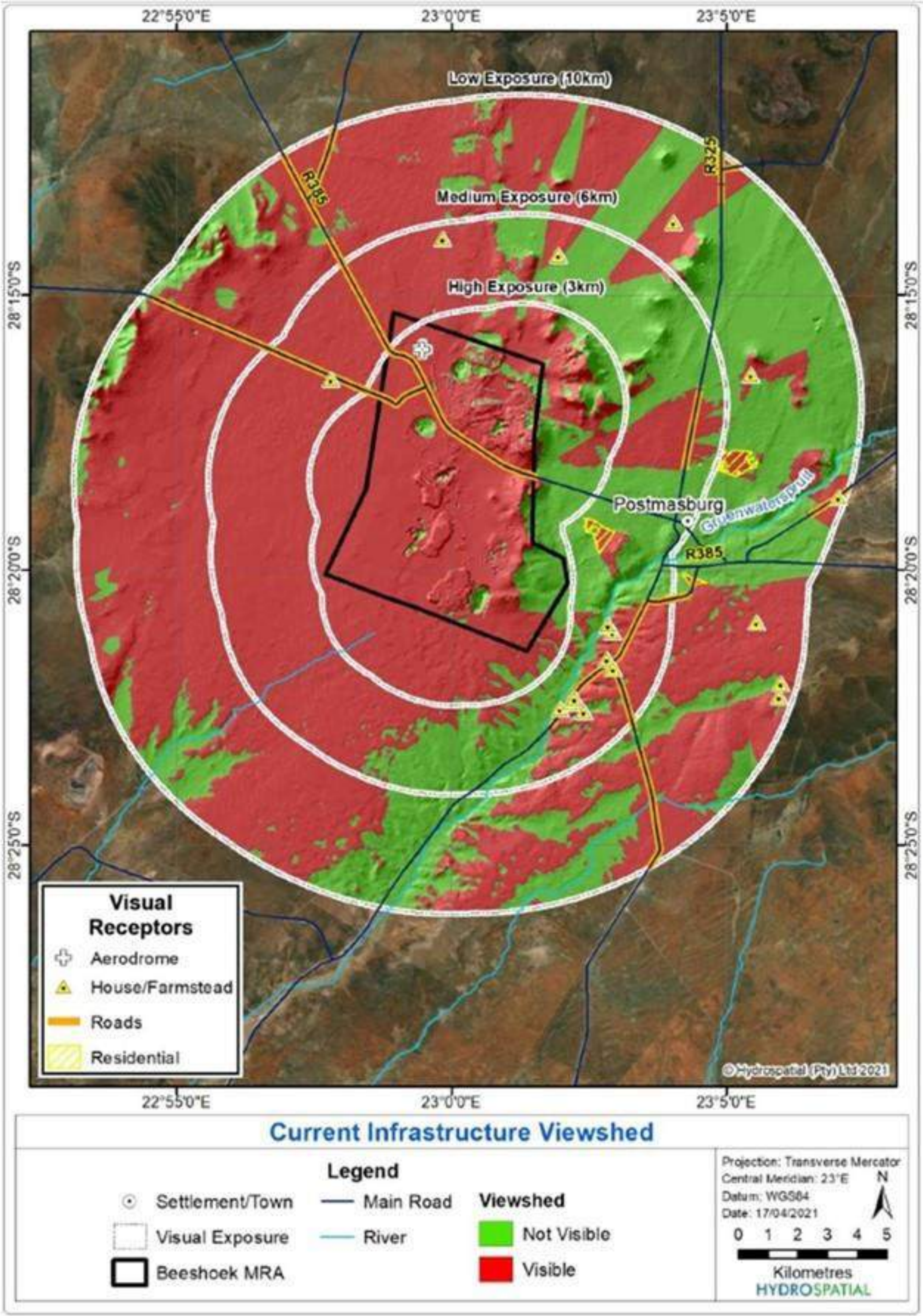


Figure 107: Current Infrastructure Viewshed

2.e.iii.13 Socio-Economic Setting

The Socio Impact Assessment was undertaken by BathoEarth.

2.e.iii.13.a ZF Mgcawu Districts Municipality

The study area falls within the boundaries of the ZF Mgcawu District Municipality and under the jurisdiction of the Tsantsabane Local Municipality.

The ZF Mgcawu District Municipality[3] was formerly known as the Siyanda District Municipality. It lies within the mid-northern section of the Northern Cape Province, bordering with Botswana in the north and Namibia in the west and covers an area of 102 484 km^2.

The ZF Mgcawu District comprises five Local Municipalities namely:

- Dawid Kruiper Local Municipality;
- Kai !Garib Local Municipality;
- !Kheis Local Municipality; and
- **Tsantsabane Local Municipality (within which the Mine is situated)**; and
- Kgatelopele Local Municipality.

The main towns that are scattered through the area are Beeshoek, Brandboom, Danielskuil, Eksteenskuil, Groblershoop, Kakamas, Keimoes, Kenhardt, Lime Acres, Mier, Postmasburg, Rietfontein, and Upington. The latter serves as the district municipal capital where the municipal government is located.

Agriculture, mining, and tourism form the key economic drivers in this area. The spatial vision of the ZF Mgcawu District Municipality thus include[4]:

- Tourism: Cultural, wilderness, floristic, river tourism ranging from the Kgalagadi international trans frontier park to the culture of the Riemvasmaak community to river tourism on the Orange River;
- Mining and mining beneficiation;
- Agriculture: riverbank vineyards and expansive stock and game farming in the Kalahari; and
- Renewable energy technology opportunities.

2.e.iii.13.b Tsantsabane Local Municipality and Municipal Wards

The Tsantsabane Local Municipality falls under the jurisdiction of the ZF Mgcawu District Municipality formerly known as the Siyanda District Municipality. The extent of the geographical area of the municipality is 18 317 km^2. It is bordered by the John Taolo Gaetsewe and the Pixley-ka-Seme District Municipalities. Furthermore, Tsantsabane Local Municipality is bordered by Siyancuma Local Municipality, //Khara Hais Local Municipality, !Kheis Local Municipality, Gamagara LM and Kgatelopele Local Municipality.

The municipal area falls in the Gamagara Corridor. The Northern Cape Province Spatial Development Plan (NCPSDF (2012: 68)) defines the Gamagara Corridor as comprising the mining belt of the John Taolo Gaetsewe and ZF Mgcawu districts and runs from Lime Acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese.

Postmasburg is the main town within the Tsantsabane Local Municipality, with various other small rural settlements such as Jenn-Haven, Groenwater and Skeyfontein. Beeshoek is now seen as a mining residential satellite town of Postmasburg. The main routes include the R385 and R31 from Kimberley that runs through Beeshoek, the R309 and the R325 to Kathu.

Economically, Tsantsabane Local Municipality is known for being rich in minerals, and for its mining, agriculture, manufacturing and farming sectors. The municipality has become one of the leading investment areas in the Northern Cape.

The municipality is divided into seven wards, as listed in the table below[5].

[3] www.localgovernment.co.za

[4] Tsantsabane Local Municipality. Integrated Development Plan

[5] Tsantsabane Local Municipality. Integrated Development Plan

The study area falls within Ward 6 and a section of Ward 7 with Wards 1, 2, 3, 4 and 5 in very close proximity.

Table 58: Wards and settlements in the study area

Wards	Affected Settlements in Ward
Ward 1	Part of Postdene and Carnation
Ward 2	Newtown
Ward 3	Groenwater, Jenn Haven, part of Postdene and Kolomela houses
Ward 4	Boichoko
Ward 5	Skeifontein, Soetfontein, Strathmore, Part of Boichoko and Postmasburg Town
Ward 6	**White City, Glossom, Maremane, Beeshoek, Stasie**
Ward 7	**Maranteng, Kanonbult**

2.e.iii.13.c Strategic Development Framework

The key Municipal priorities as set out in the Tsantsabane Local Municipality Integrated Development Plan (IDP) include:

- Bulk Infrastructure services;
- Revenue Collection and Enhancement;
- Provision of Sustainable Basic Services (Water, Electricity & Sanitation);
- Local Economic Development and Job Creation;
- Education: access to land for educational purposes;
- Access to land for residential and business erven;
- Library services for rural areas;
- Refurbishment of community halls; and
- Access to health services.

2.e.iii.13.d Population Figures

The total population of the Tsantsabane Local Municipality is 39 344 individuals based on the Community Survey of 2016. There is an average 2.1 person population density per km^2 and the number of households totals 11 820. The average household size is 3.5.

2.e.iii.13.e Age Groups and Gender

The Tsantsabane Local Municipality population indicates a predominantly young age structure with 34% of the population under 18 years and 62% between 18 and 64 years. The median age is 26 years with the highest percentage (23%) of people falling between 20 and 29 years of age. Those within the working age category (18-64 years) are approximately 10% higher than the rate in the Northern Cape and also slightly higher than the district rate[6]. These figures indicate the critical need for employment opportunities within the area.

The male population (21 086 individuals) within the municipality are at 54%. The main reason for this situation in the area is attributed to the influx of various workers from outside the province in search of work at the different mining developments and mining being a more male dominant employment industry. The number of males within the study area is thus again approximately 10% higher than the rate within the province and slightly higher than the district rate[7].

2.e.iii.13.f Population Stability

Approximately 11% of the population within the Tsantsabane Local Municipality area are from outside the province[8]. The population stability is thus influenced by the in-migration of outsiders to the area, mainly due to the presence of various mining activities and sources of employment within this sector. These outsiders consist of foreigners, as well as individuals from other areas within South Africa.

This in-migration, which is thus mostly attributed to people in search of employment, has further socio-economic consequences such as additional pressure on the Tsantsabane Local Municipality and the business sector to provide

[6] StatsSA: Community survey 2016

[7] StatsSA: Community survey 2016

[8] StatsSA: Community survey 2016

employment opportunities, as well as the provision of social infrastructure and services. Residents have further indicated that small businesses are mainly owned by foreigners limiting opportunities for locals in this regard[9].

2.e.iii.13.g Education and Skills Levels

The proportion of the adult population with no schooling amounts to 7%, with only 2% having obtained a tertiary level of education. Approximately 36%, however has a matric certificate, which is about 20% higher than the rate in the district and 10% higher than the provincial rate.

The statistics indicate that although a high number of students enroll for primary school, a very low number of students complete Grade 12. Furthermore, only 5% of those who enrolled for Grade 1 endure it into a tertiary level.

With the low number of the population having a tertiary qualification or having completed Grade 12, it can be assumed that the skills levels are also low. This results in a very low probability for employment. Unemployment and low skills remain a major concern within the Tsantsabane Local Municipality area.

Within the municipality, the educational profile of those of 20 years and older is as follows[10]:

Table 59: Educational Profile of Population in Tsantsabane Local Municipality

Educational Profile: Tsantsabane Local Municipality					
No Schooling	**Some primary**	**Completed primary**	**Some secondary**	**Completed secondary**	**Higher**
1 853 (7.3%)	2 326 (9.1%)	1 500 (5.9%)	9 185 (36%)	9 165 (36%)	262 (2.2%)

It must, however, be noted that the education level is further being negatively affected by the urbanisation process, with a lack of sufficient schools for the increase in people coming to Postmasburg and surrounds in search of employment[11]. Learners from all over the Tsantsabane Local Municipality area are transported to attend school in Postmasburg. Overcrowding in the classrooms is a serious challenge which hampers the learning experience. There is thus an urgent need for additional school facilities. The challenges in this regard relate to:

- An urgent need for additional school facilities in Newtown (Postmasburg) and Groenwater/Skeyfontein;
- Lack of a Setswana medium school/s;
- Lack of specialised schools focusing on specialized traits i.e. technical or agricultural;
- Lack of proper water and sanitation services at schools;
- Not enough classrooms and high learners and teacher ratio; and
- A need for an additional technical high school that will respond/address for the needs of the mining sector.

2.e.iii.13.h Employment and Income

The mining sector, followed by the agricultural sector, is the main employment sectors within the local study area. The mining industry's contribution to the Gross Domestic product (GDP) of Tsantsabane Local Municipality increased from R1,5bn in 2002 to R3,9bn in 2012. During 2012 the mining industry employed 54.5% (6 648 persons) of the employed population[12].

The employment profile of persons 15 years and older is as follows:

[9] Tsantsabane Local Municipality. Integrated Development Plan

[10] StatsSA: Community survey 2016

[11] Tsantsabane Local Municipality. Integrated Development Plan

[12] Tsantsabane Local Municipality. (2014) Spatial Development Framework

Table 60: Employment Profile[13]

Employment Profile				
Area	**Employed**	**Unemployed**	**Discouraged work-seeker**	**Other non-economically active**
Tsantsabane Local Municipality	10 760 (45.3%)	3 795 (16%)	419 (1.8%)	8 764 (36.9%)
ZF Mgcawu District	74 449 (47.3%)	17 696 (11.3%)	4 961 (3.2%)	60 210 (38.3%)
Northern Cape Province	282 791 (38.4%)	106 723 (14.5%)	39 913 (5.4%)	306 291 (41.6%)

Although various mines operate in the Tsantsabane Local Municipality area (e.g. Kolomela Mine, Beeshoek Mine and other smaller mining companies), these mines cannot accommodate all the jobseekers. According to the Census of 2011, the employment rate in the municipality is slightly less compared to the district rate, but significantly higher than the provincial rate. The non-economically active people are still of concern as they would thus be dependent on the employed. Due to the existing socio-economic circumstances in South Africa as a result of the negative impact of Covid-19, the unemployment figures can now even be higher. More up to date figures, however, was not available. Job creation in the TLM among the youth will remain a challenge with limited sectors available.

The average annual income in the Tsantsabane Local Municipality is calculated at R57 700 per annum[14], approximately 29% of the households within the Tsantsabane Local Municipality fall within the lower bound income brackets of below R20 000 per year. The average annual income is almost double that of the Northern Cape Province (R30 000) and the district figures. Employment figures for the Tsantsabane Local Municipality, are again slightly lower than that of the District, but higher than the Provincial figures.

Poverty levels in the study area remain high which indicates a higher dependency ratio and it can lead to higher crime rates.

2.e.iii.13.i Community Resources and Infrastructure

The following key notes should be considered:

- The larger study area is characterised by various type of infrastructure such as railway lines, power lines, communication masts, roads and various different type of mining infrastructure, mining developments and agricultural farming practices (commercial livestock and subsistence grazing), with limited game farming.
- The proposed Beeshoek Optimisation Project is located within an area that is semi-arid with no large dams or rivers. There is a dependency on the existing limited groundwater sources for agricultural activities and provision of water to some settlements.
- In Tsantsabane the natural resource base is threatened or under pressure due to the mining developments. Concerns relate to habitat transformation and degradation, the generation and disposal of various types of waste, the invasion of alien species, air quality impacts, impacts on ground and surface water sources, as well as the overall climate change. The management of these is critical in ensuring effective conservation and sustainable use of the biodiversity. Further issues of concern in the Tsantsabane Local Municipality area relate to the over-exploitation of natural resources and the pressure on development also places additional strain on water as natural resource.
- Postmasburg has one police station which has to serve the entire municipal area, except for the Maremane area which is attended to by the Dingleton and Kathu Police Stations. Police are understaffed and lack enough vehicles to respond to all the crime related issues. Due to the influx of more individuals to the area, as well as an increase in alcohol and drug abuse, the crime levels in the study area have increased over the past couple of years.
- There are no disaster management services as part of the Tsantsabane Local Municipality. The communities are dependent on Assmang Mine to provide firefighting services.

[13] StatsSA: Census 2011

[14] www.wazimap.co.za: Census 2011

- Postmasburg has one hospital that is usually functioning at capacity, three Primary Health Care clinics (Postdene, Boichoko and Newtown) and four mobile clinics15. The hospital received some upgrades in 2019 undertaken by Anglo American Group of Companies' Kumba Iron Ore (Kolomela Mine) as part of their community investment programme. These included the construction of an additional primary health care facility next to the hospital and mobile care for rural areas; retention and attraction of key health professionals as well as the construction of doctor's living unit; and a focus on secondary healthcare which included the hospital upgrade16.
- there remain additional needs for more clinics and even mobile clinics.
- Further health challenges that were highlighted in the Assmang Iron Ore Social and Labour Plan are:
    - HIV/AIDS increase and Tuberculosis (TB) increase;
    - High rate of teenage pregnancies;
    - Lack of sufficient and qualified staff with limited skills amongst current nurses and nursing sisters;
    - Lack of sufficient facilities to render a proper health service to all communities; and
    - Lack of necessary health equipment and medication at clinics[17].
- Human settlements are scattered throughout the municipal area resulting in some areas still lacking services and infrastructure in comparison to other areas in the Municipality. Due to the increase in mining activities, the demand for housing has also increased[18].
- The Tsantsabane Local Municipality is continuously aiming to address the issues of basic service delivery and the provision of housing and the Tsantsabane Local Municipality has made some progress with regards to the provision of housing, but due to the influx of outsiders to the area, it seems as if the need remains higher than the actual approved allocations.
- Challenges in this regard that still remain include:
    - Proper maintenance of existing infrastructure;
    - Economic and social development at risk due to infrastructure deterioration,
    - Adherence to statutory plans such as the Strategic Development Framework (SDF),
    - Verification process as per the Department of Human Settlement's Standards,
    - Housing need (demand) that is higher than the actual approved allocation (supply)
- In line with the Mining Charter, Assmang Ltd. through its Khumani Housing Development Company (Pty) aims to facilitate and assist with the process of homeownership for its employees. Beeshoek Iron Ore Mine has to date built 357 homes in the main residential areas of Postmasburg, namely Boichoko (51), Postdene (163) and Airfield (143)[19].
- Currently the municipality is experiencing high development backlogs as a result of increasing population figures and socio-economic growth underpinned mainly by the solar and mining sector investments. This has resulted in massive pressure on the delivery of basic services within the TLM area[20].

2.e.iii.13.j Internal Strategic Perspective (ISP)

According to the Lower Vaal Water Management Area (WMA): Overview of Water Resources Availability and Utilisation Report (DWAF; 2003), the Gross Geographic Product (GGP) of the Lower Vaal WMA was R9.8bn in 1997. The most important magisterial districts in terms of contribution to GGP in this WMA are shown below:

- Kimberley: 29.6%
- Postmasburg: 14.8%
- Lichtenburg: 9.6%
- Kuruman: 8.9%
- Vryburg: 8.3%.

[15] Tsantsabane Local Municipality. (2014) Spatial Development Framework

[16] Huisman, B. (November 2019) City Press: Care for communities: Contributing to people's wellbeing

[17] Assmang Iron Ore (2019). Social and Labour Plan Beeshoek Iron Ore Mine 2019-2024

[18] Tsantsabane Local Municipality (2020) Final 2020/21 Revised Integrated Development Plan 2020/21

[19] Assmang Iron Ore (2019). Social and Labour Plan Beeshoek Iron Ore Mine 2019-2024

[20] Tsantsabane Local Municipality (2018) Integrated Development Plan: Revised Draft

The most important economic activities taking place within the WMA are:

- Mining: 23%
- Government: 16%
- Trade: 15%
- Agriculture: 14%

The main agricultural activities identified include livestock and dryland cropping. Livestock includes beef and dairy cattle, goats, non-wooled sheep, pigs and ostriches. Crops grown are mainly maize, but also sunflower, cotton, groundnuts and vegetables. The mining activities in this WMA include mining for diamonds, iron ore, manganese and other minerals such as limestone, dolomite and amphibole asbestos. Kimberlite diamonds are mined at the Finch Mine at Lime Acres, one of the most important diamond producing mines of the De Beers Company. Kimberley is also an important diamond mining area, which is known for its high-quality diamonds. The Sishen Mine, currently the major supplier of iron ore in the country, is also located in the Lower Vaal WMA. This mine has a mineable depth of 30 metres and was opened in 1953 as part of Iscor's expansion strategy. In 1997, it produced approximately 2 400-million-ton iron ore per year. Other important mining areas includes Kudumane (iron, manganese and asbestos etc.), Ganyesa (diamonds, mica group clay and salt) and Taung (diamonds, limestone, dolomite and salt). Since manufacturing production is far less than mining production, it can be deduced that only a small percentage of beneficiation is done locally. This implies that a large percentage of raw mining products are exported to other areas for beneficiation. Lichtenburg is the largest manufacturing town in the WMA, where manufacturing includes cement and cheese factories. Kimberley is the second largest manufacturing town, but its output is half that of Lichtenburg.

The trade sector is concentrated in wholesale of primary products and related services to the community. Main products of trade in this WMA are:

- diamonds (for export);
- food retail related products; and
- ostrich-related products.

2.e.iii.13.k Local Economic Profile

As with the province's economy, the economies of the ZF Mgcawu District Municipality and the Tsantsabane Local Municipality are largely dominated by mining, agriculture and manufacturing. Mining in TLM is the highest contributor to both its economic growth and job creation. In 2014 it was indicated that the primary sector contributed 74% of all the sectors' contribution to the GDP of Tsantsabane Local Municipality. Mining was then still the single biggest contributor of all industries within the district and province. Expansions in the mining sector over the past couple of years led to the growth in the local economy. However, downscaling in this regard, however also had a significant impact on the local economies dependent on mining with long term negative consequences.

According to the Tsantsabane Local Municipality IDP, mining accounts for 55% of the GDP within the region[21]. Postmasburg, and the surrounding area, had positive local business related impacts from mining due to the development of the Kolomela Mine and the constant input from the Assmang Beeshoek Mine. Individual new businesses, include retail and wholesale (53%), personal services (19%), transport (16%), catering and accommodation (6%), as well as financial services (3%).

Furthermore, tourism could be a relatively small but important contributor to the local economy as more tourists are attracted to the distinguishing desert landscape with relative accessibility. This sector, however, was also negatively impacted by the Covid-19 Pandemic and associated lockdown restrictions.

Financial resources of the Tsantsabane Local Municipality are further limited due to ongoing poor payment levels by consumers. This has resulted in declining cash inflows for the municipality, which has necessitated restrained expenditure to ensure that cash outflows remain within the affordability parameters of the Municipality's finances[22]. The effect of the COVID-19 pandemic further resulted in inability for them to effectively implement credit control and debt collection measures. In 2020 Eskom identified the Tsantsabane Local Municipality as one of the defaulting Northern Cape Municipalities that failed to pay Eskom large amounts for the service delivery. Continued stable electricity provision thus hangs in the balance. Possible future disconnections of electricity supply may cause undue hardship to consumers and members of the community, and may adversely affect the delivery of other services.

[21] Tsantsabane Local Municipality (2020) Final 2020/21 Revised Integrated Development Plan 2020/21

[22] Tsantsabane Local Municipality (2018) Integrated Development Plan: Revised Draft

In order to ensure further economic growth in the region, the Tsantsabane Local Municipality's Local Economic Development strategy should ensure the utilisation of the economic potential to the benefit of the broader community. Projects would include supporting the establishment of various industries and businesses and the promotion of tourism through the development of a Tourism Marketing Strategy.

The above could link with the efforts to identify skills to be developed to respond to the economic opportunities in the municipality. In this regard, the municipality, with the assistance of Kumba Resources, established the Tsantsabane Youth Service Centre in 2009. The focus of the Centre is skills development of youth in the area in order to empower them to play a vital role in the economy of the area. Specific programmes include life skills training, leadership training, computer training and so forth.

As part of local growth further key investment opportunities within the Tsantsabane Local Municipality relate to:

- Public-private partnerships to speed up development in the area;
- Developmental assistance to the agricultural sectors with the focus on the emerging farmers;
- The development of a manufacturing strategy including the availability of serviced plots and the development of local skills;
- Identification of export opportunities and international markets;
- The establishment of a permanent working group between the mining companies and the municipalities to ensure an effective relationship together with the development of skills training and support programmes;
- Investigating and exploiting activities related to road-transport routes or corridors due to the suitable location of the municipality;
- The establishment of a local business support centre for the benefit of local entrepreneurs and informal traders;
- Exploit possible benefits of solar development projects in the area (e.g. Lesedi, Jasper and Red Stone projects) to the benefit of the local communities; and
- The development and implementation of an aggressive tourism marketing strategy

2.e.iii.14 Description of the Current Land Uses

Mining at the Beeshoek was established in 1964 with a basic hand sorting operation. In 1975 a full Washing and Screening Plant was installed. Because of increased production, Beeshoek South, a southern extension of the Beeshoek Mine, was commissioned during 1999 on the farms Beesthoek and Olynfontein.

The area is zoned as a mining area, with large scale mining taking place within the region. The mining area was most likely used for livestock grazing before mining commenced, based on surrounding land use of grazing taking place.

The dominant land uses in the surrounding areas include mining, airfield, wildlife/wilderness, access roads and services roads as well as existing railway line. No cultivated commercial agricultural activities were observed within the study area and the immediate vicinity. Current land use examples are presented

Photo 17: Photographic presentation of the dominant land uses within the study area and surrounding areas

From a land capability point of view, the Beeshoek Mine area is dominated by soils with low agricultural potential. At best, the soils within the Beeshoek Mine Area are suitable for supporting wildlife and grazing to a degree. Although small patches of arable soils occur within the area, given the climatic constraints of the area (Rainfall less than 400 mm) and lack of irrigation options, these soils are not likely to contribute substantially to national food production grid. The very low rainfall in the area infers that the only means of cultivation would be by irrigation. However, based on observation of the area there are no signs of irrigation infrastructure. In addition to that, high temperatures occurring in this area are also likely to cause crop permanent wilting, thus affecting crop yield. Given these constraints the extent of the high productivity soils is not considered sufficient for viable cultivated commercial farming.

2.e.iii.15 Description of Specific Environmental Features and Infrastructure on Site & Specific Zones of Regulation

There are a number of specific environmental features:

- The mine site is located on the western edge of the Ghaap Plateau that has been identified by the Northern Cape Nature Conservation Services as a priority for conservation in the Northern Cape and is regarded as an ecologically sensitive habitat. Endoreic pans occur on the Ghaap Plateau and are prevalent within the Sishen/Postmasburg area. Various of these pans are present within the project area;
- Non-perennial drainage channel observed on the south eastern boundary of the mine, which will not be impacted on by the proposed mining activities;
- Increased dewatering activities, especially on the southern and south-eastern boundary of the mine and the potential impact thereof on surrounding farmers;
- According to the screening tool the overall aquatic sensitivity of the Beeshoek Mine and surrounds is very high due to the area being classified as a FEPA catchment, the presence of wetlands and the Beeshoek Mine falling within a strategic water source area. This latter area is located on the eastern south eastern portion of the mine; and
- The “recharge zone” of the small unnamed tributary of the Groenwaterspruit does not possess well-defined characteristics indicative of either wetland or riparian conditions. Nevertheless, it is a clearly defined low-lying area, which possesses a unique digital signature and based on analysis of available digital satellite imagery, it is very likely that water from this area flows to the Groenwaterspruit and may contribute to the continued ecological functioning thereof. The importance of this feature from a hydropedological perspective in terms of

its contribution to the recharge to the downstream system would need to be determined by a suitably qualified specialist.

2.e.iii.16 Environmental and Current Land Use Map

Please refer to the following figure for the landcover map.

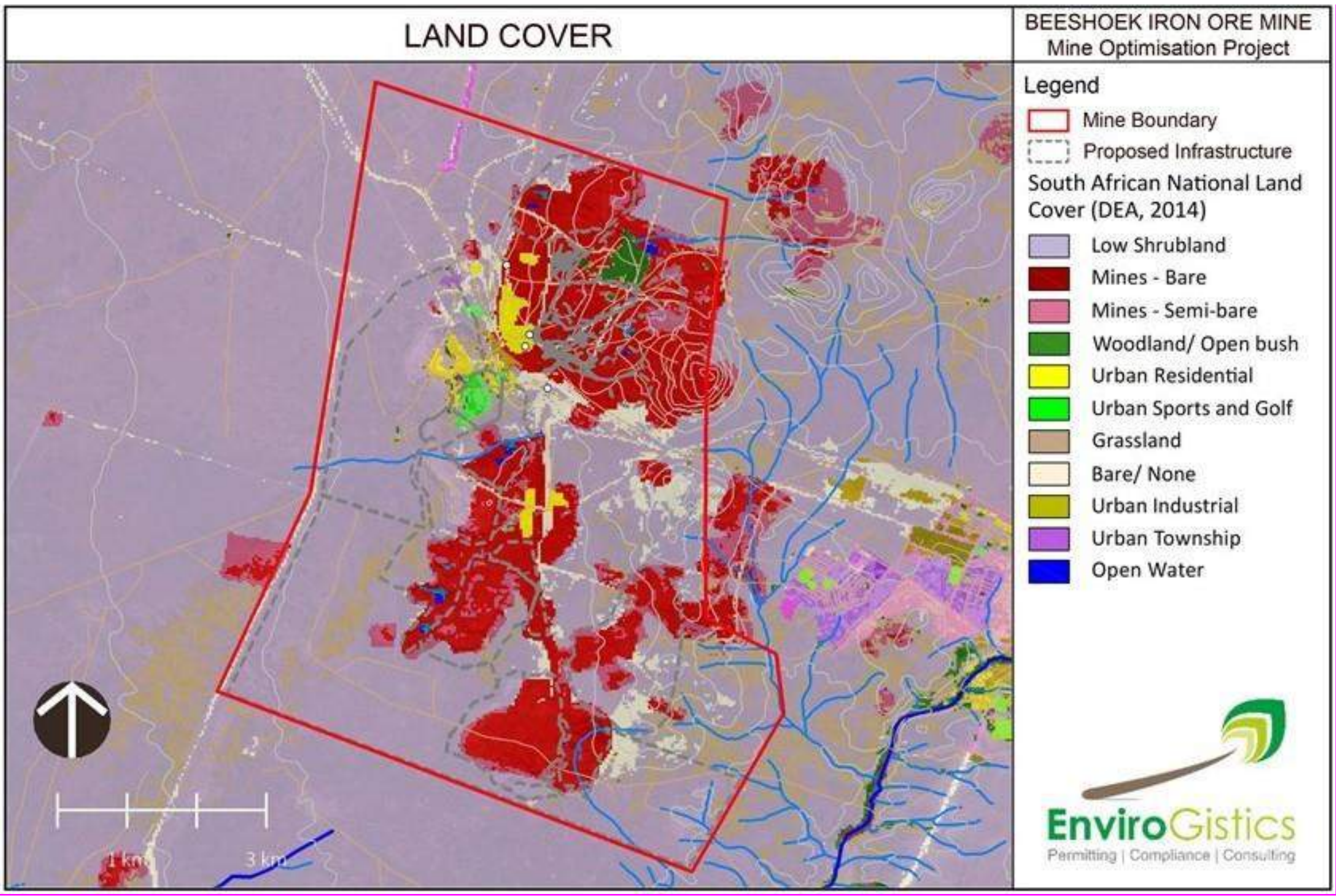


Figure 108: Land Cover map

2.e.iv Impacts and Risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be mitigated

2.e.iv.1 Typical Activities to be undertaken

Before the impact assessment can be done, the different activities must be identified, mapped and understood. The activities directly related to this impact assessment are listed in Table 8 discussed in the first section of the report. Each of these activities were assessed in detail as part of the specialist investigations.

Various phases of implementation have been considered in the identification of the activities to be assessed and includes:

- Pre-construction activities which would include fencing of the mining sections (sites), earth clearing activities (clearing of vegetation, soil stripping), the demarcation of the areas in question, the drafting and agreement to land access contracts as well as relocation of infrastructure where required, and the understanding and training of personnel in environmental and safety legalities and requirements.
- During the construction phase, the appointed contractors will be responsible for the main earthworks, establishment of laydown areas, clearance and commissioning of borrow pits, bridge construction, temporary road accesses, road construction, construction of beneficiation plants, rerouting and laying of water and slimes pipelines, security checkpoints and surface infrastructure. It should be noted that the laydown areas will be established on areas which are demarcated for construction activities. During the construction phase an

Environmental Control Officer (ECO) will be appointed to ensure that all activities are undertaken in line with the approved Environmental Authorisations.

- During the operational phase, all activities will be in place and the only ongoing clearance will be that of the ongoing exploration drilling activities and as the WRDs and Opencast Pits develop. The operational phase will involve the management and coordination of exploration drilling activities, the management and coordination of the opencast operations, the management and coordination of the opencast pits and potential backfilling opportunities, haul road usage, the beneficiation of slimes and low grade material, operation of the railway lines, the management of hydrocarbons in and around the oil and fuel (diesel) storage and supply areas and general environmental management and controls.
- The decommissioning and closure phase will be undertaken in line with the mine's overall closure commitments and will involve the removal of all infrastructure and the rehabilitation of the land to its end land use commitments.

The mining activities can be summarised as the following.

- Planning Phase:
    - Ensure the implementation of Legal Requirements (Environmental Permits and Authorisations);
    - Drafting of contracts and protocols;
    - Training of contractors on environmental requirements;
    - Walkover to identify all protected plant, mark all species and apply for the necessary removal permits; and
    - Develop a clear and safe traffic management plan for the duration of the railway line construction specifically relating to the temporary traffic rerouting during bridge construction.
- Construction Phase:
    - Demarcation of laydown areas;
    - Demarcation of borrow pit areas;
    - Implementation of traffic management plan;
    - Land and footprint clearance;
    - Topsoil stripping and stockpiling;
    - Establishment of surface infrastructure (foundation preparation and liner implementation; infrastructure establishment, laydown areas, temporary water supply points, roads, etc.); and
    - Waste Management
- Operational Phase:
    - Opencast mining operations;
    - Beneficiation;
    - Implementation of Drilling Programme and concurrent rehabilitation;
    - Transportation (roads);
    - Mine Residue disposal;
    - Water reticulation management; and
    - Waste management (mineral waste, domestic waste and hazardous waste)
- Closure Phase:
    - Ensure the implementation of Legal Requirements (Environmental Permits)
    - Rehabilitation of Exploration Sites;
    - Backfilling or safe-making of opencast pits;
    - Rehabilitation and shaping of Mine Residue Deposits;
    - Dismantling and decommissioning of infrastructure and buildings, including product stockpiles;
    - Earth moving, shaping and ripping of ground;
    - Cessation of Labour Contracts; and
    - Waste Management.

Based on the above activities detailed tables are provided with all the identified impacts associated with the environmental authorisation application together with the significance before and after mitigation. Proposed mitigation measures are also provided for each identified impact. Please refer to Table 71 to Table 74 for the detailed table per mining phase of each listed impact.

2.e.iv.2 Methodology used in determining and ranking the Nature, Significance, Consequences, Extent, Duration and Probability of potential Environmental Impacts and Risks

In order to adequately assess and evaluate the impacts and benefits associated with the project it is necessary to use a methodology that could scientifically achieve this and to reduce the subjectivity involved in making such evaluations. For proper decision-making it is necessary to assess all legal requirements and clearly defined criteria in order to accurately determine the significance of the predicted impacts or benefits on the surrounding natural and social environment.

This section will aim to discuss the methodology to be followed to determine, assess and describe possible impacts as a result of project implementation. Impacts will be discussed in terms of the construction, operational and decommissioning/closure phases of the project. The evaluation of impacts is conducted in terms of the criteria discussed below. The various environmental impacts and benefits of this project will be discussed in terms of the nature of the impact, as well as the status, certainty, duration, magnitude, extent, intensity, frequency and significance. The significance rating of each impact will determine whether or not mitigation will be required.

The EIA will also aim to achieve the following:

- Provide an overall assessment of the social and biophysical environments affected by the proposed project;
- Assess the study area in terms of environmental criteria;
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts;
- Successfully analyse all public issues raised to date in order to recommend appropriate mitigation measures for all social and environmental related concerns; and
- Impacts and benefits are assessed before and after the application of mitigation measures.

The following section presents the criteria used to assess the potential impacts presented in the previous section.

2.e.iv.2.a Criteria of assigning significance to potential impacts

The evaluation of impacts is conducted in terms of the criteria detailed in Table 61 to Table 66. The various environmental impacts and benefits of this project are discussed in terms of impact status, extent, duration, probability, and intensity. Impact significance is regarded as the sum of the impact extent, duration, probability and intensity and a numerical rating system has been applied to evaluate impact significance. Therefore, an impact magnitude and significance rating are applied to rate each identified impact in terms of its overall magnitude and significance (Table 66).

In order to adequately assess and evaluate the impacts and benefits associated with the project, it was necessary to develop a methodology that would scientifically achieve this and to reduce the subjectivity involved in making such evaluations. To enable informed decision-making it is necessary to assess all legal requirements and clearly defined criteria in order to accurately determine the significance of the predicted impact or benefit on the surrounding natural and social environment.

2.e.iv.2.b Impact Status

The nature or status of the impact is determined by the conditions of the environment prior to construction and operation. A discussion on the nature of the impact will include a description of what causes the effect, what will be affected and how it will be affected. The nature of the impact can be described as negative, positive or neutral.

Table 61: Status of Impact

Rating	Description	Quantitative rating
Positive	A benefit to the receiving environment.	P
Neutral	No cost or benefit to the receiving environment.	-
Negative	A cost to the receiving environment.	N

2.e.iv.2.c Impact Extent

The extent of an impact is considered as to whether impacts are either limited in extent or if it affects a wide area or group of people. Impact extent can be site specific (within the boundaries of the development area), local, regional or national and/or international.

Table 62: Extent of Impact

Rating	Description	Quantitative rating
Low	Site Specific; Occurs within the site boundary.	1
Medium	Local; Extends beyond the site boundary; Affects the immediate surrounding environment (i.e. up to 5 km from the Project Site boundary).	2
High	Regional; Extends far beyond the site boundary; Widespread effect (i.e. 5 km and more from the Project Site boundary).	3
Very High	National and/or international; Extends far beyond the site boundary; Widespread effect.	4

2.e.iv.2.d Impact Duration

The duration of the impact refers to the time scale of the impact or benefit.

Table 63: Duration of Impact

Rating	Description	Quantitative rating
Low	Short term; Quickly reversible; Less than the project lifespan; 0 – 5 years.	1
Medium	Medium term; Reversible over time; Approximate lifespan of the project; 5 – 17 years.	2
High	Long term; Permanent; Extends beyond the decommissioning phase; >17 years.	3

2.e.iv.2.e Impact Probability

The probability of the impact describes the likelihood of the impact actually occurring.

Table 64: Probability of Impact

Rating	Description	Quantitative rating
Improbable	Possibility of the impact materializing is negligible; Chance of occurrence <10%.	1
Probable	Possibility that the impact will materialize is likely; Chance of occurrence 10 – 49.9%.	2
Highly Probable	It is expected that the impact will occur; Chance of occurrence 50 – 90%.	3
Definite	Impact will occur regardless of any prevention measures; Chance of occurrence >90%.	4
Definite and Cumulative	Impact will occur regardless of any prevention measures; Chance of occurrence >90% and is likely to result in in cumulative impacts	5

2.e.iv.2.f Impact Intensity

The intensity of the impact is determined to quantify the magnitude of the impacts and benefits associated with the proposed project.

Table 65: Intensity of Impact

Rating	Description	Quantitative rating
Maximum Benefit	Where natural, cultural and / or social functions or processes are positively affected resulting in the maximum possible and permanent benefit.	+ 5
Significant Benefit	Where natural, cultural and / or social functions or processes are altered to the extent that it will result in temporary but significant benefit.	+ 4
Beneficial	Where the affected environment is altered but natural, cultural and / or social functions or processes continue, albeit in a modified, beneficial way.	+ 3
Minor Benefit	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are only marginally benefited.	+ 2
Negligible Benefit	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are negligibly benefited.	+ 1
Neutral	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are not affected.	0
Negligible	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are negligibly affected	- 1
Minor	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are only marginally affected.	- 2
Average	Where the affected environment is altered but natural, cultural and / or social functions or processes continue, albeit in a modified way.	- 3
Severe	Where natural, cultural and / or social functions or processes are altered to the extent that it will temporarily cease.	- 4
Very Severe	Where natural, cultural and / or social functions or processes are altered to the extent that it will permanently cease.	- 5

2.e.iv.2.g Impact Significance

The impact magnitude and significance rating are utilised to rate each identified impact in terms of its overall magnitude and significance.

Table 66: Impact Magnitude and Significance Rating

Impact	Rating	Description	Quantitative rating
Positive	High	Of the highest positive order possible within the bounds of impacts that could occur.	+ 12 – 17
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. Other means of achieving this benefit are approximately equal in time, cost and effort.	+ 6 – 11

Impact	Rating	Description	Quantitative rating
	Low	Impacts is of a low order and therefore likely to have a limited effect. Alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming.	+ 1 – 5
No Impact	No Impact	Zero impact.	0
Negative	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural, and economic activities of communities can continue unchanged.	- 1 – 5
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly possible. Social cultural and economic activities of communities are changed but can be continued (albeit in a different form). Modification of the project design or alternative action may be required.	- 6 – 11
	High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or a combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt.	- 12 - 17

2.e.iv.3 Impacts and Risks identified

In addition to the specialist studies on the environmental considerations, the project also considered the potential impact mineral waste could have on the groundwater quality. Before the impact tables are presented, the outcomes of the waste classification are presented:

The following section provides a systematic presentation of the steps followed by the mine to determine whether the Mine Residue Deposits on site have any potential latent or residual risk:

2.e.iv.3.a Initial Assessments (2015/2016)

During 2015 and 2016, Waste Classification was undertaken on 20 samples from Beeshoek. The aim of the tests was to classify the material in terms of the waste classification guidelines set by the Department of Environmental Affairs (DEA) and published in the Government Gazette during August 2013. The guidelines which gave effect to this study were:

- GN R. 634 (GN634) of NEMWA: Waste Classification and Management Regulations;
- GN R. 635 (GN635) of NEMWA: National Norms and Standards for the Assessment of Waste for Landfill Disposal; and
- GN R. 636 (GN636) of NEMWA: National Norms and Standards for Disposal of Waste to Landfill.

The sample material was submitted to SGS in Johannesburg South Africa, which is a South African National Accreditation System (SANAS) accredited laboratory, for the analyses. Tests the samples were subjected to include:

- Total Concentration (TC); and
- Leachable Concentration (LC).

<u>Total concentration test results</u>

The test results for the TC show that Hexavalent Chromium (Slimes Dam, Contaminated Dump, West Pit and Village waste material), Barium (all sampled waste material), Copper (BN, West and East waste material), Manganese (all waste material except BIS, West and Village waste material), Vanadium (Historic waste material) and Lead (Discard, HL, Slimes, BN, Historic, Contaminated Dump, BIS, and East Pit waste material) exceed the TCT0 guidelines in some of the samples. Arsenic exceed the TCT0 guidelines in all the samples. All the samples comply with the TCT1 guidelines.

It should be noted that all elements that exceed the TCT0 guideline values still comply with the TCT1 guideline values.

<u>Discussion of leach test analysis results as part of the 2015 study</u>

There are a number of facilities where leachate from the facility towards the aquifers would not cause the groundwater quality to deteriorate to a level where it does not comply with the LCT0 guideline values (assuming that the barium concentration in the natural groundwater complies with the LCT0 guidelines in the first place – no information on this is available). These include:

- Contaminated Dump;

- BIS;
- West Pit WRD; and
- Village Pit WRD.

There are several facilities where the LC exceeds the LCT0 guideline values only slightly. It would be reasonable to assume that dilution with groundwater in the underlying and surrounding aquifers will reduce the LC to below the LCT0 guideline value, again assuming that the barium concentration in the natural groundwater complies with the LCT0 guidelines in the first place – no information on this is available. These include:

- Discard (Barium concentration of 0.755mg/L compared to LCT0 guideline of 0.7mg/L);
- Old Slimes Dam (Barium concentration of 0.82mg/L compared to LCT0 guideline of 0.7mg/L);
- North Pit detrital (TITR) (Barium concentration of 0.78mg/L compared to LCT0 guideline of 0.7mg/L);
- East Pit (Barium concentration of 0.77mg/L compared to LCT0 guideline of 0.7mg/L); and
- HL Dump (Manganese concentration of 0.57mg/L compared to LCT0 guideline of 0.5mg/L).

Facilities where additional studies must be performed to determine whether dilution of the leachate with groundwater will yield a combined groundwater quality compliant with LCT0 are:

- Slimes Dam;
- BN WRD; and
- Historic Dump A.

These additional studies to be done would include:

- Determining the natural groundwater quality in the area in terms of barium and manganese concentrations (study was subsequently completed in 2019); and
- Possibly a basic groundwater contaminant model to determine the cumulative impact of leachate from the facilities on the underlying and surrounding aquifers should the natural barium and manganese concentrations in the groundwater be below LCT0 guideline values (study was subsequently completed in 2019).

Waste classification based on TC and LC test analyses

Based on the test results, the material from all the different sites is classified as Type 3 Waste following the GN635 classification system.

This classification is mostly based on the results of the total concentration testing results where there are several elements that exceed the TCT0 guidelines for all the samples. There are several facilities which will not be impacted, or may not be impacted when taking into consideration dilution with natural groundwater based on the leach concentration results.

2.e.iv.3.b Waste Classification Clarification Study, 2017

A Waste Characterisation and Groundwater Monitoring Network Audit was undertaken by GPT, April 2017, following the 2015 study.

Based on the study, groundwater quality analysis, solid waste analyses and liquid waste analyses, it was deduced that the chemical signatures of the three (3) mediums (leach, groundwater and waste rock) are quite similar. Additionally, it was found that the constituents found to exceed the relevant screening levels for each of the three mediums are also similar. Also, most of the sources are located within the dewatered area, directing any contaminants towards the active mining areas.

The 2017 study concluded that groundwater monitoring in terms of chemistry is not recommended for expansion as the effects of sources on the groundwater environment are likely to be negligible and are unlikely to be observed in samples as the chemical signatures of the different mediums are so similar.

The report also stated the following: "The available hydrogeochemical data (incl. solid waste, liquid waste and groundwater) were analysed using IBM.s SPSS v. 20. The corresponding chemical constituents between each of the samples were defined as chemical fingerprints, which could be correlated and cross-correlated with each other in an attempt to identify the similarities between the waste samples and background water quality. All the chemical compositions of the solid waste and liquid waste samples show a significant correlation (á = 0.01 or 0.05) with that of at least one background groundwater sample. This illustrates that contamination from these sources is likely to have the same geochemical signature as the local groundwater. This shows that contamination to the aquifer from the identified sources is unlikely."

2.e.iv.3.c Follow up risk study, 2019

A Contamination Assessment was undertaken at the mine in terms of Nitrate, Barium and Manganese as Contaminants of Concern. This arose from the 2015/2016 Waste Classification Study, and the request for further studies became a key condition in the WUL, Annexure IV, Condition 3.18.

The study found that:

- A cone of depression has developed within the active mining area with flow directed towards the mining excavation due to mine dewatering (this was also found in the 2016 Numerical Model undertaken by GPT- Updated Numerical Modelling of the predicted groundwater drawdown resulting from mining of the Village Pit of the Beeshoek Mine, June 2016).
- None of the targeted constituents exceed the prescribed 2018 WUL limits.
- Nitrate as N concentrations exceed the SANS241-1:2015 standard limit in, BN Pit, WG74 and WG34.
- Barium (Ba) and Manganese (Mn) concentrations are within SANS 241-1:2015 recommended limits in all samples.
- All samples have a $Ca^{2+}/Mg^{2+}/HCO_3^{-}$ hydrochemical signature typical of unpolluted groundwater enriched in Calcium (Ca) and Magnesium (Mg) due to the presence of dolomite [$CaMg(CO_3)_2$] in the area which can influence the carbonate concentration in the groundwater by dissolution.
- The $\delta^{18}O$ and $\delta^{2}H$ analytical results of all samples were plotted on a $\delta^{2}H$ vs $\delta^{18}O$ chart relative to the Global Meteoric Water Line (GMWL). The samples deviate from the GMWL due to depletion in isotopes. Depletion in $\delta^{18}O$ and $\delta^{2}H$ are indicative of evaporation losses in the pit water (BN Pit) and recharge following evaporation and mixing in groundwater.
- The $\delta^{15}N$ (from NO_3) and $\delta^{18}O$ values for all samples were plotted against each other on a Kendall plot. The isotopic signatures of the samples are typical of NO_3 values derived from a mixture of soil, agricultural, and , and septic waste sources, with contribution from N-based explosives in the mining area.
- The use of N-based explosives for mine blasting is likely to contribute to elevated nitrate levels in groundwater as most explosives contain between 70 . 90% ammonium nitrate. Nitrates are highly soluble in water. The occurrence of nitrate in groundwater and the pit water indicates that nitrate is naturally occurring (outside of the mining area) with contribution from N-based explosives in the mining area.
- Nitrate occurrence may be attributed to nitrogen cycling in the environment and the use of N-based explosives (for mine blasting). This study indicates that the nitrate circulation in water is complicated involving multiple sources and the occurrence of nitrate is natural with contribution from mining-related blasting using N-based explosives.
- In the mining environment, the leaching of blasting residue from waste rock, tailings and mine water impoundment are also potential sources of nitrate in groundwater. The contribution of N-based- explosives to nitrate concentration in groundwater is negligible compared to background values.
- Based on the scope and findings of this investigation within the mining area and immediate surroundings, Ba and Mn were not regarded as contaminants of concern in groundwater.

The conclusion of the study stated that due to the limited contribution of explosives regarding elevated nitrate concentration (less than 1mg/l), as well as the fact that groundwater flow eventually ends up in the dewatered zone, no active remediation is required. As part of the groundwater management plan, focus should be on the management of the water balance of the mine to ensure minimal infiltration of surface water enriched in nitrates. The conclusion again, was that no residual or latent groundwater pollution risk was identified on site.

2.e.iv.3.d GN704 Exemption

In order to maintain safety and security in and around these pits two key activities are implemented:

- Enviroberms and temporary berms around opencast pits; and
- Safety berms on roads.

The purposes of the berms are to:

- Restrict water inflow into the pits in the event of a rain event;
- Restrict access to the operation, which could lead to safety concerns; and lastly
- These berms are a commitment as part of the:
    a. Approved MPRDA EMPr to retain safety around open voids which will remain post closure; as well as

b. Commitment in the 2016 Integrated Water and Waste Management Plan (IWWMP), where it is stated that: ***"If opencast pits are not backfilled, enviroberms or a similar structure should be implemented to keep runoff from the opencast pits."***

In addition to the above, various haul roads are present on the North and South Mine to ensure safe access to opencast pits, crushers, workshops and the Mine Residue Deposits. As the opencast pits are developed these haul roads may:

- Be deviated slightly, where opencast pits have not reached its full footprint design; or
- The routing of the vehicles on the haul roads are managed to ensure safe passage during blasting operations.

In order ensure on site regulations on the use of haul roads to maintain a safe operation, safety berms are constructed either in the centre between two driving directions, or haul roads may be temporary or permanently closed as part of the pit development.

To achieve the two activities above, the Mine makes use of the overburden and waste rock obtained during the development of the opencast pits.

Due to the nature and characteristics of the mine residue, the Mine received Exemption from Regulation 5 of GN704, 1999 in the WUL, 2015 for the use of waste rock in the construction of various safety berms around roads, and for the use of enviroberms around opencast pits where required.

2.e.iv.3.e Risk to Water Quality

Based on the outcomes of the studies stipulated in the preceding section, no impact on groundwater is foreseen from the mining activities as determined by various specialist studies described hereafter. The groundwater system is therefore well placed to provide potable and process water for the mining operations. This was also confirmed in the 2021 Hydrogeological Assessment (Annexure 10).

2.e.iv.3.f Residual vs. Latent Risks

For this discussion the following should be clarified:

A residual risk as per the Oxford Dictionary is: "Remaining after the greater part or quantity has gone." The 2015 Financial Provision Regulations defines residual environmental impacts as "any environmental impact or risk that may result or manifest <u>after</u> actions for final rehabilitation, decommissioning and closure have been implemented.

A latent risk as per the Oxford Dictionary is "(of a quality or state) existing but not yet developed or manifest; hidden or concealed."

Based on the specialist studies conducted as part of the past Environmental Authorisation Processes, which includes multi-disciplinary specialist studies, as well as subsequent reviews of these studies (such as the Numerical Groundwater Model updates), it is concluded that no quantitative residual risks have been identified. This pertains to the fact that no specific quantitative risk has been identified which can be costed for the purposes of long term management post mine closure -i.e. when all closure measures have been implemented and still specific impacts remain. For example, where decant has been identified as part of a mine's operational layout and plan, the decant can be quantified, and the treatment options thereof stipulated or where a groundwater pollution plume has been identified as part of a numerical model a specific measures are determined to retract or manage the movement of this plume, such as scavenger boreholes. For the purposes of Beeshoek Mine, no residual risks have been identified.

Latent risks on the other hand are regarded as those risks which are unknown/hidden and for which further studies and/or investigations are required. These are typically associated with ineffective rehabilitation due to premature closure (the risk is present, however management measures are in place throughout the operational phase of the mine to address these), or the loss of employment due to premature closure, or instability due to the underlying strata/geology, such as dolomites (investigations are undertaken on a regular basis to determine where infrastructure must be place or where risk of subsidence are present and as a result these are incorporated within the mine planning and layout. However, in the event of poor stormwater management or dewatering from other sources, residual to the mine activities, subsidence may occur. This is however a latent risk and not a residual risk – this is a "what if", which must be investigated and understood and incorporated as part of the ongoing layout development of the mine.

Latent Environmental Impacts may be expected for the post-closure scenario, should the recommended operational, ongoing rehabilitation and rehabilitation as part of decommissioning and closure not be successful. This is however unlikely and managed through ongoing studies and investigations. These risks are therefore subjected to further studies as identified in the 2021 Beeshoek Residual Risk Report or as part of ongoing incorporation of measures as presented in the Social and Labour Plans. These relates specifically to:

- Stability (due to the presence of the dolomites in the area);
- Management of the impact on the loss of employment once the mine closes; and
- The impacts on premature closure.

Ongoing updates of the groundwater reports and reassessment of the deep dolomitic studies due to the incorporation of conditions listed in these reports may be suitable to better understand the environment and also manage specific areas of concern to manage and/or avoid any potential unknown residual risks.

The potential latent risks identified includes:

1. Mine potentially not rehabilitated and closed properly, which could lead to access and security concerns which could lead to establishment of informal settlements. This could also lead to injury or fatalities dur to unauthorised and unrestricted access to mining areas not properly rehabilitated.
2. Mine potentially not rehabilitated and closed properly, which could lead to the occurrence of sinkhole development due to lack of rehabilitation and storm water control around Mine Residue Stockpile slopes and the Slimes Dam.
3. Potential inadequate budget to adequately rehabilitated the environment. This could result in not achieving the final land use plan (rating considering ongoing rehabilitation is currently undertaken).
4. Potential negative effect of future closure on the employees and their future income, which could lead to employees and community income source lost.
5. Potential surface subsidence at opencast pit voids, which could have a negative impact on surface rehabilitation due to the collapse of Opencast Walls – impact on rehabilitation landscape and storm water management.
6. Potential surface subsidence around Mine Residue Slopes. This could have a negative impact no surface rehabilitation due to the collapse of surface infrastructure (MRD) and pooling of surface water – injury to humans and/or animals.
7. Potential surface subsidence on the general environment, resulting in a negative impact on surface rehabilitation due to the collapse of surface infrastructure due to pooling of surface water – injury to humans and/or animals, damage to local infrastructure.
8. Potential dissatisfaction of communities with future land use resulting in protests and disruption of the closure process.
9. Potential unforeseen waste disposal at closure, resulting in unforeseen economic and environmental cost – changes in legislation can also contribute.
10. Potential changes in future legislation. This could include more stringent closure requirements with an unforeseen cost implication.

The management measures provided in the sections below are all formulated to ensure that these risks can be managed and monitored.

2.e.iv.3.g Impact Assessment

Please refer to Table 71 to Table 74 which presents the impacts assessed based on the sections hereafter. The impacts make provision for the significance identified before and after mitigation. The tables further indicate in the view of the EAP, whether these impacts can be reversed, avoided and or whether it is irreplaceable. For future clarity, please also refer to the Sections hereafter.

2.e.iv.3.h The Positive and Negative Impacts that the Proposed Activity (in terms of the Initial Site Layout) and Alternatives will have on the Environment and the Community that may be affected

As mentioned before (Section 2.d) the proposed projects have various benefits for not only the mine, but also the local, regional and national economic. The benefits can be characterised into the following:

- Economic Benefit;
- Social Benefit;
- Giving effect to Waste Reduction;
- Giving effect to an approved Environmental Activity as part of Environmental Management and Impact Reduction; and
- Logistics to Improve infrastructure to supply Export Market demands.

Section 23(1)(a) of the MPRDA states in Section 1(a), that subject to subsection (4), the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. This project specifically gives rise to this requirement, and results in the optimisation of mineral waste deposition, beneficiation, water management and the logistical requirements for product transportation.

Various optimisation activities are planned for the mine as previously discussed. By not allowing this project to proceed, the mine will lose the opportunity to rework current waste streams and thereby reducing the dirty water footprint.

In addition to this, this project plans to optimise the exploration of mineral resources to which the mine has the Mineral Rights to. By not allowing the expansion of opencast operations, the mine will not be in a position to optimally work within its allocated Mineral Resource boundaries.

The opportunity to effectively and efficiently export iron ore resources via the Saldanha port will further be lost should the allowance for the railway line link not realise.

The projects in question will have a substantial socio-economic benefit within the local area, and also regionally. No fatal flaws or environmental concerns, which cannot be addressed with sound and proper management have been identified. Should the proposed project not proceed, the status quo in terms of the existing social impacts in the area would therefore remain. The life of mine would then not be extended and the mine would cease to operate over a shorter period of time.

The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region.

As the Beeshoek mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

The ‘no-go alternative’ should thus not be considered from a social point of view as the negative social impacts anticipated with the Beeshoek optimisation project are deemed low. The negative impacts would further respond to mitigation as proposed. The proposed activities further fall within the mining rights area and the area is already characterised by and surrounded by various mining infrastructure.

The Beeshoek Optimisation project will extend the Life of Mine and will result in the continuation of the existing operations and by not allowing this project, the following opportunities will be lost:

- The continuation of job and income opportunities with subsequent positive economic spin-offs;
- Continuation of central tax revenues;
- Positive impact in terms of the socio-economic development of the area and reducing poverty levels through continued employment; and
- Socio-economic investments targeted at the local community through local economic development projects, as well as through capacity building and training.

2.e.iv.3.h.1 Planning Phase

During the Planning phase, no specific impacts will take place directly, however, poor planning towards the implementation/construction during this phase, could result in significant project delays. This will be due to environmental authorisations and other permits (such as tree and plant removal) not being in place and/or specifically for the purposes of the Railway line, agreements not being in place being Transnet and the Roads Agency, including the Aviation Authority and the Mine.

2.e.iv.3.h.2 Construction-Decommissioning Phases

2.e.iv.3.h.2.1 Logistical Impacts

During the construction phases of the activities, there is the possibility of impacting on the logistical arrangements of adjacent mines, such as Kolomela Mine, as well as road users depending on the R385 and access to the Tommy's Field Airport. This is due to the construction of the bridge to allow for the new railway line to cross over the R385 and also to allow for the railway line to cross the Tommys Field access road.

2.e.iv.3.h.2.2 *Topography and Soils*

The construction of infrastructure and stockpiles will alter the topography by adding features to the landscape which may have a negative impact if not suitably planned to blend into the environment where possible (specifically considering the construction of the railway line and the increase in the heigh of the WRDs.

Loss of Soil due to Exploration Activities

The majority of the soils that will be subjected to exploration activities are shallow (i.e., Coega/Knersvlakte. Mispah/Glenrosa) and not suitable for cultivation. Even though grazing can still occur in the soils, the grazing capacity is low (14ha/LSU) and as such it is not considered sufficient for viable commercial farming unless intensive management practices are implemented. From a soil, land use and land capability point of view, the overall impact significance of the proposed exploration activities is anticipated to be low after mitigation measures have been implemented during all phases of development.

Soil Erosion

Shallow, and sandy textured soils have a low water retention capacity and are typically more susceptible to erosion in comparison to clay textured soils, which in contrast are less susceptible to erosion. However, the parameters determining the extent and severity of soil erosion are highly complex, with water and wind as the main geomorphic agents, and soil erosion is largely dependent on land use and soil management and is generally accelerated by human activities such as tillage practices.

Most of the proposed activities in the Mine Optimisation area are located on a relatively flat and gently sloping terrain, consisting of rocky Coega/Knersvlakte and Mispah/Glenrosa soils with very shallow to no soils. The identified soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. This will most likely lead to:

- Loss of soil;
- Reduced soil fertility status of soils and subsequently loss of valuable arable land; and
- Possible pollution and sedimentation of nearby watercourses consequently affecting the water quality for livestock.

However, the Railway Line area is located on a relatively flat and gently sloping terrain of less than 1% slope gradient at most, consisting of rocky outcrops of Coega/Knersvlakte, Mispah/Glenrosa soils with very shallow to no soils. The identified soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. This will most likely lead to:

- Reduced soil fertility status of soils and subsequently loss of valuable arable land;
- Reduced farm yields due to loss of arable land; and
- Possible pollution and sedimentation of nearby water sources consequently affecting the water quality for livestock.

Soil Compaction

Heavy equipment traffic during construction activities is anticipated to cause significant soil compaction. The severity of this impact is anticipated to be moderate for soils such as the Vaalbos/Nkonkoni soil due to loamy sand texture. Whereas soils with a relatively shallow bedrock and lithocutanic character (partly weathered rock material) such as the Coega/Knersvlakte and Glenrosa/Mispah soil forms are anticipated to be less impaired due to the resistance offered by the underlying bedrock. Soil compaction will potentially lead to:

- Increased bulk density and soil strength, reduced aeration and lower infiltration rate;

- Consequently, it lowers crop performance via stunted aboveground growth coupled with reduced root growth;
- Destroyed soil structure, leading to large with fewer natural voids with a high possibility of soil crusting. This situation may lead to stunted, drought-stressed plants due restricted water and nutrient uptake, which results in reduced crop yields; and
- Soil biodiversity is also influenced by reduced soil aeration. Severe soil compaction may cause reduced microbial biomass. Soil compaction may not influence the quantity, but the distribution of macro fauna that is vital for soil structure including earthworms due to reduction in large pores.

Soil Contamination

All the identified soils are considered equally predisposed to potential contamination, as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The impact significance of soil contamination is largely dependent on the nature, volume and/or concentration of the contaminant of concern. If the management protocols are not well managed this will more likely lead to:

- Contaminants leaching into the soil and thus potentially rendering the soil sterile. reducing the yield potential of soils; and
- Potential reduction of water quality used for irrigation and for livestock use.

Loss of Agricultural Land Capability

The proposed Mine Optimisation Project will impact the soil resources in varying severities, with project 3 (opencast pits) posing the highest impact significance due to its extent in size as well as the encroachment on high agricultural potential soils. Project 2 (WRDs) is anticipated to have the second highest impact while the remaining projects are anticipated to a limited impact since majority of the development will occur on previously disturbed soils. Although there is occurrence of arable soils, low crop yields are foreseen for this area due to climatic constraints (i.e., limited rainfall) and lack of irrigation options. Nevertheless, protection of high agricultural resources (where feasible) is deemed imperative in efforts to conserve the limited agricultural resources in line with the CARA (CARA), 1983 (Act No. 43 of 1983).

The proposed railway line link project is not anticipated to result in significant loss of agricultural land capability since the majority of the soils within the footprint areas are not considered to contribute substantially to national food production. Although the Plooysburg soil form is considered a high potential agricultural soil type, low crop yields are foreseen for this area due to climatic constraints and lack of irrigation options. The footprint of the railway line link project is limited in extent hence the resultant impact on natural (undisturbed) soil resources will be limited.

Cumulative Impact

The surrounding areas within which the proposed expansion project is to occur are dominated by Iron Ore mines, and no cultivated agricultural activities occur in the immediate vicinity. This is largely attributable to the dominance of rocky outcrops and shallow soils which are not ideal for cultivated agricultural production. In addition, lack of rainfall as well as limited irrigation options further disqualifies the area from being ideal for agricultural production. Therefore, based on the above-mentioned limiting factors, the proposed project is anticipated to contribute n a relatively limited manner to the cumulative loss of arable land and medium low cumulative loss of natural grasslands for grazing. Therefore, from a soil and land capability point of view, the addition to the cumulative impact footprint of the region is considered relatively minor and insignificant on a provincial or national scale.

2.e.iv.3.h.2.3 Ecology (Flora)

Separately, the six projects will vary considerably in the significance of the impact ratings on floral ecology associated with the Beeshoek Mine. Collectively, the impacts are anticipated to be greater (in extent) for the Rupicolous Habitat, Calcrete Shrubland, Degraded Thornveld, and Open Thornveld. Most of the proposed activities is, however, restricted to the Transformed Habitat Unit and will thus not significantly impact on habitat within the Beeshoek Mine Area.

Floral Habitat and Diversity

For floral habitat and diversity, the construction and operational phases (or mining phase) will have the greatest impacts. Impacts on protected floral species will be higher during the planning phase during which SCC should be relocated and/or propagules harvested for propagation in plant nurseries. Relocation of most of the geophyte and succulent SCC on site will likely be successful, with woody species more likely to require harvesting of propagules to propagate in a plant nursery. Avoidance of impacts on SCC population genetics and dynamics will, however, not be entirely possible. Impacts during the construction and operational phase can be reduced to lower impact significance on floral SCC given that sufficient monitoring of relocated and harvested specimens is implemented. During closure and rehabilitation, the significance of impacts on floral SCC will be limited in its potential to be reduced for some species, as it is unlikely that the favourable, pre-mined habitat can be achieved with rehabilitation for certain habitat types (e.g. Rupicolous Habitat Unit). Habitat generalists will more easily be reinstated during rehabilitation regardless of the success of achieving the pre-mined condition.

There are five key ecological impacts on the receiving environment that are anticipated to occur based on the exploration plan, namely:

1. Loss of vegetation and potential displacement of faunal SCC within the impacted sites;
2. In response to the disturbance caused by the exploration drilling, there will be an increased risk of proliferation of alien vegetation which will alter and impact the areas ability to support faunal species;
3. Increased sedimentation of the Cryptic Wetlands as a result of disturbances to the soils, impacting on these niche habitats and their ability to support faunal species reliant on these systems;
4. Fragmentation of habitat in the event that the disturbed areas are not rehabilitated or temporary roads are constructed for exploration vehicles to get to and from the drill sites; and
5. Potential contamination of soils and surface water.

Impact on Floral Habitat and Diversity

The data gathered during the site visit indicate that the Mine Optimisation Project Modified Habitat Unit is of Low and Moderately Low Sensitivity, the Calcrete Shrubland is of Intermediate and Moderately Low Sensitivity, the Watercourses (Cryptic Wetlands and Episodic Drainage lines) of Moderately High Sensitivity, the Non-watercourses (Preferential Flow Paths, Seasonal Depressions and Recharge zone) of Moderately Low Sensitivity, the Open Thornveld varied between Intermediate and Moderately Low Sensitivities, and the Rupicolous Habitat varied between Moderately Low and Moderately High Sensitivities. The proposed Railway Line Link Project will result in the clearance of vegetation that is of intermediate sensitivity (Natural Habitat Areas) and moderately low sensitivity (non-watercourse habitat, encroached sections in the Natural Habitat Areas, Degraded Thornveld), with some sections of low sensitivity (Modified habitat unit).

Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between Medium-Low (Natural Habitat Areas), Low (Non-watercourse habitat) and Very Low (Modified habitat unit). With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity can mostly be reduced to Low and Very low for the Modified habitat and non-watercourse habitat.

The activities related to Projects 1 and 2 are limited in extent and will in many instances impact on habitat that is already degraded (due to edge effect from current mining activities, or their fragmentation from larger, intact habitat). There will, however, be loss of floral habitat from especially the Calcrete Shrubland (Village Pit North Waste Rock Dump and East Pit Waste Rock Dump) and Open Thornveld (Village Pit South Waste Rock Dump and East Pit Waste Rock Dump), which will result in localised impact on floral diversity and habitat given that mitigation measures are sufficiently implemented. Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between Medium-Low and Low for all the natural areas being impacted, to Very low where habitat is already transformed or degraded. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity can mostly be reduced to Low for all the natural areas being impacted, with impact significance remaining Very Low for the Transformed Habitat Unit. To guarantee impacts remain localised, it must be ensured that planned and authorised footprints do not increase as mining activities continue. Edge effects from mining activities and AIP proliferation must be strictly managed. The below table summarises the extent of habitat that will be impacted by the proposed Project 1 and 2 in relation to the habitat that will be lost resulting from all proposed activities.

Table 67: Approximate extent of habitat impacted by the proposed Projects 1 and 2.

HABITAT UNIT	Total Extent (ha) of Habitat Unit Impacted by proposed Projects 1 - 5	Extent (ha) of Habitat Unit Impacted by proposed Projects 1 and 2	Percentage of total habitat unit lost
Calcrete Shrubland	133	21	16%
Cryptic Wetlands	-	-	-
Degraded Thornveld	157	-	-
Episodic Drainage Line	-	0	-
Open Thornveld	107	47	44%
Preferential flow paths	4	-	-
Recharge Zone	-	-	-
Rupicolous Habitat	131	13	10%
Seasonal Depressions	1	-	-
Transformed Habitat	948	485	51%

The activities associated with Project 3 will result in greater loss of natural habitat areas when compared to the other proposed projects. The Calcrete Shrubland, Open Thornveld Habitat, and the Rupicolous Habitat Units will be directly impacted. The extent of habitat lost will result in declines in floral diversity and habitat within the Beeshoek Mine area; however, impacts are likely to only be of local extent for the current Beeshoek Mine Optimisation Project (projects 1 – 5). If future expansions will occur, these habitat types will be threatened on a larger scale, especially if the closure and rehabilitation phases of the project cannot achieve the pre-mined state.

The below table summarises the extent of habitat that will be impacted by the proposed Project 3 in relation to the habitat that will be lost resulting from all proposed activities (Project 1 – 5).

Table 68: Approximate extent of habitat impacted by the proposed Project 3.

Habitat Unit	Total Extent (ha) of Habitat Unit Impacted by proposed Projects 1 - 5	Extent (ha) of Habitat Unit Impacted by proposed Project 3	Percentage of total habitat unit lost
Calcrete Shrubland	133	106	80%
Cryptic Wetlands	-	-	-
Degraded Thornveld	157	155	98%
Episodic Drainage Line	-	-	-
Open Thornveld	107	59	55%
Preferential flow paths	4	4	100%
Recharge Zone	-	-	-
Rupicolous Habitat	131	107	82%
Seasonal Depressions	1	0,5	50%
Transformed Habitat	948	376	40%

Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between Medium-high (Rupicolous Habitat) and Medium-low (Calcrete Shrubland, Open Thornveld and Cryptic Wetlands) for all the natural areas being impacted, to Low and Very low in areas where habitat is already transformed or degraded (Modified Habitat and non-watercourse habitat). With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity can mostly be reduced to Very low for the Non-watercourses and Modified Habitat, with impact significance lowered to a potential Moderately-low and Low for the Cryptic Wetlands, Rupicolous Habitat, Calcrete Shrubland and Open Thornveld.

Loss of natural habitat areas such as the Calcrete Shrublands, Open Thornveld and Rupicolous Habitat will be unfavourable and will result in local loss of floral habitat and diversity. These habitat units are representative of their reference states, albeit somewhat modified due to current and historic disturbances. Considering that the Postmasburg Thornveld, Kuruman Thornveld and Kuruman Mountain Bushveld are endemic vegetation types (Skowno et al, 2019) and the fact that there are several additional mining expansions planned in the region, further impact on the remaining extent of the currently least concern, but poorly protected, vegetation types could increase their threat status. Loss of Cryptic Wetlands are restricted to two pans impacted by the Village Pit Expansion; thus, the impact will be restricted to a local scale. However, as far as possible, no additional Cryptic Wetlands should be impacted as these are significant biodiversity features for which impacts cannot be fully mitigated or restricted to the local scale.

The activities associated with Projects 4 and 5 are limited in extent and will mostly impact on habitat that is already degraded and transformed. There will be loss of some floral habitat within the Rupicolous Habitat (Beneficiation Optimisation infrastructure), which will result in small and localised impacts on floral diversity and habitat given that mitigation measures are sufficiently implemented. The below table summarises the extent of habitat that will be impacted by the proposed Projects 4 and 5 in relation to the habitat that will be lost resulting from all proposed activities (Project 1 – 5).

Table 69: Approximate extent of habitat impacted by the proposed Projects 4 and 5.

Habitat Unit	Total Extent (ha) of Habitat Unit Impacted by proposed Projects 1 - 5	Extent (ha) of Habitat Unit Impacted by proposed Projects 4 and 5	Percentage of total habitat unit lost
Calcrete Shrubland	133	6	4%
Cryptic Wetlands	-	-	-
Degraded Thornveld	157	2	2%
Episodic Drainage Line	-	-	-
Open Thornveld	107	0,3	1%
Preferential flow paths	4	-	-
Recharge Zone	-	-	-
Rupicolous Habitat	131	12	9%
Seasonal Depressions	1	-	-
Transformed Habitat	948	86	9%

Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between Medium-low to Very low. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity can mostly be reduced to Low and Very low impact significance.

With mitigation measures adhered to, the proposed activities associated with Projects 4 and 5 are not anticipated to have significant or residual impacts on the floral communities within the Beeshoek Mine.

The proposed Railway Line Link Project will result in the clearance of vegetation that is of intermediate sensitivity (Natural Habitat Areas) and moderately low sensitivity (non-watercourse habitat, encroached sections in the Natural Habitat Areas, Degraded Thornveld), with some sections of low sensitivity (Modified habitat unit). Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between Medium-Low (Natural Habitat Areas), Low (Non-watercourse habitat) and Very Low (Modified habitat unit). With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity can mostly be reduced to Low and Very low for the Modified habitat and non-watercourse habitat.

Most significant impacts to affect the floral habitat integrity and species diversity within the Beeshoek Mine include, but are not limited to, the following:

- Mining activities within sensitive habitat such as Cryptic Wetlands, species-rich Rupicolous Habitat, large stretches of untransformed Calcrete Shrubland;
- Continued expansion resulting in increasingly fragmented habitat;
- Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint;
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species;
- Rehabilitation efforts are likely to result in sub-optimal recovery of pre-mining conditions, resulting in residual impacts to floral communities; and
- Increased human populations in the surrounding area leading to greater pressure on natural floral habitat both within the Beeshoek Mine and the surroundings.

Impacts on Floral SCC

The Beeshoek Mine and many sections of the focus area are associated with floral SCC which will directly be impacted on by the proposed mining activities. The SCC recorded on site include species protected under the NCNCA (Schedule 1 and 2) and the NFA, which are species not threatened in terms of NEMBA Section 56. The habitat associated with the Calcrete Shrubland and Rupicolous Habitat provide favourable conditions for threatened species to occur and their potential occurrence within the focus area cannot be excluded.

Within the focus area, the habitat units with the highest abundance and diversity of floral SCC included the Rupicolous Habitat (most diverse) and the Calcrete Shrubland and Open Thornveld (more abundant). The remaining habitat units were either too degraded to host a good representation of floral SCC or comprised specialised habitat (Cryptic Wetlands) where SCC will Likely only be detected with ongoing seasonal surveys.

Table 70: Floral SCC summary per habitat unit.

HABITAT UNIT	Impacts on protected SCC	Total Extent (ha) of Habitat Unit Impacted by proposed Projects 1 - 5
Calcrete Shrubland	High abundance of protected SCC	133
Cryptic Wetlands	Low abundance and diversity of protected SCC	0
Degraded Thornveld	Moderate abundance of protected SCC	157
Episodic Drainage Line	Moderately low association with protected SCC	0
Open Thornveld	High abundance of protected SCC	107
Preferential flow paths	Low association with protected SCC	4
Recharge Zone	Moderately low association with protected SCC	0
Rupicolous Habitat	High abundance and diversity of protected SCC	131
Seasonal Depressions	Low association with protected SCC	1
Transformed Habitat	Low association with protected SCC	948

Impact on floral SCC varies significantly between the habitat units. Without mitigation implemented, the anticipated impact significance on floral SCC communities is between Medium-low and Medium-High for the SCC occurring within the natural habitat areas. The pre-mitigation impacts on floral SCC for the Degraded and Transformed Habitat Unit and Non-watercourse habitat is anticipated to vary from Medium-low to Low. With mitigation measures implemented, the impact significance can be reduced Medium-low and very low levels.

Mining activities associated with Project 2 and especially Project 3 are anticipated to have an unfavourable impact on floral SCC. Projects 4 and 5 will minimally impact on floral SCC. Schedule 1 and 2 Protected Species require permits from the NCDENC before vegetation clearing can commence, with TOPS and NFA protected species requiring permits and authorisation from DFFE. Species of geophytes and succulents are good candidates for rescue and relocation, and it is recommended that where these species will be cleared as part of site preparation activities or maintenance activities, they rather be relocated to suitable, similar habitat outside of the proposed footprint area. For woody species that require more effort to relocate and for which relocation success is often low, it is recommended that propagules be harvested prior to clearing. These propagules can be propagated in a plant nursery for use in rehabilitation activities later down the line.

Due to the potential for threatened plant species (RDL plants as per NEMBA Section 56) to occur within the proposed project footprint, it is recommended that a walkdown of the site take place prior to vegetation clearance activities. The walkdown should take place in the optimal season for detecting the threatened species, i.e., typically between November and March, as well as winter months for some species. According to SANBI's Red List of South African Plants website, ex situ ('search and rescue') options for RDL plants is strongly discouraged. As such, the best mitigation to limit impacts on these species is avoidance. However, if the proposed activities are authorised, and RDL plants will be impacted, compensating for the loss of SCC must occur. All RDL plant species that will be lost due to clearing of vegetation must be replaced either during rehabilitation initiatives or through translocation to suitable habitat surrounding the disturbance footprint. SCC lost due to the proposed activities must be replaced following the guideline for biodiversity offsets proposed in the draft National Biodiversity Guidelines (GN 276 of 2017), e.g., for species with a vulnerable threat status: replace species at a ratio of 1:5.

Activities which are likely to negatively affect the flora of conservation concern within and around the focus area include, but are not limited to, the following:

- Placement of mining infrastructure within floral SCC habitat;
- Destruction, removal or harvesting of floral SCC during construction and operational activities; and
- Potentially poorly implemented and monitored rescue and relocation of SCC that will be affected by the proposed projects, leading to unsuccessful rescue efforts and loss of SCC individuals.
- Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas

The proposed development will not impact on CBAs or threatened ecosystems. The development will, however, impact on ESAs (Cryptic Wetlands and Rupicolous Habitat). These ESAs are important features in the greater landscape and provide unique conditions for flora adapted to soils with higher moisture content during rain periods. The mountainous Rupicolous Habitat further provide important movement corridors for both floral and faunal species.

Probable Latent Impacts

Even with extensive mitigation, latent impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key latent impacts that have been identified:

- Permanent loss of niche floral habitat (Rupicolous Habitat and Cryptic Wetlands);
- Permanent loss of and altered floral species diversity;
- Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment;
- The ongoing loss of SCC/protected floral species and suitable habitat for such species; and
- Disturbed areas not rehabilitated to an ecologically functioning state, e.g., the currently rehabilitated areas are only vegetated with the alien grass Pennisetum setaceum, (Fountain grass, category 1b invader) resulting in landscapes with low biodiversity and ecological potential. If this rehabilitation practice continues, it will result in significant loss of floral habitat, species diversity, large stretches of endemic vegetation types, and SCC/protected floral species.

Cumulative Impacts

The proposed project could further impact on the floral habitat and diversity as well as floral SCC through fragmentation of habitat of increased biodiversity importance and sensitivity.

AIP spread can potentially become severe if AIPs are not monitored, especially along linear developments that typically serve as a corridor for spread of AIPs. These species can spread to adjacent natural areas, thus impacting on the indigenous biodiversity of the region. If the current rehabilitation practice is pursued, i.e., revegetating with Pennisetum setaceum (see below image), then there will be potential for this species to displace native floral communities in adjacent, natural vegetation communities over time.

The proposed project could potentially lead to expanding human populations within the area, such as the informal settlements. Such expansions can place additional pressure on floral habitat resulting from associated increases in the collection of plant material for medicinal purposes, the introduction of AIP species and an increase in fire frequency risks.

Ongoing mining expansion within the area surrounding Postmasburg will contribute to regional scale loss of the endemic vegetation types associated with the Beeshoek mine (Kuruman Mountain Bushveld, Kuruman Thornveld and the Postmasburg Thornveld). The location of the mine within the Griqualand West Centre (GWC) further points to the potential for loss of endemic floral species due to mining expansion in the area.

2.e.iv.3.h.2.4 Ecologyl (Fauna)

Separately, the projects will vary considerably in the significance of the impact ratings on faunal ecology associated with the Beeshoek Mine. Cumulatively however, the various projects are anticipated to significantly impact on both faunal habitat and diversity within the SRA and outside of the property. Impacts to faunal SCC will largely be related to the loss of habitat and foraging grounds, with any potential species being forced out of the focus area as mining expands, potentially placing these species at increased risk as they may face increased persecution or be forced to relocate to areas of substandard habitat.

Faunal habitat and diversity will be most impacted upon during the construction and operational phases (or collectively considered the mining phase), with the closure and rehabilitation phase unlikely to reinstate the pre-mined faunal species diversity or habitat conditions, thus limiting the ability to reduce impacts on faunal ecology in the long-term.

Impacts on protected faunal species will be higher during the planning phase during which SCC should be, where feasible, rescued and relocated to areas of non-disturbance but suitable habitat. Avoidance of impacts on SCC population dynamics will, however, not be entirely possible. Impacts during the construction and operational phase can be reduced to lower impact significance on faunal SCC provided that the future opencast pit layouts are carefully planned and position so as to limit impacts to sensitive habitats whilst retaining habitat connectivity and suitable areas for SCC breeding and habitation. During closure and rehabilitation, the significance of impact on faunal species will be limited in its potential to be reduced as it is unlikely that the favourable, pre-mined habitat can be achieved with rehabilitation.

Impact on Habitat and Diversity

The data gathered during the site visit indicate that the habitat units associated with the SRA range from Low to Moderately High sensitivity. The proposed Beeshoek Mine expansion activities will impact on these habitat units in varying degrees and is discussed in more detail below.

<u>Impacts from Project 1 and 2 (Consolidation of ROM Stockpiles on South Mine and amendments to the design of existing WRD's)</u>

The activities related to Projects 1 and 2 are limited in extent and will in many instances impact on habitat that is already degraded due to edge effects and / or habitat fragmentation from current mining activities. There will, however, still be a loss of faunal habitat, especially from the Calcrete Shrubland and Open Thornveld, which, provided that mitigation measures are implemented, will result in localised impact on faunal species diversity and habitat.

Prior to the implementation of mitigation measures, impact significance on faunal habitat and diversity varies between Medium High-Medium Low for all natural areas being impacted, to Very Low where habitat is already transformed or degraded. With mitigation measures implemented, the direct and indirect impacts on the faunal habitat and diversity can mostly be reduced to Medium Low and Low for the natural areas and Low for the transformed areas. During the closure phase post mitigation impacts are expected to range from Very Low to Medium Low.

To ensure impacts remain localised, it must be ensured that no footprint creep occurs as mining activities continue. Edge effects from mining activities and AIP proliferation must be managed.

<u>Impacts from Project 3 (Pit expansions)</u>

The activities associated with Project 3 will result in significant impacts to the faunal ecology (species diversity, abundance, and habitat) within the SRA, as Project 3 activities encompass the greatest area and will account for the largest extent of habitat disturbance and loss.

Prior to mitigation measures implemented, impact significance on faunal habitat and diversity varies between High and Medium-High (natural habitat areas, cryptic wetlands and non-watercourse habitat), to Medium Low (degraded habitat) and Low in areas where habitat is already transformed. With mitigation measures implemented, the direct and indirect impacts on the faunal habitat and diversity can mostly be reduced to Low and Very low for the degraded and transformed habitats, with impact significance decreasing to Medium High-to Medium-Low for the remaining habitats post mitigation. The above scoring is wholly reliant on the sound management of prospecting activities in the more sensitive habitats, and under provision that the prospecting activities and associated access roads will remain outside of the areas of increased sensitivity. Should this not be the case, the impacts to the receiving environment and will be notably higher.

Loss of natural habitat areas such as the Calcrete Shrublands, open Thornveld and rupicolous Habitat will result in the displacement of faunal species in these areas, or worst case, the death of species herein, especially smaller less mobile fauna. The proposed pit expansion adjacent to Village and BF Pits will result in the loss of two cryptic wetlands and four seasonal depressions. Given that these habitats will be lost as part of the pit expansion program, it is important to ensure that the remaining cryptic wetlands and seasonal depressions in the southern portion of the Surface Roghts Area, are not impacted upon by future exploration activities.

Impacts from Projects 4 and 5 (Beneficiation Project and Water Management)

The activities associated with Projects 4 and 5 are limited in extent and will mostly impact on faunal habitat and species that have already been subjected to mining related impacts and habitat degradation. Projects 4 and 5 will lead to the loss of portions of faunal habitat within the Calcrete Shrubland, rupicolous habitat and preferential flow path, which will result in small and localised impacts on faunal diversity and habitat provided mitigation measures are sufficiently implemented.

Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between Medium Low to Very low. With mitigation measures implemented, impacts on the faunal habitat and diversity can mostly be reduced to Low and Very low impact significance.

With mitigation measures adhered to, the proposed activities associated with Projects 4 and 5 are not anticipated to have significant impacts on the faunal communities within the Beeshoek Mine.

Impacts from Project 6 (Railway Line)

The proposed Railway Line Link Project is associated with habitats that may, from time to time, be utilised by faunal SCC either for foraging or whilst moving through the local area. No SCC were recorded on site, however, several species protected under the NCNCA (Schedule 1 and 2) and within NEMBA Section 56 do have an increased probability of occurring within the area in which the railway is proposed, though, impacts from the development are not expected to pose a significant risk to these species.

Without mitigation implemented, the anticipated impact significance on faunal SCC varies between Medium-Low and Low. The impacts on SCC are deemed to be mitigatable and thus with mitigation measures implemented, the impact significance can be reduced to Low and Very low levels.

The most significant impacts that will affect the faunal habitat integrity and species diversity within the Beeshoek Mine include, but are not limited to, the following:

- Mining activities within sensitive habitat such as cryptic wetlands, seasonal depressions and large stretches of untransformed Calcrete Shrubland;
- Continued expansion resulting in fragmented habitat and loss of habitat connectivity for faunal species;
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species;
- Even with extensive rehabilitation, it is likely to result in sub-optimal recovery of pre-mining conditions, resulting in residual impacts to faunal communities; and
- Increased human populations in the surrounding area will lead (as already observed) to greater pressure on natural faunal habitat both within the Beeshoek Mine and the surroundings, including increased incidences of poaching and snaring on mine property.

Impacts on SCC

The Beeshoek Mine and many sections of the focus area are associated with faunal SCC which may be impacted on by the proposed mine expansion activities. Only one SCC was observed on site during the field assessments, namely Ardeotis kori (Kori Bustard, VU, TOPS). This species was observed in the Calcrete Shrubland in the southern section of the mine, however, given its inherent mobility, is likely to utilise large sections of natural habitat within the mining property, notably for foraging. A burrow of what may be Pterinochilus sp (Baboon Spider) was observed along the western boundary of the waste rock dump in the southern portion of the mine, however this could not be confirmed. This species is listed as Specially Protected under the NCNCA (2009) and as such, may require permits to rescue and relocate prior to any ground clearing activities taking place.

Overall, a low diversity of SCC is expected within the focus area, likely due to the inherent arid nature of the region and the pre-existing impacts stemming from mining and farming activities. Without mitigation implemented, the anticipated impact significance on faunal SCC communities is between Medium Low and Low, decreasing to Low significance post mitigations measures for all mining operations.

Mining activities associated with Project 3 are anticipated to impact on faunal SCC to a greater extent in comparison to Projects 1, 2, 4 and 5, and as such, care must be taken to ensure that all mitigation and management measures are carried out. Not all faunal SCC can be rescued and relocated, notably avifaunal species. Mammal species may, to a degree be suitable candidates for such, however it is likely that as clearance activities start taking place, these species will naturally relocate themselves. Smaller invertebrate SCC are less capable of relocating, especially burrow dwelling species. A suitable rescue and relocation plan should be developed for such species, with pre-walk downs of the development footprints being undertaken prior to vegetation clearance to identify and mark locations of SCC.

The proposed Railway Line Link Project is not anticipated to have a significant impact on faunal SCC and with mitigation measures implemented, the impacts are likely to remain localised in extent. Not all faunal SCC can be rescued and relocated, notably avifaunal species and in many instance medium sized mammals, especially if they are raising young or in a den. Smaller invertebrate SCC are less capable of relocating, especially burrow dwelling species. A suitable rescue and relocation plan should be developed for such species, with pre-walk downs of the development footprints being undertaken prior to vegetation clearance to identify and mark locations of SCC.

Probable Residual Impacts

Even with extensive mitigation, residual impacts on the receiving faunal ecological environment are likely. The following points highlight the key residual impacts that have been identified:

- Permanent loss of niche faunal habitat (cryptic wetlands and seasonal depressions);
- Permanent loss of and altered faunal species diversity;
- Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation;
- The ongoing loss of SCC/protected faunal species and suitable habitat for such species; and
- It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to pre-mining levels being unlikely.

Cumulative Impacts

The current mine structure traverses north to south through the central portions of the focus area, limiting faunal species movement between the far eastern and western land portions. Small corridors of potential connectivity do still remain; however the new proposed mine expansion will reduce these, further impacting on species movement. The proposed expansion plan in the western of the SRA will lead to significant numbers of faunal species relocating to more suitable habitat which can be found both adjacent to the current mining areas and in the south of the SRA, leading to increased pressure on the remaining open spaces and food resources in these areas. Further, mining activities in the region have already contributed to loss of habitat in the region, importantly the loss of niche habitat such as the cryptic wetlands and the seasonal depressions. Such habitat loss has led to widespread species population declines in the region, to which the proposed expansion activities will only compound. The displacement of faunal species currently inhabiting the focus area into the surrounding vegetated areas will likely lead to increased competition for territories and breeding sites. Moreover, there is likely to be a knock-on dispersal affect, leading to increased resource competition and possible increased mortality rates, resulting in decreased species abundances and possible further loss of species diversity beyond that of the mine property.

2.e.iv.3.h.2.5 Freshwater and Aquatic Environment

No watercourses, as defined by the National Water Act, 1998 (Act No. 36 of 1998) were identified within 500 m of the proposed railway line. Due to the nature of the proposed development and the location thereof in relation to any identifiable drainage systems (in excess of 1 km from the proposed railway line), the development of the railway is considered to pose little to no risk to any freshwater ecosystems in the region. Therefore, it is the opinion of the specialist that there is no reason, from a freshwater resource management point of view, for the development to not be authorised.

Based on the layout provided to the specialist in July 2021, two of the 21 cryptic wetlands will be irreversibly lost should the proposed expansion of the Village Pit and future opencast areas proceed. Whilst the results of the risk assessment indicate that the associated risk significance is ‘medium’ it is the specialist’s opinion that this is understated due to the impact only occurring once, and therefore the score is ‘1’; thus a more accurate representation of the risk significance is 'high'. Restoration of the affected cryptic wetlands will not be practical nor viable, therefore the proponent must engage with the relevant authorities to implement appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent with regards to the outright loss of the affected CWs. Project 2 could further result in the following impacts:

- Outright loss of CW habitat, specifically CWs 15 and 21;
- Damage to or outright loss of vegetation, leading to exposure and compaction of soil, in turn leading to increased risk of wind erosion and wind-blown sediment reaching surrounding CWs;
- Increased sedimentation of the surrounding CWs may lead to changes to habitat, potentially altered surface water quality, smothering of vegetation and/or altered vegetation composition and altered macroinvertebrate assemblages (if present in the affected CWs);
- Decreased ecoservice provision;
- Decreased ability to support biodiversity; and
- Proliferation of alien vegetation as a result of disturbances.

With the exploration activities resulting in the following impacts:

- Potential direct loss of cryptic wetland habitat (where drill sites encroach on delineated boundary thereof);
- Increased hardened surfaces within the catchment of various cryptic wetlands and compacted soils thus reducing integrity of interflow;
- Localised landscape alterations within the catchment of affected cryptic wetlands, potentially leading to loss of recharge as surface water is directed away from CWs, and/or formation of preferential surface flow paths leading to erosion;
- Increased surface water runoff, leading to erosion, and sedimentation of freshwater resource habitat.
- Loss of foraging and breeding habitat for wetland-dependent fauna;
- Proliferation of alien vegetation as a result of disturbances;
- Increased water inputs to cryptic wetlands in the vicinity of drill pads;
- Possible contamination of surface water runoff from drill pads;
- Possible erosion/incision of the cryptic wetlands adjacent to drill pads due to concentration of storm water runoff;
- Sediment-laden runoff entering cryptic wetland habitat leading to altered water quality (when present), and smothering of vegetation and macroinvertebrate egg banks, leading to impacts on macroinvertebrate and faunal assemblages.;
- Altered topography/geomorphology, leading to altered runoff patterns and formation of preferential flow paths;
- Altered water quality, possible changes to flow patterns as a result of blockages caused by solid waste/rubble; and
- Possible damage to or smothering of macroinvertebrate egg banks, leading to impacts on macroinvertebrate and faunal assemblages.

The expansion of the existing WRDs and detrital area, and proposed activities within already disturbed areas are anticipated to have a 'low' or even negligible risk significance, provided that strict enforcement of mitigation measures takes place. Therefore, those activities may be considered acceptable from a freshwater ecological management perspective. Project 3 can result in the following impacts:

- Exposure of soil, leading to increased runoff, erosion and wind-blown sediment, and thus potential increased sedimentation of the CWs;
- Increased sedimentation of CW habitat, leading to smothering of flora and benthic biota and potentially altering surface water quality when water is present;
- Decreased ecoservice provision; and
- Proliferation of alien vegetation or encroacher species as a result of disturbances.

The Cryptic Wetlands and episodic drainage line identified in the Beeshoek Mine boundary are deemed to be in a natural to largely natural condition, since few discernible impacts have occurred. Although not necessarily important for the provision of ecological services such as flood attenuation, these systems are deemed important for biodiversity maintenance, and may potentially provide important breeding and foraging habitat for various fauna, particularly since the presence of macroinvertebrates was confirmed at two cryptic wetlands. These CWs may provide habitat for floral SCC.

Responsible implementation of the mitigation hierarchy as well as strict adherence to cogent, well-developed mitigation measures must take place throughout all phases of the proposed mining expansion to minimise the significance of impacts to the receiving freshwater environment. This is particularly important in a semi-arid region to protect the scarce water resources of the region. Should the proponent commit to such adherence to the mitigation hierarchy and mitigation measures, the significance of potential impacts arising from some of the proposed mining activities can be reduced although the direct impact to those cryptic wetlands which will be mined through is irreversible. Restoration of the affected cryptic wetlands will not be practical nor viable, therefore the proponent must engage with the relevant authorities to implement appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent with regards to the outright loss of the affected CWs.

Due to the outright loss of two cryptic wetlands, it is the specialist's opinion that the proposed mining expansion has the potential to result in impacts of very high significance on the receiving freshwater environment, particularly of a wetland type which is under-researched and of scientific interest. It is however noted that, based on the layout provided at the time of preparing this report, the extent of direct impact will be contained to the local area and will equate to less than 3 ha of wetland habitat. Thus, consideration of the value of this landscape must be considered from a freshwater and terrestrial biodiversity resource management point of view and juxtaposed with the responsibility to comply with Regulation 23 of the MPRDA pertaining to the optimisation of the Mining Right as well as the socio-economic and socio-cultural impact the project will have and the decision should be made and aligned with the principles of sustainable development and Integrated Environmental Management.

The expansion of the existing WRDs and detrital area, proposed exploration drilling and proposed activities within already disturbed areas are anticipated to have a 'low' or even negligible risk significance, provided that strict enforcement of mitigation measures takes place. Therefore, those activities may be considered acceptable from a freshwater ecology management perspective.

2.e.iv.3.h.2.6 Hydrology

The climate of Beeshoek can be described as semi-arid to arid, with evaporation far exceeding rainfall. The Mine is located in an endoreic catchment, and therefore, surface water runoff is limited. The general topography of the MRA is flat and the soils consist mostly of semi-permeable to permeable soils. Shallow ephemeral drainage lines occur in the south-east of the MRA and drain towards the Groenwaterspruit. A number of pan like features occur in the west and south of the MRA and have been classified as Cryptic Wetlands and seasonal depressions in the Freshwater Ecological Assessment (SAS, 2021).

Beeshoek is located in quaternary catchment D73A within the Vaal WMA. According to the Water Resources of South Africa Study 2012 (WR 2012), quaternary catchment D73A is endoreic, meaning that surface water runoff does not flow out of the catchment, and that water is lost to evaporation and infiltration. This is mostly due to the low rainfall and high evaporation of the area.

Surface water quality is monitored at the dams/tanks, pits and pipelines. According to Aquatico (2021), the general surface water quality during the 2020 period was classified as being neutral, saline and very hard. Low salt concentrations, metal concentrations and nutrient concentrations were detected at all of the sampling localities. Elevated bacteriological counts occurred at some of the sampling locations. According to GPT (2021), groundwater levels range between 5 metres below ground level (mbgl) in the unaffected mining areas, to 180 - 200 mbgl in the dewatered areas due to groundwater abstraction for dewatering and water supply. The effect of dewatering is more pronounced to the south of the mine. The direction of groundwater flow is south to south easterly from the mining area. A cone of depression has developed within the active mining area with flow directed towards the mining excavation due to the active mining areas. The general groundwater quality is good; however, elevated nitrate does occur at some of the sampling boreholes due to expected mining related impacts (Aquatico, 2021).

The only natural defined drainage channel occurs in the south-east of the MRA. A 1:50 and 1:100 year floodline determination was undertaken on this drainage line, as according to Regulation 4 (b) of GN704, prospecting should not take place within the 1:50 year floodline unless exemption is obtained from the DWS. The proposed activities will not be undertaken within this area.

No watercourses were identified in the vicinity of the railway line project.

The impact assessment indicated that all identified impacts would have a medium significance pre-mitigation, and that these impacts can be mitigated to a low significance should mitigation measures be adhered to. Typical impacts identified include:

- Erosion of exposed soils leading to siltation and sedimentation of downslope drainage channels.
- Potential hydrocarbon spillages washed into downslope drainage channels.

- Alteration in natural drainage patterns leading to erosion and siltation.
- Loss of hydrological connection and water quantity.
- Loss of natural seasonal storage areas.
- Loss of water quantity to downstream users. Due to the arid climate this is likely to be a very small to negligible impact.

2.e.iv.3.h.2.7 Groundwater

The hydrogeology in the Postmasburg/Beeshoek area is extremely heterogeneous due to the complex geology of the area. Karoo Supergroup sediments, volcanics and karstic (dolomitic) formations are the main components of the groundwater regime in the area.

Hydraulic conductivity varies spatially and vertically, and the modelled conductivities vary by at least six orders of magnitude, from 10^{-3} m/d to 10^{+2} m/d (0.001m/d to 100m/d).

Groundwater levels range between 5mbgl in unaffected areas to 180 - 200mbgl in dewatered areas due to groundwater abstraction for dewatering and water supply.

The effect of dewatering is more pronounced to the south of the mine (south of Olynfontein).

The direction of groundwater flow is south to south easterly from the mining area. A cone of depression has developed within the active mining area with flow directed towards the mining excavation due to the active mining areas.

The leachable concentrations of solid waste were compared to the leachable concentration threshold (LCT) limits to determine the leachability of the different waste types at the mine. Solid waste types were described as either “type 4” or “type 3” waste types which are low hazard waste types with regards to the likelihood to release contaminants in dissolved phase.

Generally, the groundwater resources at all the sampling localities are described as being neutral to alkaline (pH levels between 7.8 and 8.0), non-saline to saline (TDS between 445.5mg/l and 563.8mg/l), and the hardness can be classified as very hard (> 300mg $CaCO_3$/l). Water hardness at Beeshoek mine is not unlike most other boreholes in the area, resulting from the calcareous/dolomitic underlying geology characteristic of many parts of the Northern Cape. Metal concentrations were below detection limit or low at all the monitoring boreholes. Nitrate as N and combined nitrate and nitrite exceed the drinking water limit in the majority of external user boreholes regardless of location. The WUL identified nitrates as a contaminant of concern in relation to mining activity due to the use of N-based emulsions for blasting. Through the analysis of N-isotopes from nitrates, a contamination assessment was conducted in 2019 and it was concluded that mine’s contribution to nitrate levels in and around the mine was minimal (<1%).

The aquifer can be classified as a minor aquifer system, with medium level protection required.

The potential influences on groundwater quality were identified as opencast mining, fuel storage and handling, sewage management, solid and liquid mining-related waste management at the mine (i.e. ore discards and impounded mine water).

The construction phase is not expected to influence the groundwater levels. With the exception of minor oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality.

During the operational phase, it is expected that the main impact on the groundwater environment will be dewatering of the surrounding aquifer. Water entering the mining areas will have to be pumped out to enable mining activities. This will cause a lowering in the groundwater table in- and adjacent to the mine.

Mining in this area has been ongoing for many decades, and there are historical impacts on the surrounding aquifer which are impractical to simulate in a numerical model. Thus, current groundwater levels (obtained from various sources) have been used as baseline for this impact assessment, and all dewatering impacts related to the current water levels as a starting point. Considering the impact associated with each mining pit, the following observations were made:

- The area to the south of the mining rights area is characterised by deep groundwater levels (>100 m) associated with large-scale dewatering at the neighbouring Kolomela Mine.
- No drawdown is expected for further mining at East Pit as the declining groundwater levels is predicted to be below the bottom of mining.
- Drawdown at Village pit is predicted to extent to up to 2km from the pit in a mostly westerly direction, for an insignificant drawdown of 5 – 10 metres. Areas of significant drawdown is expected only in in the immediate vicinity of the pit, which could even decline with time as Leeuwfontein mining impacts northward into this area.

- HF Pit is predicted to have a minor impact limited to the immediate surroundings of the pit itself.
- The BN Pit is predicted to have the largest area of impact due to substantial increase in mining depth. Drawdown of groundwater levels will be up to about 100 m but limited to an area of about 1 km around the pit. This is mainly due to different hydraulic characteristics in the area around the pit.
- No groundwater-related impacts are expected on surface water resources.

After closure and cessation of dewatering/groundwater abstraction, the water table will rise in the mine to reinstate equilibrium with the surrounding groundwater systems. The rebound period also depends on regional activity as large-scale dewatering is occurring at the neighbouring mines as well. Following the closure of the opencasts and the cessation of the dewatering it is assumed to lead to groundwater rebound and potential decanting. However, due to naturally deep-lying groundwater levels, no decant is predicted.

The rise of solute concentrations in groundwater is expected to occur slowly in a south to south-westerly direction, at about 100 metres per year. No adverse effects are predicted on receptor boreholes with regards to increasing solute concentrations in groundwater.

2.e.iv.3.h.2.8 Air Quality

The following potential impacts have been identified as part of the Air Quality Assessment.

Project 1: Consolidation of Run of Mine (ROM) Stockpiles on South Mine

- Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative.
- For PM10, PM2.5 and dust fallout the extent of the potential impact is limited to the ROMs and does not extend beyond the mine boundary.
- The predicted ambient concentrations resulting from the consolidated ROM activities are very low and the intensity is rated as very low for PM10, PM2.5 and dust fallout.
- Although the intensity is very low, any impact will endure for the life of the consolidated ROM activities. The duration is therefore long term.
- The consequence of the potential impact is very low for PM10, PM2.5 and dust fallout from the consolidated ROM activities.
- As the intensity is low, the probability of air quality impacts beyond the mine boundary from the consolidated ROM are improbable for all pollutants.
- The significance rating is considered low for PM10, PM2.5 and dust fallout.

Project 2: Amendments to the existing Waste Rock Dumps (WRDs)

- Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative.
- For PM10, PM2.5 and dust fallout the extent of the potential impact is limited to the WRDs and does not extend beyond the mine boundary.
- The predicted ambient concentrations resulting from the amended WRD emissions are very low and the intensity is rated as very low for PM10, PM2.5 and dust fallout.
- Although the intensity is low, any impact will endure for the life of the amended WRD. The duration is therefore long term.
- The consequence of the potential impact is therefore very low for PM10, PM2.5 and dust fallout from the amended WRD.
- As the intensity is low, the probability of air quality impacts from the amended WRD beyond the mine are improbable for all pollutants.
- The significance rating is considered low for PM10, PM2.5 and dust fallout.

Project 3: Increase of Opencast Footprint Areas

- Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative.
- For PM10, PM2.5 and dust fallout the extent of the potential impact is concentrated over the Village Pit and extends over the eastern mine boundary. It does not extend to commercial or residential areas.
- The predicted ambient concentrations resulting from the increased opencast emissions are low and the intensity is rated as low for PM10, PM2.5 and dust fallout.
- Although the intensity is low, any impact will endure for the life of the increased opencast. The duration is therefore long term.

- The consequence of the potential impact is therefore low for PM10, PM2.5 and dust fallout from the increased opencast.
- The intensity is regarded as low, but as the predicted concentrations are exceeded beyond the eastern mine boundary air quality impacts from the increased opencast are probable for PM10.
- The significance rating is considered medium for PM10 and low for PM2.5 and dust fallout.

Project 4: Development of the Beneficiation Project (Jig Plant)

- Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative.
- For PM10, PM2.5 and dust fallout the extent of the potential impact is limited to the jig plant and does not extend beyond the mine boundary.
- The predicted ambient concentrations resulting from the jig plant emissions are very low and the intensity is rated as very low for PM10, PM2.5 and dust fallout.
- Although the intensity is very low, any impact will endure for the life of the jig plant. The duration is therefore long term.
- The consequence of the potential impact is therefore very low for PM10, PM2.5 and dust fallout from the Jig Plant.
- As the intensity is very low, the probability of air quality impacts from the increased opencast are improbable for all pollutants.
- The significance rating is considered low for PM10, PM2.5 and dust fallout.

Beeshoek Mine after implementation of the optimisation projects

- Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative.
- For particulates the extent of the potential impact is concentrated on the mine property, but extends beyond the boundary to the east and south of the mine.
- The predicted ambient concentrations resulting from emissions from Beeshoek Mine after implementation of the optimisation projects are low beyond the mine boundary and the intensity is rated as low for PM10, PM2.5 and dust fallout.
- Although the intensity is low, any impact will endure for the life of the Beeshoek Mine. The duration is therefore long term.
- The consequence of the potential impact is therefore low for PM_{10}, $PM_{2.5}$ and dust fallout from the from Beeshoek Mine after implementation of the optimisation projects.
- While intensity is low, exceedances of the NAAQS are predicted beyond the mine boundary to the east and south of the mine, so air quality impacts from the increased opencast are improbable are probable for all pollutants.
- The significance rating is however considered medium for PM10 and low for PM2.5 dust fallout.

No additional impacts to those currently taking place at the load out areas are expected at the railway lines.

2.e.iv.3.h.2.9 Heritage

A Heritage Impact Assessment (HIA) was conducted for the project and the study area was assessed on desktop level and by a non-intrusive pedestrian field survey. Key findings of the assessment include:

<u>Mine Optimisation Project Area</u>

- Large sections of the study area are disturbed by existing mining activities;
- Archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for Stone Age sites/finds. This pattern was corroborated during the survey where isolated artefacts were recorded (in undisturbed areas) with a higher frequency of background scatter of artefacts in the southern section (Strategic exploration area) where several pans dot the area;
- Dense vegetation after exceptionally high rainfall limited archaeological visibility, this limitation can be successfully mitigated as outlined under the recommendations;
- The heritage survey recorded a range of heritage features including Stone Age artefacts, Ruins, Stone cairns and cemeteries;
- Two cemeteries were recorded located **outside** of the mining footprints in addition to stone cairns of unknown purpose within the mining footprint. The stone cairns are most probably the result of clearing or construction activities and although unlikely these can represent graves. Graves and cemeteries are of high social significance and should be avoided and retained *in situ*; and

- In terms of the palaeontological component, the area is of high paleontological sensitivity and a separate study was conducted for this aspect (Bamford 2019 & 2021). This study concluded that it is extremely unlikely that any fossils would be preserved in the Campbell Rand Subgroup stromatolites or in the loose sands of the Quaternary. There is however a very small chance that fossil may occur in palaeopans in the ancient rocks.

Railway Line Area

- The surrounding area has been disturbed by mining activities, Tommy's airfield, road and railway developments;
- Stone Age material is on record in the general area where archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for archaeological finds and specifically Stone Age sites, as these areas were utilized for settlement of base camps close to water and hunting ranges;
- None of the above-mentioned focal points occur in the study area although the heritage survey recorded two observation points, the first is an isolated find dating to the Earlier Stone Age and the second is a low-density scatter of lithics possibly dating to the Middle and Later Stone Age. The lithics that are in a deflated context, impacted on by the surrounding developments and found in low densities, forming part of the archaeological background scatter (Orton 2016) and are of low significance apart from providing evidence of use of the wider landscape from as early as >200 ka. No other heritage sites of significance were recorded within the proposed impact areas;
- In terms of the palaeontological component, the area is of moderate paleontological sensitivity and a separate study was conducted for this aspect (Bamford 2021). This study concluded that it is extremely unlikely that any fossils would be preserved in the Campbell Rand Subgroup stromatolites or in the loose sands of the Quaternary. There is however a very small chance that fossil may occur in palaeopans in the ancient rocks;

The project is in line with surrounding land use and the impact to heritage resources can be mitigated to an acceptable level. The project can commence provided that the recommendations in this report are adhered to and based on SAHRA's approval.

The only impact identified was:

- Loss of resources in the case of a chance find.

2.e.iv.3.h.2.10 Visual

The following were the main findings of the study:

- The proposed infrastructure will be located within the existing Beeshoek MRA;
- Mining activities, primarily from two large iron ore mines in the area, namely, Beeshoek and Kolomela Mine, largely characterise the landscape to the west and south-west of Postmasburg. Their large mine dumps have been constructed in a region that has flat topography, surrounded by short vegetation. Mining dominates the landscape of these areas, and the sense of place has been altered from a natural open landscape, to one associated with mine dumps and bare areas.
- Due to the general flat topography and short vegetation of the area, the proposed raised Mine dumps will be visible over a large area.
- The visual quality was determined to be medium in the flat natural areas away from the mining areas, and high in the natural mountainous areas particularly to the north-west of the study area. The town of Postmasburg has a medium scenic quality, whilst the immediate outer lying areas have a low scenic quality, due to the dusty nature and large amount of litter noted as well as informal settlements that characterise the area.

The mining areas, particularly to the centre and south of the study area were assigned a low scenic quality.

- The Visual Absorption Capacity (VAC) in general was determined to be low, particularly to the west of Beeshoek. The north – south ridge located to the east of Beeshoek, has a high VAC in concealing and blending the proposed increase in the mine dumps into the landscape. The trees and buildings within Postmasburg will have a high VAC in concealing any views of the dumps.
- The visual intrusion of the proposed project was determined to be low, due to mine dumps and mining activities already taking place at Beeshoek as well as in the surrounding area. The proposed Project is in line with the current land use of the area.
- Visual receptors include houses and farmsteads in the rural areas, residents of Postmasburg, motorists on the roads surrounding Beeshoek, and an aerodrome. The viewer sensitivity of the farmsteads and

rural houses was determined to be moderate, and low for the remaining visual receptors due to the already existing mine infrastructure in the area.

- The impact assessment indicated that all impacts would have a medium significance pre-mitigation, with most achieving a low significance post-mitigation.

2.e.iv.3.h.2.11 Socio Economic

Based on the social assessment, the following concluding remarks should be noted:

- In view of the fact that mining activities are already undertaken in the area and that the Beeshoek Optimisation Project would be situated within the mining rights area, the proposed mining activities do not constitute a separate activity. It would rather be perceived as development associated with an existing activity.
- The mining activities and associated infrastructure by itself will thus not introduce new social risks and hazards, but only increase the probability and scale of those already associated with the existing mining activities.
- Limited direct negative impacts on the social environment are, at this stage, anticipated.
- No negative social impacts that could be classified as fatal have been identified and there are also no impacts of such a high significance that they could prevent the project from continuing. It is thus concluded that the proposed project is acceptable from a social point of view, provided that mitigation measures are implemented.

2.e.iv.3.i The possible mitigation measures that could be applied and the level of risk

Specialist studies have been undertaken to assess each of the project areas in detail, in order to determine the possible impacts and associated management measures required. Detailed mitigation measures and recommendations have been included into this EIA report. Please refer to Table 71 to Table 74 for management measures which will be further assessed and confirmed by the specialist investigations. Some of the key management measures currently foreseen include:

2.e.iv.3.i.1 Planning Phase

The mine should ensure that all licences are in place to legally commence with any clearance activities, this will include the Integrated Environmental Authorisation, as well as the Section 21c & i water use authorisation and associated GN704 exemptions. The WUL will further be required for the operation of any of the identified water uses.

The relevant tree and plant removal permits will be required to ensure that vegetation clearance can be initiated.

An action plan for the construction or offsetting of cryptic wetland should be developed during this phase. This may necessitate the recreation of these systems, as is discussed in further detail below – an opportunity to undertake this task on the Doornfontein property could be considered.

2.e.iv.3.i.2 Construction Phase

2.e.iv.3.i.2.1 Logistics and General Management

- A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised.
- The Integrated Environmental Authorisation Conditions, EMPr and WUL must be applied for and be available on site at all times.
- Early consultation should be initiated with Kolomela Mine, the municipality, the roads agency and the Aviation Authority, prior and during the construction activities of the railway line, to determine the requirements and potential concerns of all parties.
- An open channel of consultation must be maintained throughout the railway construction process.
- Detailed contracts must be drafted to avoid later disputes. These contracts should include the timing of activities and the people who will access the land.
- Construction areas must be clearly demarcated to control movement of personnel and vehicles, providing clear boundaries for construction sites in order to limit the spread of impacts. Markers and pegs will be erected and maintained along the boundaries of the working areas, access roads, haul roads and paths before commencing any work. If proved insufficient for control, these shall be replaced by fencing.
- Exemption in terms of GN704 should be obtained from the DWS for the placement of infrastructure within 100m of a watercourse.

2.e.iv.3.i.2.2 Soil, Land Use and Land Capability Management

The following management measures have been recommended as part of the specialist report and are included into the EMPr.

Stockpile and Stripping Management

- Excavation and long-term stockpiling of soil should be limited within the demarcated areas;
- Ensure all stockpiles (especially topsoil) are clearly and permanently demarcated and located in defined no-go areas;
- Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used;
- Use of heavy machinery such as bulldozers should be avoided as far as possible;
- Soil stripping should be done in conjunction with a soil specialist and careful consultation of the pre-mining soil survey is essential. This will ensure optimal soil availability and avoid excessive mixing of soil due to over-stripping, as well as loss of available cover soil due to under-stripping. Such consultation is recommended for the whole soil handling process, from stripping through stockpiling to final rehabilitation;
- Separate stockpiling of different soil to obtain the highest post-mining land capability;
- For deep soils such Vaalbos and Nkonkoni, separate stripping, stockpiling and replacing of soil horizons [A (0-30 cm) and B (30-60 cm)] in the original natural sequence to combat hard setting and compaction, and maintain soil fertility;
- Stockpile height should be restricted to that which can deposited without equipment being located on the stockpile;
- The stockpile should be treated with temporary soil stabilisation methods such as the application of organic matter to promote soil aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion;
- Soil erosion should be controlled on stockpiles by having control measures to reduce erosion risk such as erosion control blankets, soil binders, revegetation, contours, diversion banks and spillways;
- Stockpiled soils should be stored for a maximum of 5 years. Concurrent rehabilitation should strongly be considered to reduce the duration of stockpile storage to ensure that the quality of stored soil material does not deteriorate excessively; especially with regard to leaching and acidification;
- The topsoil stockpile should be vegetated and while vegetating, measures will be needed to contain erosion of the stockpile during rain events.
- Temporary berms can be installed, around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion;
- The recovered soils should be re-used to rehabilitate the mine footprint following mine closure;
- During rehabilitation replace soil to appropriate soil depths in the correct order, and cover areas to achieve an appropriate topographic aspect and attitude so as to achieve a free draining landscape that is as close as possible the pre-mining land capability rating as possible; and
- A short-term fertilizer program should be based on the soil chemical status after levelling and should consists of a pre-seeding lime and fertilizer application, an application with the seeding process as well as a maintenance application for 2 to 3 years after rehabilitation or until the area can be declared as self-sustaining by an appropriately qualified soil scientist.

Soil Erosion and Dust Emission Management

- The footprint of the proposed infrastructure area must be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint;
- Clearing of vegetation should take place in a phased manner as to keep bare soil areas as small as possible to limit the erosion potential;
- Moisture control will be necessary on large bare areas during dry season construction, in order to reduce the frequency and amount of dust suspended in the ambient air;
- The mine should implement adequate wet suppression techniques to limit dust release;
- Regulated speed limits of 40km/hr must be maintained on gravel roads to minimise dust generation; and
- All disturbed areas adjacent to the expansion project infrastructural areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.

Soil Compaction management

- All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible; and
- Compacted soils adjacent to the mining and associated infrastructure footprint should be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.

Soil Contamination Management

- Regular monitoring of site activities and machinery must be undertaken to identify spills or leaks;
- A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans must be developed and be implemented;
- Withdraw equipment for maintenance if change in emission characteristics is noticeable;
- Spill kits (such as spill-sorb or a similar type of product) must be kept on site and used to clean up hydrocarbon spills in the event that they should occur; and
- Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site.

Loss of Land Capability Management

- Due to the extent of the proposed expansion projects, mining (i.e., opencast pits excavation) should done in a phased manner and concurrent rehabilitation should occur as far as practically possible. This will allow the post closure land uses to potentially commence on the rehabilitated portions;
- Direct surface disturbance of the identified arable soils can be avoided where possible to minimise loss of arable soils;
- During the decommissioning phase the footprint should be thoroughly cleaned, and all building material should be removed to a suitable disposal facility;
- The footprint should be ripped to alleviate compaction;
- Stored topsoil should be replaced and the footprint graded to a smooth surface;
- The topsoil should be ameliorated according to soil chemical analysis;
- Soil placement and revegetation trials should be implemented on WRD slopes, backfilled opencast footprint areas, as well as areas where infrastructure was previously demolished; and
- Should self-succession not be achieved after the first rain season, the mine must revegetate with an indigenous grass mix, or rehabilitate in terms of the successful rehabilitation trial outcome, to re-establish a natural protective cover, in order to minimise soil erosion and allow preconstruction activities to take place (grazing and wildlife).

Exploration Sites Specific

- All drill pads and access road footprints are to be kept as small as possible and are to be rehabilitated post drilling;
- Drill pads located within the mountainous areas should be restricted to the lower slopes as far as practically possible, so as to avoid the need to cut access roads and drill pads into the steeper mountain sides. This will greatly reduce habitat loss through clearing activities and erosion, whilst minimising the need for extensive rehabilitation activities;
- Drill pads are to be located outside of the freshwater habitats and the associated buffer zones as presented in Section 2.e.iii.15;
- All drill pads and access roads are to be rehabilitated after drilling activities;
- Footprint sizes of the drill pads, access roads and capital layout areas are to remain as small as possible;
- Storm water must be suitably managed and mitigated in order to ensure sedimentation of the freshwater habitats does not occur;
- Where drill pads are located in close proximity to the freshwater habitats and associated buffer zones temporary berms are to be constructed in order to ensure that sediment laden runoff from the drill sites does not enter into the freshwater systems;
- As far as possible existing access roads are to be used to gain access to the new drill pad sites in order to minimise the need for additional vegetation clearance.

2.e.iv.3.i.2.3 Ecological Management (Flora)

A floral monitoring plan must be designed and implemented throughout all phases of the proposed mining project, should it be approved.

Floral Habitat and Diversity

Minimise loss of indigenous vegetation where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as other specialist studies.

It must be ensured that, as far as possible, all proposed infrastructure, including temporary infrastructure, is placed outside of sensitive habitat units.

Access roads should be kept to existing roads, as far as possible, so as to reduce fragmentation of natural habitat outside of the authorised footprint.

It is recommended that prior to the commencement of construction activities that the entire construction servitude be fenced off and clearly demarcated.

Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation:

- Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction and operational phases. AIPs should be cleared within the focus area before any vegetation clearing activities commence, thereby ensuring that no AIP propagules are spread with construction rubble, or soils contaminated with AIP seeds during the construction phase; and
- An AIP Management/Control Plan should be implemented by a qualified professional. No uncertified chemical control of AIPs to occur within the watercourses.

Floral SCC

Floral SCC recorded within the proposed mining footprint included species protected under the NFA and the NEMBA TOPS regulations, as well as species protected under Schedule 1 and 2 of the NCNCA. A walkdown of the footprint area is required before construction activities commence, where all anticipated floral SCC/protected species are searched and marked for relocation and/or destruction so that all necessary permits can be obtained from the DENC and DFFE;

For NFA protected tree species, attempting to relocate mature individuals are often too expensive and/or result in unsuccessful re-establishment due to unavoidable damage to their root systems during their excavation. Where possible, seedlings of affected tree species should be targeted for relocation, and seeds must be harvested prior to vegetation clearance to use in rehabilitation activities. It is important that seedlings and seeds be harvested within a close proximity of an area to be impacted, so as to prevent alteration of population genetics;

Geophytes and succulents are good candidates for rescue and relocation, and these should be targeted for such initiatives. Where possible, propagules of such species must also be harvested and propagated in a plant nursery to use in rehabilitation activities during the closure and rehabilitation phase of the project; and

A rescue and relocation plan must be drafted and approved by the relevant authorities for all floral SCC that will potentially be impacted by the proposed mining activities. The Rescue and Relocation Plan must be used in conjunction with an approved Rehabilitation Plan for the Beeshoek Mine to ensure successful translocation and/or reinstatement of floral SCC and habitat for such species.

Proposed mitigation and management measures:

- The disturbance footprint must be kept as small as possible in order to minimise impact on the surrounding environment (edge effect management);
- All areas of increased ecological sensitivity beyond the approved footprint must be designated as No-Go areas and be off-limits to all unauthorised construction vehicles and personnel;
- Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint;
- No additional habitat is to be disturbed during the operational phase of the project outside of the demarcated approved footprints (being applied for). Biweekly (recommended) to monthly (minimum requirement) monitoring and recording of the footprint areas must be done by the Environmental Control Officer (ECO) and photographic records kept – special attention should also be paid to potential increase and spread of alien vegetation and bush encroachment;
- Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal;
- No collection of indigenous floral species must be allowed by construction personnel, especially with regards to floral SCC;
- No dumping of litter, rubble or cleared vegetation on site must be allowed. Infrastructure and rubble removed as a result of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas

with natural vegetation. Waste disposal containers and bins should be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility;
- If any spills occur, they should be cleaned up immediately to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and
- Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area.

Edge effect Management

To limit edge effect impacts to the surrounding natural habitat, the below guidelines must be followed:

- Demarcating all footprint areas during construction activities;
- No construction rubble to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility;
- All soils compacted as a result of construction activities should be ripped, profiled and reseeded;
- Suppress dust to mitigate the impact of dust on flora within a close proximity of construction activities;
- Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil; and
- Manage the spread of AIP species and bush encroachers, which may affect remaining natural habitat within surrounding areas.

Ongoing AIP monitoring and clearing/control should take place throughout all phases of the project activities. The project perimeters should regularly be checked for AIP proliferation to prevent spread into surrounding natural areas; and

Management of AIPs during the construction-phase and operational-phase activities must be focused on limiting their introduction and preventing their spread. For example, roadsides should be monitored, as they serve as common corridors along which AIP species are introduced and dispersed, and disturbed areas should regularly be monitored for AIP recruitment until successfully rehabilitated.

Floral SCC

- Any unauthorised collection of floral material is to be prohibited;
- Monitoring of any rescued and relocated floral SCC should commence during the construction phase and continue unit it is evident that relocated species have successfully established;
- Harvesting of protected floral species by construction and operational personnel should be strictly prohibited; and
- Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed development footprint area.

Fire

- No illicit fires must be allowed during the operational phases of the proposed project; and
- Fire breaks should be maintained during the construction and operational phases.

Dust

An effective dust management plan must be designed and implemented to mitigate the impact of dust on flora throughout the construction phase:

- Dust pollution have been associated with poor photosynthetic functionality in plants . There is evidence of dust pollution leading to a reduction in chlorophyll, including chlorophyll degradation and reduced photosynthetic activity , resulting from dust deposition on leaf surfaces. Dust deposition also result in stomata clogging , which causes a decreased rate of carbon dioxide exchange, carbon assimilation, transpiration, and therefore decreased net photosynthesis.

Rehabilitation

- Rehabilitation of natural vegetation should proceed in accordance with the rehabilitation plan – concurrent rehabilitation is recommended. This rehabilitation plan should consider all phases of the project indicating rehabilitation actions to be undertaken during and once construction has been completed, ongoing rehabilitation during the operational phase of the project as well as rehabilitation actions to be undertaken after operations have ceased;

- Appropriate shaping of disturbed areas is essential. To promote successful establishment of vegetation, the slopes must not be steeper than 1(V):5(H) or 1(V):3(H) (depending on engineering input and recommendations). New slopes should resemble/mimic the natural topography of the surrounding area. Where slopes are left steeper than what is recommended for whatever reason, additional measures will be required to prevent soil erosion and to appropriately manage stormwater;
- Any natural areas beyond the direct footprint, which have been affected by the construction or operational activities, must be rehabilitated using indigenous species;
- Floral monitoring should be done annually during operational activities;
- Rehabilitation must be implemented concurrently as per the rehabilitation plan, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and costs associated with it;
- All soils compacted because of construction activities falling outside of the project area should be ripped and profiled. Special attention should be paid to AIP control within these areas;
- All infrastructure and footprint areas should be rehabilitated in accordance with the rehabilitation plan;
- All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated;
- The post-closure rehabilitation land use must be determined and agreed upon for the rehabilitation plan to be drafted. It is recommended that the port-closure land use be to natural vegetation that represents, as far as possible, the pre-mined vegetation communities, with ecological function prioritised. The rehabilitated areas must be able to sustain floral SCC, especially if such species are relocated into rehabilitated sites;
- Edge effects such as erosion and AIP proliferation, which may affect adjacent or sensitive habitat, need to be strictly managed adjacent to the footprint areas and as part of the rehabilitation phase;
- Ongoing alien and invasive vegetation and bush encroachment monitoring and control should take place throughout the rehabilitation phase of the project; and
- Monitoring of rescued and relocated floral SCC should continue during the Closure & Rehabilitation Phase until it is evident that the species have successfully established. Where possible, these species should be reintroduced into rehabilitation sites.

2.e.iv.3.i.2.4 Ecological Management (Fauna)

Exploration Management

Recommendations, in addition to the "good housekeeping practices", required to minimise the impact on the faunal ecology of the area, should the exploration drilling proceed, are provided below:

- Limit the footprint area of each exploration site (including the placement of temporary infrastructure and access roads) to what is absolutely essential in order to minimise the loss of habitat, compaction of soils, erosion and potential increase of surface water runoff;
- The footprint areas of all surface infrastructure (e.g., truck parking area, low grade stockpiles etc.) must remain as small as possible within the parameters of operational and engineering requirements. It is strongly recommended that during the planning phase, layout and positioning of infrastructure and boreholes take into consideration the sensitivity map within this report;
- As far as possible, all drilling activities (including any creation of soil or vegetation stockpiles and any temporary structures as part of the drilling rig) must remain in well-planned, demarcated areas so to minimise the footprint area;
- All drilling activities must be strictly managed in a responsible manner in line with the mitigation hierarchy; and
- Access to the drilling sites for the transport of the drilling equipment and samples should make use of existing roads as far as possible.

Habitat management

- Ensure that all spills are immediately cleaned up;
- No dumping of waste should take place within the natural habitat areas;
- All material and waste must be removed from site upon the completion of exploration at each site;
- An alien vegetation control program should be implemented. Alien plant invasion is expected within any disturbed areas, and therefore regular monitoring and control of alien invasive vegetation should take place in accordance with the EMPr;
- Edge effects must be monitored and managed;
- All areas affected by topsoil stockpiling (from sump excavation) or vegetation stockpiling (vegetation clearance) during the operational phase of the drilling activities should be rehabilitated; and

- Upon completion of drilling activities all access roads which are no longer required must be rehabilitated, and all drilling related equipment should be removed. Compacted soils should be ripped and revegetated with indigenous vegetation to prevent erosion, sheet runoff, and to discourage the establishment of AIPs after the operational phase.

Given the above, provided that the exploration activities avoid sensitive habitat associated with the Cryptic Wetlands and the Seasonal Depressions, and that areas are rehabilitated post-drilling, the impact on faunal ecology in these areas may remain minimal. It is however important to ensure that should any faunal SCC be affected by exploration activities; the necessary permits must be sought from the relevant authorities (DENC and/or DFFE). Avoiding unnecessary loss of faunal habitat must be prioritised and the areas that are disturbed by exploration activities must be rehabilitated and edge effect impacts prevented.

Faunal Habitat and Diversity

- At all times, ensure that sound environmental management and engineering is in place during the planning phase;
- Minimise loss of indigenous vegetation where possible through refining the final footprints of the opencast pits, optimising the design within habitat of lowered ecological importance and sensitivity, avoiding sensitive habitats and ensuring habitat connectivity and movement corridors remain;
- Planning and design, notably for future prospecting, should aim to avoid the cryptic wetlands and seasonal depressions whilst maintaining habitat connectivity as far as possible;
- Ensure that prior to project commencement a suitable rescue and relocation plan, alien plant control plan and rehabilitation plan are already in place; and
- Prior to vegetation clearing activities in the natural vegetation units the site should be inspected for the presence of mammal and scorpion burrows, reptiles and baboon spiders. If located, these species should be carefully flushed out or excavated ensuring no harm to the specimens, and relocated to similar surrounding habitat outside of the disturbance footprint area.

General Mitigation Measures

- All future prospecting activities should remain outside if the cryptic wetlands and the seasonal depressions, including their regulated zones;;
- Ensure habitat connectivity is not compromised by maintaining movement corridors between the various habitat units as far as possible;
- The development footprint should be demarcated, and it should be ensured that no mining related activities take place outside of the demarcated footprint;
- Faunal habitat beyond the demarcated area should not be cleared or altered;
- All areas of increased ecological sensitivity beyond the approved footprint must be designated as No-Go areas and be off-limits to all unauthorised construction vehicles and personnel;
- Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal;
- No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility;
- If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line and faunal recolonization. In the event of a breakdown, maintenance of vehicles must take place with care, and the collection of spillages should be practised preventing the ingress of hydrocarbons into the topsoil;
- Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the study site during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or staff member. For larger venomous snakes, a suitably trained official or specialist should be contacted to affect the relocation of the species, should it not move off on its own;
- It is recommended that a monitoring program be developed during the operational phase to detect any changes to species compositions in the area, and where appropriate initiate mitigation / management measures to minimise impacts to these species;
- No informal fires are to be allowed;
- No hunting/trapping or collecting of faunal species is allowed; and
- Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area.

Edge effect Management

To limit edge effect impacts to the surrounding natural habitat, the below guidelines must be followed:

- Demarcating all footprint areas during construction activities;
- No construction rubble to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility;
- All soils compacted as a result of construction activities should be ripped, profiled and reseeded;
- Suppress dust to mitigate the impact of dust on flora within a close proximity of construction activities;
- Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil;
- Manage the spread of AIP species and bush encroachers, which may affect remaining natural habitat within surrounding areas; and
- Ongoing AIP plant monitoring and clearing/control should take place throughout all phases of the project activities. The project perimeters should regularly be checked for AIP proliferation to prevent spread into surrounding natural areas.

Faunal SCC

- It is recommended that prior to vegetation clearing and earth moving activities a walkdown is conducted in order to ascertain the possible presence of faunal SCC and where feasible effect the relocation of such species provided the correct rescue and relocation permits are in place;
- A suitable rescue and relocation plan should be developed and overseen by a suitably qualified specialist should SCC be identified within the focus area in order to ensure that species loss during construction activities is kept to a minimum;
- Should any other faunal species protected under NEMBA or the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) be encountered, construction should be halted and authorisation to relocate such species must be obtained from relevant authorities; and
- No collection of faunal SCC may be allowed by construction or operational personnel.

Rehabilitation

- When rehabilitating a footprint site, it is imperative that as far as possible the habitat that was present prior to disturbances is improved, so that faunal species that were displaced by vegetation clearing activities are able to recolonize the rehabilitated area;
- Rehabilitation must be implemented concurrently as per the rehabilitation plan, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and costs associated with it.
- Ensure that no further clearing of faunal habitat occurs;
- No hunting/trapping or collecting of faunal species is allowed;
- No informal fires by any personnel are allowed;
- Following heavy rains, all stormwater structures and erosion susceptible areas must be inspected, and any damage or early onset erosion rectified;
- Monitor the success of rehabilitation efforts of all areas that were disturbed and revegetated during the operational phase;
- Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the closure/ decommissioning phase, and the immediate surrounding area (30m from the perimeters) should be regularly checked during the decommissioning phase for alien vegetation proliferation to prevent spread into surrounding natural areas. Alien vegetation control must be monitored. The AIP control plan must be implemented for a period of at least 5 years after decommissioning and closure;
- Continue with and update the AIP control plan accordingly;
- Any infrastructure and reclamation operation footprints should be rehabilitated in accordance with a rehabilitation plan compiled by a suitable specialist;
- All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated as per the post-closure objective;
- Rehabilitation efforts must be implemented for a period of at least five years after decommissioning and closure; and
- The rehabilitation plan should consider all development phases of the project indicating rehabilitation actions to be undertaken during and once construction or operation has been completed. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and cost.

2.e.iv.3.i.2.5 Freshwater and Aquatic Environment

The following management measures, *inter alia*, are included:

- The catchments of all identified watercourses must be determined by a suitably qualified specialist, and as far as feasible, no activities must be permitted within the delineated catchments.
- Retain as much indigenous vegetation as possible.
- The watercourse areas and their associated catchments beyond the proposed footprint of expansion should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas.
- It is worth nothing that should the exploration drilling within the Future Strategic Exploration Block latterly translate to open cast mining, CW14 could, potentially, be mined out. Due consideration must be given to this possibility during future planning phases to ensure that engagement with the relevant authorities takes place to ensure that appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent can be planned for and implemented appropriately. Management measure to be discussed with authorities in the event that the mine proceed with future mining activities in this area could include that cryptic wetlands will be undisturbed, or to recreated wetlands.
- Activities associated with Projects 1, 2, 3, 4 and 5 will pose a negligible risk to CW19, as none of the proposed activities will occur within proximity to the CW, although the general increase in mining activity is likely to result in increased dust generation, potentially posing a moderate to high risk significance to the wetland. Therefore, dust suppression must be implemented throughout the life of mine to minimise the risk of wind-borne sediment reaching this, and other, cryptic wetlands.
- General:
    - Measures to contain and reuse as much water as possible within the mine process water system should be undertaken. Very strict control of water consumption and detailed monitoring must take place, and all water usage must continuously be optimised;
    - Limit the footprint area of construction activities in order to minimise the loss of clean water runoff areas which recharge the receiving freshwater / aquatic environment;
    - The Mine's water balance must be strictly controlled at all times to ensure optimal water use, prevent overflow in dirty storm water management systems and prevent spills to the environment;
    - No dirty water runoff (as defined by Regulation GN704) must be permitted to reach the freshwater resources during the entire life of mine, and clean and dirty water management systems must be maintained and operated efficiently to prevent any contaminated runoff from entering the receiving aquatic environment. Clean and dirty water runoff separation systems should be implemented in accordance with the approved SWMP or EMPr. Clean and dirty water runoff separation systems should be developed before the development of any other infrastructure takes place;
    - No discharge of waste should take place within the freshwater resources. If any spills occur, they should be immediately cleaned up;
    - Upon closure all haul and access roads as well as all unnecessary mining infrastructure should be removed in order to minimise the impacts on the aquatic resources of the area beyond the life of mine;
    - Strict monitoring throughout the life of mine and post-closure is required in order to ensure the ecological integrity and functioning of freshwater resources is retained. Monitoring data must be utilised proactively to identify any emerging issues;
    - Demolition footprint must be clearly demarcated and no related activities, including the movement of vehicles, must be permitted to occur outside of the footprint area;
    - All related waste and rubble must be removed from site and disposed of according to relevant SABS standards. No waste must be permitted to enter freshwater resources;
    - Edge effects such as erosion must be monitored and managed;
    - All areas affected by stockpiling during the operational phase of the mine should be rehabilitated and stabilised using cladding or a suitable grass mix to prevent sedimentation of the freshwater resources in the area;
    - Rehabilitation of affected freshwater resources must ensure that riparian structure and function are reinstated in such a way as to ensure the ongoing functionality of the larger drainage systems at pre-mining levels;
    - All affected areas should be resloped and dressed with topsoil where necessary and reseeded with indigenous grasses;

- It is critical that ongoing monitoring of alien vegetation is maintained post-closure, as proliferation of alien vegetation in the demolition areas is expected;
- Ongoing aquatic biomonitoring should take place throughout the closure phase of the mine and should continue into the post closure phase to define latent impacts that need to be mitigated.

Key Note:
Whilst few to no faunal species were observed within the assessed in the CWs during the site visit, as noted in Section 2.e.iii.6.e, features such as those identified in the study area are noted to be important habitat for various Branchiopod species in the region, which are able to withstand extended periods of desiccation. Confirmation of the presence of these invertebrates by means of hatching out eggs under laboratory conditions did not form part of the scope of work thus their presence or absence in this group of CWs cannot be ruled out without further investigation; however, Branchiopods and tadpoles were found in CW 14, inferring that they may be present in the other CWs assessed. It is therefore strongly recommended that:

1. Sampling of the CWs to determine the presence (or absence) of macroinvertebrates be undertaken.
2. Sampling under dry conditions can be achieved by obtaining soil samples from the top layer (0-50 mm) of soil within each CW, which would hold the egg banks of any invertebrates present.
3. These soils samples are then processed under laboratory conditions to hatch out and enumerate the invertebrate taxa present.
4. Should invertebrate taxa be present, a detailed rescue and relocation plan should be developed by a suitably qualified specialist, to relocate egg banks, either to CWs that will be undisturbed, or to recreated wetlands (refer to the Figure 109). Such a rescue and relocation plan could potentially form part of and offset initiative, which could be on site or also potentially be included at the Doornfontein property should it be required by the relevant authority.

2.e.iv.3.i.3 Water Management

The determined floodline is connected to what has been delineated as a recharge zone in the Freshwater Ecological Assessment (SAS, 2021). It is recommended that future prospecting activities do not take place within the 1:50 year floodline as required by GN704 Regulations. It is further recommended that future prospecting activities remain outside of the recharge zone pending further investigation and understanding of this area.

The following are proposed stormwater measures:

- Berms should be placed around the proposed ROM Stockpile consolidation area, as is the case with other ROM Stockpiles on site. Waste rock can be used to construct the berms, as it has been authorised for such purposes in the Mine's amended WUL. This will ensure that any clean water runoff is diverted away.
- No stormwater measures to contain runoff were recommended around the existing WRDs due to the low rainfall, high evaporation and waste classification which indicated non-hazardous material (SWS, 2016). Furthermore, waste rock has been exempted from regulation 5 of GN704 (which pertains to "Restrictions on the use of material") for the construction of berms and haul roads. Based on the above, it is not foreseen that runoff from the WRD expansion areas would need to be contained. However, WRDs close to sensitive areas such as wetlands and depressions should be contained.
- Berms should be placed around the proposed pits and Detrital mining areas, as is the case with the other existing pits, to ensure that no clean water flows into the voids. Seepage and dirty water runoff collected within the voids should be managed by recycling and reusing dirty water as far as practicably possible.
- The WHIMS and Jig Plants should be operated as dirty areas. Dirty water runoff from the WHIMS and Jig Plants should be directed via lined channels to lined sumps or Pollution Control Dams (PCDs). The water collected within the sumps/PCDs should be recycled and reused as process water. Both the WHIMS and Jig Plants will be located on topographically elevated areas surrounded by disturbed areas, and therefore, the diversion of clean runoff around these areas is not foreseen.
- Water levels and sufficient freeboard within the proposed dirty water dams/tanks, should be monitored and reported on. Dirty water storage facilities must be sufficiently lined with adequate capacity, in accordance with GN704 regulations.
- Monitoring plans have been proposed under section 2.h of this EMPr (Part B) report.

Based on the findings and outcomes of this study, it is the opinion of the specialist that from a surface water perspective, the proposed projects and activities can commence, provided that the recommendations and mitigation measures provided in this report are adhered to. It is important that future prospecting activities in the southern and western extent of the MRA should avoid the wetlands, depressions, recharge zone and drainage lines.

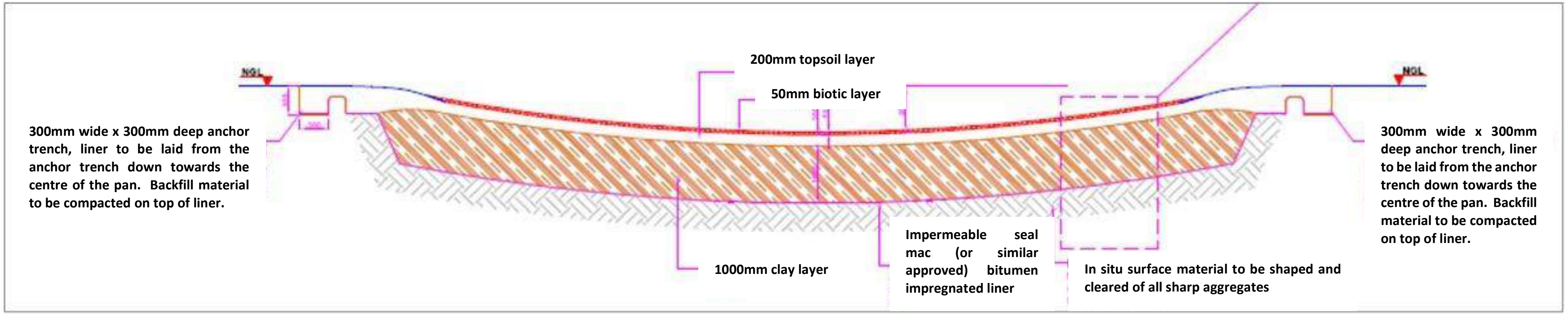


Figure 109: Conceptual diagram of a recreated cryptic wetland

2.e.iv.3.i.4 Storm Water Management

The following includes the proposed Storm Water Management Measures.

ROM Stockpile Consolidation

Berms should be placed around the proposed ROM Stockpile consolidation area, as is the case with other ROM Stockpiles onsite. Waste rock can be used to construct the berms, as it has been authorised for such purposes in the Mine's amended WUL. This will ensure that any clean water runoff is diverted away.

Waste Rock Dump Expansion

As previously mentioned, no stormwater measures to contain runoff were recommended around the existing WRDs due to the low rainfall, high evaporation and waste classification which indicated non-hazardous material (SWS, 2016). Furthermore, waste rock has been exempted from regulation 5 of GN704 (which pertains to "Restrictions on the use of material") for the construction of berms and haul roads. Based on the above, it is not foreseen that runoff from the WRD expansion areas would need to be contained. However, WRDs close to sensitive areas such as wetlands and depressions should be contained.

Open Pit and Detrital Area Expansion

Berms should be placed around the proposed pits and Detrital mining areas, as is the case with the other existing pits, to ensure that no clean water flows into the voids. Seepage and dirty water runoff collected within the voids should be managed by recycling and reusing dirty water as far as practicably possible.

WHIMS and JIG Plant

The WHIMS and Jig Plants should be operated as dirty areas. Dirty water runoff from the WHIMS and Jig Plants should be directed via lined channels to lined sumps or Pollution Control Dams (PCDs). The water collected within the sumps/PCDs should be recycled and reused as process water. Both the WHIMS and Jig Plants will be located on topographically elevated areas surrounded by disturbed areas, and therefore, the diversion of clean runoff around these areas is not foreseen.

Water Management Infrastructure

Water levels and sufficient freeboard within the proposed dirty water dams/tanks, should be monitored and reported on. Dirty water storage facilities must be sufficiently lined with adequate capacity, in accordance with GN704 regulations.

2.e.iv.3.i.5 Groundwater Management

The mine was awarded a WUL August 20018, licence number 10/D73A/ABGJ/2592 (read with update 2019). The WUL covers Sections 21(a), 21(b), 21(g) and 21(j) of the NWA. The conditions as set out in the WUL serve as the guidelines for monitoring data interpretation and reporting for authorised activities. A monitoring programme is in place which entails quarterly water quality monitoring and monthly manual water level and daily telemetric/auto-level water level monitoring at select locations.

The current water quality and water level monitoring network is considered adequate to detect and quantify the presence and migration of any contaminants in groundwater and measure the effects of large-scale groundwater abstraction for mining purposes on groundwater levels.

A groundwater monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. The boreholes can be grouped or classified according to the following purposes:

- Source monitoring: Monitoring boreholes are placed close to or in the source of contamination to evaluate the impact thereof on the groundwater chemistry. Monitoring boreholes within the mining area satisfy this condition.
- Pathway monitoring: Monitoring boreholes are placed in the primary groundwater migration pathways to evaluate the migration rates and chemical changes along the pathway. Monitoring boreholes located along groundwater flow paths satisfy this condition.
- Impact monitoring: Monitoring of possible impacts of contaminated groundwater on sensitive ecosystems or other receptors. These monitoring points are also installed as early warning systems for contamination break-through at areas of concern. External user boreholes and monitoring placed in positions to detect and monitor impacts on groundwater availability and quality satisfy this condition.
- Background monitoring: Background groundwater quality is essential to evaluate the impact of a specific action/pollution source on the groundwater chemistry. Monitoring boreholes located up-gradient/upstream of the mining area satisfy this condition.

- Dewatering is primarily achieved through wellfields of abstraction boreholes and in pit dewatering points, and the combination thereof functions with the purpose of keeping the pit floor dry by creating a cone of depression around the excavation. The pit floor was thus modelled as a drain, which in MODFLOW uses the bottom elevation of the drain as the hydraulic head that controls flow into the drain. In this way the individual position of dewatering boreholes has no effect on the extent of the cone of depression or groundwater level lowering. Dewatering borehole positions may be changed without notice as objectively they will be placed as close as possible to the excavation to maintain a dry pit floor.

Beeshoek is currently operating in a dynamic mining environment. Water levels are also impacted by various external sources, which directly impacts the water levels at Beeshoek. Currently, no additional groundwater is to be abstracted from the catchment as part of this project expansion. However, due to the nature of the environment in which the mine is operating, regular numerical model updates must be undertaken to determine whether the volumes for dewatering will still be sufficient to also supply the mine with the required volumes as approved in the Section 21a water uses.

2.e.iv.3.i.6 Air Quality

Recommendations are made here to control dust generation at the four optimisation projects and so reduce the resultant ambient PM10 and PM2.5 concentrations and dust fallout, and any associated impacts.

The development and implementation of a Fugitive Dust Management Plan (FDMP) is recommended. The FDMP must define the responsible persons and should include, but not be limited to the following.

- Strictly enforcing speed limits on all mine roads.
- Limiting site clearance to design areas.
- Rehabilitation of all areas on completion of construction activities.
- Routine damping of denuded areas during construction, particularly when strong winds are forecast.
- Monitoring of activities causing high dust fallout and manage these specific activities accordingly by actively using the existing dust fallout network.
- Implementation of dust control measures in the form of slope stability and implementation a re-vegetation programme.
- Installation, operation and maintenance of dust extraction systems at the secondary and tertiary crushing and screening plants. For crushing and screening operations at mineral processing plants, fugitive dust can be controlled with dust extraction systems and water sprayers.
- The application of chemical dust suppression systems at the primary crushing and screening plants.
- Covering all product transported by vehicles using tarpaulins.

2.e.iv.3.i.7 Heritage Resources

The management measures include:

- Implementation of a chance find procedure (heritage and palaeontology) for the project;
- It is recommended that the Strategic exploration area should be subjected to a heritage walk through prior to development; and
- Graves and cemeteries (BH26 and BH27) should be retained in situ with access for family members and a sufficient buffer zone.

Although unlikely, the recorded stone cairns (BH12 and BH24) could represent graves and should be confirmed during the social consultation process.

2.e.iv.3.i.8 Visual

The following main management measures are recommended:

- Vegetation clearance should be kept to an absolute minimum. Exposed areas should be vegetated as soon as possible. Dust suppression measures should be implemented to limit the generation of dust.
- Machinery, trucks and vehicles are already present on the Mine site and are unlikely create any additional significant presence.
- The pits should be backfilled where possible. The WRDs should be vegetated as soon as practicably possible. Dust suppression measures should be implemented to limit the generation of dust.

- The natural landscape of the area has already been altered by mining. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed infrastructure. However, it is recommended that should the plant and other proposed infrastructure be painted, that earthy colours are used to blend in with the surrounding landscape. It is further recommended that the pits are backfilled where possible and that the WRDs are vegetated upon rehabilitation.
- Down lighting and lighting shields should be used as far as possible.
- The removal of Mine infrastructure should be undertaken. The pits should be backfilled where possible. The WRDs should be vegetated.

2.e.iv.3.i.9 Socio Economic Management

The following management measures have been recommended:

- Mitigation and enhancement measures proposed should be noted as recommendation measures and should be included as part of the EMPr.
- The use of local labour, if any additional labour would be required, should be maximised as it could assist in mitigating various other social impacts, but would also enhance the potential benefits of the proposed project to the local community members.
- Local procurement, especially during the operational phase, would have various trickle down positive socio-economic impacts on the beneficiary communities and local businesses. This aspect should thus be pursued as far as possible.
- Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other similar environments.
- The mine should engage the Tsantsabane Local Municipality to develop a culture of cooperative support and accountability in order to continue to facilitate and support a variety of socio-economic needs in the area.
- Local residents, with the focus on the surrounding landowners and communities, should receive accurate information with regards to the project status, timeframes for construction and other relevant information about issues that could influence their daily living and movement patterns.
- Socio-economic issues and concerns could arise during the implementation of the project. These should be thoroughly dealt with taking the sensitivities into consideration.
- In terms of the WRD Stability Review Report, 2021, it is strongly, from a safety consideration, recommended that the Licence Holder continuous monitor and observe movement of the WRD.

2.e.iv.3.i.10 Waste Management

- All wastes must be handled according to a Waste Management Plan and in line with the NEMWA Norms and Standards.
- Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded areas. Bunds to be 110% of volume of the materials stored.
- All contaminated material at the Exploration Activities must be contained in mobile sumps. The mobile sumps must maintain a suitable freeboard, to ensure when these are moved/ transported, that no spillage will occur.
- All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.
- Any significant spills must be captured in the incident reports and must be reported to the relevant department (DMRE/ Catchment Management Agency (CMA)/ DWS).
- Pipelines transporting fuels must be monitored in terms of volumes of water piped to the underground.

2.e.v Motivation of Sites

2.e.v.1 Motivation where no alternatives sites exist

Please refer to Section 2.e of this report.

2.e.v.2 Statement motivating the preferred site

Please refer to Section 2.e of this report.

2.f Full Description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred site

In order to identify the potential impacts associated with the proposed activities the following steps were undertaken:

The stakeholder consultation process is undertaken in a manner to be interactive, providing landowners and identified stakeholders with the opportunity to provide input into the project. The consultation involved, advertisements, site notices, distribution of information documents and the undertaking of focus group meetings. This is a key focus, as the local residence have capabilities of providing site specific information, which may not be available in desktop research material. Stakeholders are requested (as part of the BID) to provide their views on the project and any potential concerns which they may have. All comments and concerns received to date, have been captured and formulated into the impact assessment.

Detailed desktop and screening assessments were undertaken for the purposes of the ESR and to develop the Plan of Study for the EIA. The Plan of Study required specific specialist studies, which have been included into this report.

- A detailed desktop investigation was undertaken to determine the environmental setting in which the project is located. Based on the desktop investigations various resources were used to determine the significance and sensitivity of the various environmental considerations. The desktop investigation involved the use of:
    - NEMA Online Screening System;
    - South African National Biodiversity Institute (SANBI) Biodiversity Geographic Information System (BGIS) Land Use Decision System (LUDS);
    - Geographic Information System (GIS) base maps;
    - DWS (previously the Department of Water Affairs/ Department of Water Affairs and Forestry) information documents such as the ISP and Groundwater Vulnerability Reports;
    - AGIS;
    - Municipal Integrated Development Plan (IDP);
    - Consultation with the Department of Land Affairs.
- Additional site-specific specialist studies were conducted to determine the risk of the proposed project on the environment which included:
    - Soils Assessment;
    - Land Use and Land Capability Assessment;
    - Ecological Assessment;
    - Freshwater and Aquatic Assessment;
    - Hydrological and Storm Water Management Assessment;
    - Floodline delineation;
    - Water Balance Assessment and Development;
    - Hydrogeological Assessment;
    - Cultural and Heritage Assessment, including Paleontological study; and
    - Socio-Economic Assessment.
- Specialist site visits were undertaken in June 2019, October 2020 and March 2021. This site visits were utilised to ensure that the information gathered as part of the desktop investigation reflects the current status of the land.
- Consultation with directly affected parties were undertaken – please refer to Table 35 to ensure that concerns and queries in this regard are also addressed.
- The rating of the identified impacts was undertaken in a quantitative manner as provided in 2.e.iv.2 (Impact Ratings). The ratings are undertaken in a manner to calculate the significance of each of the impacts. The EAP also assessed the outcomes of the calculation to determine whether the outcome reflects the perceived and actual views.

The identification of management measures is done based on the significance of the impacts and measures that have been considered appropriate and successful, specifically as Best Practical and Economical Options.

2.g Assessment of each identified potentially significant impact and risk

Please refer to Table 71 to Table 74 which present the impacts assessed based on the Sections before. Please take note of the following abbreviations when assessing the tables:

- SbM: Significance before Mitigation
- SaM: Significance after Mitigation
- CbA: Can be Avoided
- R: Reversible
- Ir: Irreplaceable

Table 71: Potential Impacts and the calculated significance before and after management measures – Planning Phase

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Legal Requirements (Environmental Permits)	2, 3, 4, 5	South Africa Enviro-Legal Compliance	Unlawful water and waste (mine residue) activities, which could lead to NWA Directives and Section 24G Rectification fines. Project delays due to outstanding Enviro-Legal requirements not adhered to.	N	-4	-3	-2	-5	-14	CbA	A legal assessment of all Water Uses must be undertaken every second year to ensure that all Water Uses are licensed. The Mine must familiarise themselves with the NEMWA Regulations for the management of Mine Residue Deposits. Those included in previous approved EMPs are considered lawful under the NEMWA, however where reworking, rehabilitation, stockpiling is taking place, not included into the previous EMP, these activities are unlawful and may require a Waste Management Licence (WML). All legally appointed personnel responsible or involved in water use activities on site must receive training on the requirements of the WUL and the EMPr. No clearance of activities may be initiated without the necessary tree removal permits. A detailed ongoing rehabilitation plan must be developed for the Mine. This plan must include the following: • Continuous backfilling of opencast pit opportunities; • Rehabilitation trials to determine the most practical and suitable manner to rehabilitate WRDs, unused haul roads, historically mined areas; • Offsetting and/or recreation of disturbed Cryptic Wetlands. A Heritage and Paleontological Chance Finds Procedure must be available on site and provided to all contractors and parties available for site clearance. Regular internal audits must be undertaken on the lawful implementation of the WUL. Ensure that all parties are aware of the conditions of the Environmental Authorisation and approved EMPr. Agreements between the TFR and the Mine for the tie into the TFR line must be obtained prior to construction. Agreements must be in place between the Mine and the roads agency prior to the construction of the rail under road system. Geotechnical studies must be completed and final designs approved by the various role players (such as the mine, roads agency, TFR) prior to the construction of the railway line.	P	4	3	5	5	17

Name of Activity	Project	Impact Area	Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											WUL, EMPr an all other required Environmental Permits must be available on site at all times.						
											Floral SCC recorded within the proposed mining footprint included species protected under the NFA and the NEMBA TOPS regulations, as well as species protected under Schedule 1 and 2 of the NCNCA. A walkdown of the footprint area is required before construction activities commence, where all anticipated floral SCC/protected species are searched and marked for relocation and/or destruction so that all necessary permits can be obtained from the NCDENC and DFFE.						
											For NFA protected tree species, attempting to relocate mature individuals are often too expensive and/or result in unsuccessful re-establishment due to unavoidable damage to their root systems during their excavation. Where possible, seedlings of affected tree species should be targeted for relocation, and seeds must be harvested prior to vegetation clearance to use in rehabilitation activities. It is important that seedlings and seeds be harvested within a close proximity of an area to be impacted, so as to prevent alteration of population genetics.						
											Geophytes and succulents are good candidates for rescue and relocation, and these should be targeted for such initiatives. Where possible, propagules of such species must also be harvested and propagated in a plant nursery to use in rehabilitation activities during the closure and rehabilitation phase of the project.						
											A rescue and relocation plan must be drafted and approved by the relevant authorities for all floral SCC that will potentially be impacted by the proposed mining activities. The Rescue and Relocation Plan must be used in conjunction with an approved Rehabilitation Plan for the Beeshoek Mine to ensure successful translocation and/or reinstatement of floral SCC and habitat for such species.						
											The legal register must be updated to indicate all updated water uses.						
Planning infrastructure placement to avoid resource sterilisation	2, 4 and 6	Geological Resources	Loss of potential iron ore resources due to the placement of infrastructure.	N	-4	-3	-2	-4	-13	CbA	Implementation of strategic exploration programmes and ongoing development of the Mine Work Programme.	N	-2	-3	-1	-3	-9
	2, 3, 4, 5 and 6	Soil Resources	Soil Compaction and loss of soil resources due to potential poor planning leading to	N	-2	-4	-3	-4	-13	CbA	Implementation of decisive mine layout development.	N	-1	-2	-1	-1	-5

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Planning infrastructure placement to avoid natural resource sterilisation			excessive or unnecessary placement of infrastructure in soils highly prone to compaction.														
Planning towards construction of the railway line	6	Legal Compliance, Project Planning timeframes	Project delays due to outstanding Enviro-Legal requirements not adhered to	N	-4	-3	-2	-5	-14	CbA	No clearance of activities may be initiated without the necessary tree removal permits. A Heritage and Paleontological Chance Finds Procedure must be available on site and provided to all contractors and parties available for site clearance. The necessary traffic management plan must be developed and approval must be obtained from relevant Authorities, as well as the Airport's authority prior to the commencement of construction. Agreements between the TFR and the Mine for the tie into the TFR line must be obtained prior to construction. Agreements must be in place between the Mine and the roads agency prior to the construction of the rail under road system. Geotechnical studies must be completed and final designs approved by the various role players (such as the Mine, roads agency, TFR) prior to the construction of the railway line.	P	4	3	5	5	17
Relocation of Mine owned and State (Eskom) Owned (where possible) Powerline	6	Socio-Economic	The relocation of the powerlines (applicant owned and/or Eskom owned) could temporarily disrupt Economic Activities in the area which the powerline supplies.	N	-3	-1	-4	-4	-12	CBA	The Mine should obtain approval from the relevant parties regarding the relocation of the powerlines should this be required. The Mine should enter into discussions with affected parties to develop an operating procedure and timeline for the removal of the powerlines. The powerlines may not be removed without the required approvals by the relevant authorities (if applicable).	N	-1	-2	-1	-1	-5

Table 72: Potential Impacts and the calculated significance before and after management measures – Construction Phase

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SaM**
Land and Footprint Clearance	2, 3, 4, 5 and 6	Geology	No additional impacts from planning phase.	-	-	-	-	-	-	-		-	-	-	-	-	-
Topsoil Stripping and Stockpiling and Vegetation Removal	1, 2, 3, 4, 5 and 6	Topography	Direct impact: Alteration of topography. Removal of vegetation and the associated shaping of the area will lead to change in topographical characteristics of the area. The impact is not considered significant due to the fairly flat nature of the topography and the location of the activities in the immediate vicinity of the existing plant area.	N	-1	-3	-3	-2	-9	R	The footprint areas of all surface infrastructure must remain as small as possible within the parameters of operational and engineering requirements. Construction areas must be clearly demarcated to control movement of personnel and vehicles, providing clear boundaries for construction sites in order to limit the spread of impacts. Markers and pegs will be erected and maintained along the boundaries of the working areas, access roads, haul roads and paths before commencing any work. If proved insufficient for control, these shall be replaced by fencing. Designs of the facilities (Soil Stockpiles, Dirty water infrastructure and landscaping) must be undertaken by a registered Engineer. Draw up a procedure clearly reflecting the method and phases of clearance of vegetation only in areas where construction will take place. Removal of vegetation must be undertaken in a phased approach to limit surface exposure. Temporary erosion control measures may be used to protect the disturbed soils during the construction phase until adequate vegetation has established. Clean and dirty water separation must be implemented early in the construction phase, especially down-gradient of construction areas to ensure that the natural runoff patterns are impacted as little as possible. Clearance and activities around identified pan areas must be limited and must be approved in terms of a WUL. Linear infrastructure must follow as far as practically possible the natural contours of the area.	N	-1	-1	-2	-1	-5
	2, 3, 4, 5 & 6		Direct impact: The removal and stockpiling of "topsoil" (a mixture of soil	N	-1	-3	-5	-4	-13	R	Excavation and long-term stockpiling of soil should be limited within the demarcated areas	N	-1	-1	-2	-1	-5

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		Soil, Land Use and Land Capability	and small rock material)may lead to a loss of soil resource and land capability through erosion of the stockpiles and chemical and physical degradation. This impact is considered important due to the fact that the mine may be operating on a negative topsoil balance and therefore the retaining of suitable topsoil is important for successful rehabilitation.								Ensure all stockpiles (place for future rehabilitation) are clearly and permanently demarcated and located in defined no-go areas						
											Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used						
											Use of heavy machinery such as bulldozers should be avoided as far as possible.						
											Soil stripping should be done in conjunction with a soil specialist and careful consultation of the pre-mining soil survey is essential. This will ensure optimal soil availability and avoid excessive mixing of soil due to over-stripping, as well as loss of available cover soil due to under-stripping. Such consultation is recommended for the whole soil handling process, from stripping through stockpiling to final rehabilitation.						
											Separate stockpiling of different soil to obtain the highest post-mining land capability.						
											According to the Soils 2001 Layer the focus area is largely situated within an area where the soils are classified as red-yellow apedal freely drained soils with a high base status and less than 300mm depth, for this reason in general 300mm of soils should be removed. However, for deep soils such Vaalbos and Nkonkoni, separate stripping, stockpiling and replacing of soil horizons [A (0-30 cm) and B (30-60 cm)] in the original natural sequence to combat hard setting and compaction, and maintain soil fertility						
											Stockpile height should be restricted to that which can deposited without equipment being located on the stockpile.						
											The stockpile should be treated with temporary soil stabilisation methods such as the application of organic matter to promote soil aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion						
											Soil erosion should be controlled on stockpiles by having control measures to reduce erosion risk such as erosion control blankets, soil binders, revegetation, contours, diversion banks and spillways						
											Stockpiled soils should be stored for a maximum of 5 years. Concurrent rehabilitation should						

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											strongly be considered to reduce the duration of stockpile storage to ensure that the quality of stored soil material does not deteriorate excessively; especially with regard to leaching and acidification. The topsoil stockpile should be vegetated, or sufficient erosion control measures should be implemented to contain erosion of the stockpile during rain events. Temporary berms can be installed, around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion. Stockpiles should be managed to encourage self-succession of vegetation as an erosion control measure. These stockpiles should also be kept free of alien vegetation at all times to prevent loss of soil quality. During ongoing rehabilitation activities replace soil to appropriate soil depths in the correct order, and cover areas to achieve an appropriate topographic aspect and attitude so as to achieve a free draining landscape that is as close as possible the pre-mining land capability rating as possible						
	2, 3, 4, 5 and 6		Soil compaction due to the potential movement of construction equipment/machinery, and the unnecessary placement of construction material in soils which are prone to compaction. Heavy equipment traffic during construction activities is anticipated to cause significant soil compaction. The severity of this impact is anticipated to be moderate for soils such as the Vaalbos/Nkonkoni soil due to loamy sand texture. Whereas soils with a relatively shallow bedrock and lithocutanic character (partly weathered rock material) such as the Coega/Knersvlakte and Glenrosa/Mispah soil forms are anticipated to be less impaired due to the resistance offered by the underlying bedrock. Soil compaction will potentially lead to: ➢ Increased bulk density and soil	N	-1	-4	-3	-3	-11	R	The contractor will ensure that all activities, material and equipment storage and personnel movement take place within the designated area. As far as possible construction areas should be accessed through the existing road network. A site plan must be developed, indicating the following: • Location of all approved activities; • Buffers around pans; • 1:100 year buffer around all watercourses, where applicable; • Location of the buffer zones and other no-go zone's. Laydown areas should be located within disturbed soils or where projects are demarcated to avoid compaction of natural soils. All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of heritage artefacts and the meeting of management measures.	N	-1	-1	-2	-1	-5

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			strength, reduced aeration and lower infiltration rate; ➢ Consequently, it lowers crop performance via stunted aboveground growth coupled with reduced root growth; ➢ Destroyed soil structure, leading to large with fewer natural voids with a high possibility of soil crusting. This situation may lead to stunted, drought-stressed plants due restricted water and nutrient uptake, which results in reduced crop yields; and ➢ Soil biodiversity is also influenced by reduced soil aeration. Severe soil compaction may cause reduced microbial biomass. Soil compaction may not influence the quantity, but the distribution of macro fauna that is vital for soil structure including earthworms due to reduction in large pores.								A system must be implemented on site to address all significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation. As part of ongoing rehabilitation, compacted soils adjacent to the mining and associated infrastructure footprint should be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.						
	2, 3, 4, 5 & 6		Soil Erosion Shallow, and sandy textured soils have a low water retention capacity and are typically more susceptible to erosion in comparison to clay textured soils, which in contrast are less susceptible to erosion. However, the parameters determining the extent and severity of soil erosion are highly complex, with water and wind as the main geomorphic agents, and soil erosion is largely dependent on land use and soil management and is generally accelerated by human activities such as tillage practices. Most of the proposed activities are located on a relatively flat and gently sloping terrain, consisting of rocky Coega/Knersvlakte and Mispah/Glenrosa soils with very shallow to no soils. The identified soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. This will most likely lead to: ➢ Loss of soil;	N	-1	-4	-3	-3	-11	R	Ensure that all design drawings include effective erosion control measures. Ensure the required erosion protection measures are monitored and corrected where necessary. Ensure the required erosion protection measures are monitored and corrected where necessary. Clearing of vegetation should take place in a phased manner as to keep bare soil areas as small as possible to limit the erosion potential. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, trails must be initiated to determine the best rehabilitation procedure for the establishment of vegetation on these disturbed areas. The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites. If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low. The footprint of the proposed opencast pit and WRD expansions and infrastructure areas should	R	-1	-1	-2	-1	-5

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			➢ Reduced soil fertility status of soils and subsequently loss of valuable arable land; and ➢ Possible pollution and sedimentation of nearby watercourses consequently affecting the water quality for livestock. The significance of this impact the various projects is presented in the tables below. The impacts can be reduced if mitigation measure outlined in this document are adhered to, as illustrated on the impact rating table below.								be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible. No construction or project related activities may be undertaken outside of the demarcated areas.						
	2, 3, 4, 5 & 6		Soil Contamination due to potential leakages in construction equipment/machinery leading to contamination. All the identified soils are considered equally predisposed to potential contamination, as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The impact significance of soil contamination is largely dependent on the nature, volume and/or concentration of the contaminant of concern. If the management protocols are not well managed this will more likely lead to: ➢ Contaminants leaching into the soil and thus potentially rendering the soil sterile. reducing the yield potential of soils; and ➢ Potential reduction of water quality used for irrigation and for livestock use.	N	-1	-4	-3	-3	-11	R	Regular monitoring of site activities and machinery must be undertaken to identify spills or leaks. Spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans must be developed and be implemented. Withdraw equipment for maintenance if change in emission characteristics is noticeable. Spill kits (such as spill-sorb or a similar type product) must be kept on site and used to clean up hydrocarbon spills in the event that they should occur. Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site.	R	-1	-1	-2	-1	-5
	2, 3, 4, 5 & 6		Loss of Agricultural Land Capability due to site clearing, the removal of vegetation, and associated disturbances to soils, as well as the potential indiscriminate	N	-1	-3	-4	-4	-12	R	No construction or project related activities may be undertaken outside of the demarcated areas. Clean and dirty water systems must be established prior to construction.	R	-1	-1	-2	-1	-5

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			disposal of hazardous and non-hazardous waste material spills and disposal. The proposed expansion projects will impact the soil resources in varying severities, with Project 3 posing the highest impact significance due to its extent in size as well as the encroachment on high agricultural potential soils. Project 2 is anticipated to have the second highest impact while the remaining projects are anticipated to a limited impact since majority of the development will occur on previously disturbed soils. Although there is occurrence of arable soils, low crop yields are foreseen for this area due to climatic constraints (i.e., limited rainfall) and lack of irrigation options. Nevertheless, protection of high agricultural resources (where feasible) is deemed imperative in efforts to conserve the limited agricultural resources in line with the CARA.								 Due to the extent of the proposed expansion projects, mining (i.e., opencast pits excavation) should done in a phased manner and concurrent rehabilitation should occur as far as practically possible. This will allow the post closure land uses to potentially commence on the rehabilitated portions. Direct surface disturbance of the identified arable soils can be avoided where possible to minimise loss of arable soils.						
	6		Loss of Agricultural Land Capability (Exploration Activities specifically) The majority of the soils that will be subjected to exploration activities are shallow (i.e., Coega/Knersvlakte. Mispah/Glenrosa) and not suitable for cultivation. Even though grazing can still occur in the soils, the grazing capacity is low (14ha/LSU) and as such it is not considered sufficient for viable commercial farming unless intensive management practices are implemented. From a soil, land use and land capability point of view, the overall impact significance of the proposed exploration activities is anticipated to be low after mitigation measures have been implemented during all phases of development.	N	-1	-4	-3	-3	-11	R	No construction or project related activities may be undertaken outside of the demarcated areas. Clean and dirty water systems must be established prior to construction. Due to the extent of the proposed expansion projects, mining (i.e., opencast pits excavation) should done in a phased manner and concurrent rehabilitation should occur as far as practically possible. This will allow the post closure land uses to potentially commence on the rehabilitated portions. Direct surface disturbance of the identified arable soils can be avoided where possible to minimise loss of arable soils.	N	-1	-1	-2	-1	-5

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		Flora Habitat	Loss of Habitat and Ecosystem Characteristics Specialist impact rating: Calcrete Shrubland (low significance impact) Open Thornveld (low significance impact) Rupicolous Habitat (low significance impact) Transformed Habitat (very low significance impact)	N	-1	-3	-3	-1	-8	CbA	Adhere to the measures presented under soil impacts.	N	-1	-1	-2	-1	-5
											Adhere to the measures presented under hydrological impacts (especially by implementing storm water management measures).						
											Adhere to the management measures presented for air quality management.						
											The construction camp and laydown areas must be included in the final layout plan and placed outside of sensitive habitat as identified in the biodiversity assessments						
											Vegetation clearance and commencement of construction activities should either be scheduled to coincide with low rainfall conditions when erosive stormwater is anticipated to be limited or alternatively stormwater controls must be established at the start of construction and dust suppression implemented.						
											As far as construction areas should be accessed through the existing road network						
											Minimise loss of indigenous vegetation where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as other specialist studies. Therefore, during the surveying and site-pegging phase of the proposed mining activities, all floral SCC that will be affected must be marked and where possible, relocated to suitable habitat surrounding the disturbance footprint. The relevant permits must be applied for within the relevant province as indicated in the baseline floral assessment, prior to the construction phase.						
											Clearing of vegetation should take place in a phased manner as to keep bare soil areas as small as possible to limit the erosion potential.						
	1, 2										It must be ensured that, as far as possible, all proposed infrastructure, including temporary infrastructure, is placed outside of sensitive habitat units.						
											Should any protected floral species be encountered within the proposed development footprint areas, permits should be obtained from						

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											NCDENC and DFFDE to remove, cut or destroy any protected tree species before construction of infrastructure takes place.						
											Access roads should be kept to existing roads, as far as possible, so as to reduce fragmentation of natural habitat outside of the authorised footprint.						
											Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site.						
											No dumping of litter, rubble or cleared vegetation on site should be allowed. Infrastructure and rubble removed because of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility.						
											If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil.						
											Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation: • Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction and operational phases. AIPs should be cleared within the focus area before any vegetation clearing activities commence, thereby ensuring that no AIP propagules are spread with construction rubble, or soils contaminated with AIP seeds during the construction phase; and • An AIP Management/Control Plan should be implemented by a qualified professional. No uncertified chemical						

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											control of AIPs to occur within the watercourses. Ongoing AIP monitoring and clearing/control should take place throughout all phases of the project activities and within a 20m buffer of all activities. The project perimeters should regularly be checked for AIP proliferation to prevent spread into surrounding natural areas; and Management of AIPs during the construction-phase and operational-phase activities must be focused on limiting their introduction and preventing their spread. For example, roadsides should be monitored, as they serve as common corridors along which AIP species are introduced and dispersed, and disturbed areas should regularly be monitored for AIP recruitment until successfully rehabilitated						
	3		Loss of Habitat and Ecosystem Characteristics Specialist impact rating: Natural Habitat (Calcrete Shrubland, Open Thornveld, Rupicolous Habitat) (medium-low significance) Watercourse Habitat (Cryptic Wetlands) (medium-low significance) Non-watercourse Habitat (Preferential flow paths, recharge zone and Seasonal Depressions) (low significance) Modified Habitat (Transformed Areas and Degraded Thornveld) (very low significance)	N	-1	-3	-3	-3	-10		A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation.	N	-1	-1	-1	-2	-5
	4&5		Loss of Habitat and Ecosystem Characteristics Specialist impact rating: Natural Habitat (Calcrete Shrubland, Rupicolous Habitat) (low significance) Non-watercourse Habitat (Preferential flow paths, recharge zone and Seasonal Depressions) (low significance) Modified Habitat (Transformed Areas and Degraded Thornveld) (very low significance)	N	-1	-3	-3	-1	-8		Any department wishes to clear new areas or construction new infrastructure should supply new endemic tree species or plants to the Environmental Department to be planted in areas earmarked for rehabilitation. In terms of ongoing rehabilitation: - Rehabilitation of natural vegetation should proceed in accordance with the rehabilitation plan – concurrent rehabilitation is recommended. This rehabilitation plan should consider all phases of the project indicating rehabilitation actions to be undertaken during and once construction has been completed, ongoing rehabilitation during the operational phase of the project as well as rehabilitation actions to be undertaken after operations have ceased;	N	-1	-1	-1	-2	-5

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											Appropriate shaping of disturbed areas is essential. To promote successful establishment of vegetation, the slopes must not be steeper than 1(V):5(H) or 1(V):3(H) (depending on engineering input and recommendations). New slopes should resemble/mimic the natural topography of the surrounding area. Where slopes are left steeper than what is recommended for whatever reason, additional measures will be required to prevent soil erosion and to appropriately manage stormwater; • Any natural areas beyond the direct footprint, which have been affected by the construction or operational activities, must be rehabilitated using indigenous species; • Floral monitoring should be done annually during operational activities; • Rehabilitation must be implemented concurrently as per the rehabilitation plan, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and costs associated with it; and • All soils compacted because of construction activities falling outside of the project area should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas.						
											No illicit fires must be allowed during the operational phases of the proposed project						
											Fire breaks should be maintained during the construction and operational phases.						
											An effective dust management plan must be designed and implemented to mitigate the impact of dust on flora throughout the construction phase.						
											Dust pollution have been associated with poor photosynthetic functionality in plants5. There is evidence of dust pollution leading to a reduction in chlorophyll, including chlorophyll degradation and reduced photosynthetic activity, resulting from dust deposition on leaf surfaces. Dust deposition also result in stomata clogging, which causes a decreased rate of carbon dioxide						

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											exchange, carbon assimilation, transpiration, and therefore decreased net photosynthesis.						
	6		Loss of Habitat and Ecosystem Characteristics Specialist impact rating: Calcrete Shrubland (low significance impact) Open Thornveld (low significance impact) Rupicolous Habitat (low significance impact) Transformed Habitat (very low significance impact)	N	-1	-3	-3	-1	-8		To limit edge effect impacts to the surrounding natural habitat, the below guidelines must be followed: - Demarcating all footprint areas during construction activities; - No construction rubble to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility; All soils compacted as a result of construction activities should be ripped, profiled and reseeded; - Suppress dust to mitigate the impact of dust on flora within a close proximity of construction activities; - Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil; and - Manage the spread of AIP species and bush encroachers, which may affect remaining natural habitat within surrounding areas.	N	-1	-1	-1	-2	-5
	1, 2	Flora SCC	Loss of Species of Conservation Concern Specialist impact rating: Calcrete Shrubland (*Boscia albitrunca* and *Vachellia erioloba*) (medium-low significance impact) Open Thornveld (*Boophone disticha, Boscia albitrunca, Orbea* sp., *Vachellia erioloba*, Potentially *Euphorbia cf. duseimata* and *Harpagophytum procumbens*) (medium-low significance impact) Rupicolous Habitat (Potentially *Boscia albitrunca*) (low significance impact) Transformed Habitat (very low significance impact)	N	-1	-3	-3	-1	-8	CbA	A list and photographic illustration of all identified and probable SCC should be visually placed on site. The rescue and relocation plan must be implemented on site. The disturbance footprint must be kept as small as possible in order to minimise impact on the surrounding environment (edge effect management). All areas of increased ecological sensitivity beyond the approved footprint must be designated as No-Go areas and be off-limits to all unauthorised construction vehicles and personnel. Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint. No additional habitat is to be disturbed during the operational phase of the project outside of the demarcated approved footprints (being applied for). Biweekly (recommended) to monthly (minimum requirement) monitoring and recording of the footprint areas must be done by the ECO and photographic records kept – special attention should also be paid to potential	N	-1	-1	-1	-2	-5

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											increase and spread of alien vegetation and bush encroachment.						
											Prior to the removal of plant species, the Mine should appoint an ecologist to monitor and oversee the removal of all identified protected species, which should be removed under tree removal permits. All such species should be demarcated by signage or tape.						
											Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal.						
											No collection of indigenous floral species must be allowed by construction personnel, especially with regard to floral SCC.						
											No dumping of litter, rubble or cleared vegetation on site must be allowed. Infrastructure and rubble removed as a result of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. Waste disposal containers and bins should be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility.						
											any spills occur, they should be cleaned up immediately to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil.						
											Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area.						
											Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles.						

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											If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.						
											A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation.						
											A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation.						
	3		Loss of Species of Conservation Concern Specialist impact rating: Calcrete Shrubland (*Boscia albitrunca, Olea europaea* subsp. *africana, Ruschia calcarea, Vachellia erioloba*) (Medium-high significance impact) Open Thornveld (*Boophone disticha, Boscia albitrunca, Oxalis* sp., *Vachellia erioloba* (potentially *Orbea* and *Euphorbia* species) (Medium-high significance impact) Rupicolous Habitat (*Anacampseros filamentosa, Aloe hereroense, Aizoaceae, Ammocharis cf. coranica, Boscia albitrunca, Babiana bainesii, Euphorbia cf. rhombifolia, Gladiolus permeabilis* subsp. *edulis, Nymania capensis, Olea europaea* subsp. *africana, Vachellia erioloba*) (medium-high significance) Watercourse Habitat (Cryptic Wetlands) (*Nerine laticoma, Vachellia erioloba, Olea europaea* subsp. *africana*) (medium-high significance) Non-watercourse Habitat (Preferential flow paths, recharge zone and Seasonal Depressions) (*Vachellia erioloba* and *Nerine* sp.))(medium-low significance)	N	-1	-3	-4	-4	-12		Any department that wishes to clear new areas or construct new infrastructure should supply new endemic tree species or plants to the Environmental Department to be planted in areas earmarked for rehabilitation.	N	-1	-1	-2	-2	-6

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Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			Modified Habitat (Transformed Areas and Degraded Thornveld) *Vachellia erioloba* and *Aloe grandicornuta* (medium-low significance)														
	4&5		Loss of Species of Conservation Concern Specialist impact rating: Calcrete Shrubland (Aizoaceae, *Boscia albitrunca, Vachellia erioloba*) (low significance) Rupicolous Habitat) (*Boscia albitrunca*) (low significance) Non-watercourse Habitat (Preferential flow paths, recharge zone and Seasonal Depressions) (low significance) Modified Habitat (Transformed Areas and Degraded Thornveld) (low significance)	N	-1	-3	-3	-1	-8		Monitoring of any rescued and relocated floral SCC should commence during the construction phase and continue unit it is evident that relocated species have successfully established	N	-1	-1	-1	-2	-5
	6		Loss of Habitat and Ecosystem Characteristics Specialist impact rating: Calcrete Shrubland (low significance impact) Open Thornveld (low significance impact) Rupicolous Habitat (low significance impact) Transformed Habitat (very low significance impact)	N	-1	-3	-3	-1	-8		Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed development footprint area.	N	-1	-1	-1	-2	-5
	1, 2	Fauna Habitat	Loss of Habitat for Faunal Species Specialist impact rating: Calcrete Shrubland and Open Thornveld Habitats (medium-high significance) Transformed Habitat (low significance) Rupicolous Habitat (medium-high)	N	-2	-3	-4	-3	-12		Prior to vegetation clearing activities in the natural vegetation units the site should be inspected for the presence of mammal and scorpion burrows, reptiles and baboon spiders. If located, these species should be carefully flushed out or excavated ensuring no harm to the specimens, and relocated to similar surrounding habitat outside of the disturbance footprint area. Clearing of vegetation should take place in a phased manner. This will allow for faunal species within the Railway Line Link Project to flee and avoid harm. A suitable rescue and relocation plan should be developed and overseen by a suitably qualified specialist should SCC be identified within the focus area in order to ensure that species loss during construction activities is kept to a minimum. Faunal habitat beyond the demarcated area should not be cleared or altered	N	-1	-2	-1	-3	-7

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
	3		Los of Habitat for Faunal Species Specialist impact rating: Calcrete Shrubland, Open Thornveld, Rupicolous Habitat (High significance) Cryptic Wetland (high significance) Non-watercourse Habitat (high) Degraded Habitat (medium low) Transformed Habitat (low)	N	-2	-3	-4	-3	-12		Smaller species such as scorpions and reptiles will be less mobile during rainfall events and cold days (winter) and as such will not readily able to move out of an area ahead of ground clearing activities. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own.	N	-1	-2	-2	-3	-8
	4, 5		Loss of Habitat for Faunal Species Specialist impact rating: Calcrete Shrubland Habitat (medium-low) Preferential flow path (low) Degraded Habitat (low) Transformed habitat (very low) Rupicolous Habitat (low)	N	-1	-2	-4	-2	-9		Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimum.	N	-1	-1	-1	-2	-5
	6		Loss of Habitat for Faunal Species Specialist impact rating: Modified Habitat Unit (very low) non-watercourse habitat (low) Natural habitats (calcrete shrubland and open thornveld) (medium-low)	N	-1	-2	-3	-3	-9		All future prospecting activities should remain outside if the cryptic wetlands and the seasonal depressions, including their regulated zones, unless duly authorised to do so. No hunting or trapping of faunal species is to be allowed by construction personnel.	N	-1	-1	-1	-2	-5
	1, 2	Fauna SCC	Impact on Faunal SCC (considered medium-low)	N	-1	-2	-3	-3	-9		Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed. Whilst few to no faunal species were observed within the assessed in the CWs during the site visit, as noted in Section 2.e.iii.6.e, features such as those identified in the study area are noted to be important habitat for various Branchiopod species in the region, which are able to withstand extended periods of desiccation. Confirmation of the presence of these invertebrates by means of hatching out eggs under laboratory conditions did not form part of the scope of work thus their presence or absence in this group of CWs cannot be ruled out without further investigation; however, Branchiopods and tadpoles were found in CW 14, inferring that they may be present in the other CWs assessed. It is therefore strongly	N	-1	-1	-1	-2	-5

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Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											recommended that: 1. Sampling of the cryptic wetlands to determine the presence (or absence) of macroinvertebrates be undertaken. 2. Sampling under dry conditions can be achieved by obtaining soil samples from the top layer (0-50 mm) of soil within each CW, which would hold the egg banks of any invertebrates present. 3. These soils samples are then processed under laboratory conditions to hatch out and enumerate the invertebrate taxa present. 4. Should invertebrate taxa be present, a detailed rescue and relocation plan should be developed by a suitably qualified specialist, to relocate egg banks, either to cryptic wetlands that will be undisturbed, or to recreated wetlands (refer to the figure overleaf for a concept diagram). Such a rescue and relocation plan could potentially form part of and offset initiative, which could be on site or also potentially be included at the Doornfontein property should it be required by the relevant authority.						
	3		Impact on Faunal SCC is considered medium-low	N	-1	-1	-1	-2	-5		No trapping or hunting of fauna whatsoever must be allowed.	N	-1	-1	-1	-2	-5
	4, 5		Impact on Faunal SCC is considered low	N	-1	-1	-1	-2	-5		Should the presence of any faunal SCC be noted, or their breeding sites be located, notably ground dwelling or nesting species, within the development footprint a suitably qualified specialist should be consulted on the best way to proceed.	N	-1	-1	-1	-2	-5
	6		Impact on Faunal SCC is considered medium-low	N	-1	-1	-1	-2	-5		At a minimum a short herbaceous layer must be maintained around the Railway Line Link Project so that a semblance of faunal habitat is reinstated in these areas. All infrastructure and footprint areas should be rehabilitated in accordance with a rehabilitation plan compiled by a suitable specialist. Faunal and floral monitoring should be done annually. Ensure habitat connectivity is not compromised by maintaining movement corridors between the various habitat units as far as possible. All areas of increased ecological sensitivity beyond the approved footprint must be designated as No-Go areas and be off-limits to all unauthorised construction vehicles and personnel. Vehicles should be restricted to travelling only on designated roadways to limit the ecological	N	-1	-1	-1	-2	-5

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											footprint of the development activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimum. No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIPs.) to be carefully collected and disposed of at a separate waste facility. If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line and faunal recolonisation. In the event of a breakdown, maintenance of vehicles must take place with care, and the collection of spillages should be practised preventing the ingress of hydrocarbons into the topsoil. It is recommended that a monitoring program be developed during the operational phase to detect any changes to species compositions in the area, and where appropriate initiate mitigation / management measures to minimise impacts to these species. Should any other faunal species protected under the NEMBA or the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) be encountered, construction should be halted and authorisation to relocate such species must be obtained from relevant authorities. No collection of faunal SCC may be allowed by construction or operational personnel						
	2, 3	Riparian Habitat & Wetlands (Pans)	Expansion of Village Pit WRD, West Pit WRD and East Pit WRD Construction of clean and dirty water separation systems around the downgradient boundaries of the respective WRDs to direct clean stormwater run-off around and away from the WRD, and the clearing and levelling of land for the expansion of the Village Pit WRD within 100 m of CW 21, for expansion of West Pit WRD within 380 m of CW17 and for expansion of East Pit WRD within 150 m - 225 m of CWs 2, 10 and 11 and the removal of topsoil from WRD expansion areas, and stockpiling thereof for rehabilitation, could result in the following:	N	-1	-3	-4	-5	-13	ID	Soil must not be exposed for longer than is necessary. Ongoing research in terms of the practical rehabilitation practices to achieve the final land use commitments (wilderness) and investigate measures to ensure aquatic-ecological continuation after mining, including participate in ongoing research to better understand the strategic water setting and cryptic wetlands in this area. An action plan for the construction or offsetting of cryptic wetland should be developed during this phase. This may necessitate the recreation of these systems, as is discussed in further detail below – an opportunity to undertake this task on the Doornfontein property could be considered. Construction-related waste must not be stored on site, and must be removed and disposed of in	N	-1	-3	-4	-2	-10

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Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			*Exposure of soil, leading to increased runoff, erosion and wind-borne sediment, and thus potential increased sedimentation of the CWs; *Increased sedimentation of CW habitat, leading to smothering of flora and benthic biota and potentially altering surface water quality when water is present; *Decreased ecoservice provision; and *Proliferation of alien vegetation or encroacher species as a result of disturbances.								accordance with existing approved Beeshoek waste management policies.						
			Expansion of Village Pit may result in the following: *Direct loss of CW habitat, specifically CWs 15 and 21; *Damage to or direct loss of vegetation, leading to exposure and compaction of soil, in turn leading to increased risk of wind erosion and wind-borne sediment reaching surrounding CWs; *Increased sedimentation of the surrounding CWs may lead to changes to habitat, potentially altered surface water quality, smothering of vegetation and/or altered vegetation composition and altered macroinvertebrate assemblages (if present in the affected CWs); *Decreased ecoservice provision; *Decreased ability to support biodiversity; and *Proliferation of alien vegetation as a result of disturbances.	N	-1	-3	-4	-5	-13	ID	The catchments of all identified watercourses must be determined by a suitably qualified specialist, and as far as feasible, no activities must be permitted within the delineated catchments. Contractor laydown areas, and material storage facilities to remain outside of the CWs located beyond the extent of the planned Opencast Pit expansion. All vehicle re-fuelling is to take place outside of the outside of the CWs located beyond the extent of the planned Opencast Pit expansion. All clean and dirty water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation. All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential. Retain as much indigenous vegetation as possible. An action plan for the construction or offsetting of cryptic wetland should be developed during this phase. This may necessitate the recreation of these systems, as is discussed in further detail below – an opportunity to undertake this task on the Doornfontein property could be considered. The watercourse areas and their associated catchments beyond the proposed footprint of expansion should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas.	N	-1	-3	-4	-2	-10
			Expansion of Village Pit and the associated blasting may result in the following: *Altered water quality of adjacent CWs (to the south) as a result of wind-borne	N	-2	-2	-3	-4	-11	CbA	During construction, the topsoil should be removed up to the depth determined by the specialist soil and land capability assessment (ZRC, 2021) and be carefully stockpiled, for use during rehabilitation, away from any CWs beyond	N	-1	-2	-2	-2	-7

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Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			sediments, nitrates from blasting and so forth; and *Increased sedimentation and erosion resulting from altered run-off patterns or wind-borne transportation to adjacent CWs may have a negative impact on geomorphological processes, habitat and/or biota.								the footprint of the expansion and their catchments. Excavated materials should not be contaminated and it should be ensured that the minimum surface area is taken up. Soil should be stockpiled in line with the Soil Management Measures presented before. All exposed topsoil must be protected for the duration of the construction phase in order to prevent erosion and further sedimentation of the reach of the watercourses proximal to these stockpiles.						
			Future Strategic Exploration Block (Exploration Drilling) could lead to the altered drainage patterns due to reduced vegetation cover and increased impermeable surfaces; risk of contaminated storm water runoff (e.g. hydrocarbons, sediment, originating from impermeable surfaces) entering the cryptic wetlands. This may lead to: *Potential direct loss of cryptic wetland habitat (where drill sites encroach on delineated boundary thereof); *Increased hardened surfaces within the catchment of various cryptic wetlands and compacted soils thus reducing integrity of interflow. *Localised landscape alterations within the catchment of affected cryptic wetlands, potentially leading to loss of recharge as surface water is directed away from CWs, and/or formation of preferential surface flow paths leading to erosion; *Increased surface water runoff, leading to erosion, and sedimentation of freshwater resource habitat. *Loss of foraging and breeding habitat within the catchment of cryptic wetlands for wetland-dependent fauna. *Proliferation of alien vegetation as a result of disturbances.	N	-1	-2	-3	-2	-8	CbA	Ensure that drill rig and laydown area footprint does not encroach on cryptic wetland habitats and that vegetation clearing is limited to essential areas only. Ensure soil management programme is implemented and maintained to minimise erosion and sedimentation. Active re-vegetation of disturbed areas immediately after drilling is completed. Vegetation covers on all topsoil stockpiles. Implement and maintain an AIP management programme.	N	-1	-1	-2	-1	-5
			Stockpiling of topsoil, earthworks, movement of vehicles within delineated cryptic wetlands and their catchments as a result of the Future Exploration drill sites may lead to: *Increased water inputs to cryptic wetlands in the vicinity of drill pad;.	N	-1	-3	-3	-3	-10	CbA	Limit clearing of vegetation to what is absolutely essential in order to retain as much vegetation cover as possible; Implement and maintain soil management programme to minimise risk of erosion.	N	-1	-1	-2	-1	-5

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			*Possible contamination of surface water runoff from drill pads; *Possible erosion/incision of the cryptic wetlands adjacent to drill pads due to concentration of storm water runoff.														
			Future Strategic Exploration Block (Exploration Drilling) could lead to potential disposal of hazardous and non-hazardous materials in cryptic wetlands (although highly unlikely). This could result in: *Altered water quality, possible changes to flow patterns as a result of blockages caused by solid waste/rubble; and *Possible damage to or smothering of macroinvertebrate egg banks, leading to impacts on macroinvertebrate and faunal assemblages.	N	-1	-3	-3	-3	-10	CbA	No waste materials are permitted to be disposed of within any cryptic wetland habitat, and all waste materials must be disposed of at an appropriate disposal facility. All cryptic wetland habitats in the vicinity of the drill rig footprint are to be designated "No Go" areas and off-limits to all personnel and vehicles.	N	-1	-1	-2	-1	-5
			Removal of topsoil from drill sites, and stockpiling thereof for rehabilitation may result in the increased risk of transportation of sediment from exposed soils in wind or storm water runoff, leading to increased turbidity of surface water, sedimentation of cryptic wetlands, smothering of vegetation and/or altered vegetation composition and smothering of macroinvertebrate egg banks.	N	-1	-3	-3	-3	-10	CbA	No stockpiles may be placed within the cryptic wetlands. Temporary stockpiles must be protected by means of suitable geotextiles such as hessian sheeting, silt curtains, sandbags etc. to prevent contamination of runoff and sedimentation of cryptic wetlands in the vicinity of the drill rigs All stockpiles which are to remain on site post-construction are to be suitably managed to prevent erosion, either through managing the height and slope ratios, or through establishing indigenous vegetation. The recommendations of the specialist soil and land capability study (ZRC, 2021) must be followed in this regard.	N	-1	-1	-2	-1	-5
			Expansion of existing detrital area to the south and east of the current location may result in: • Sediment-laden runoff or wind-borne sediment entering riparian habitat leading to altered water quality, and changes to aquatic habitat; and • Altered drainage/flow regimes, leading to altered runoff patterns and formation of preferential flow paths, leading to further erosion.	N	-1	-1	-2	-2	-6	CbA	See management measures for drill sites and opencast pit expansions above.	N	-1	-1	-2	-1	-5
	2, 3, 4, 5, 6	Hydrology	Removal of vegetation for the pits, WRDs and associated infrastructure. Stripping and stockpiling of topsoils, may result in erosion of exposed soils leading to	N	-2	-1	-2	-2	-7	CbA	Vegetation clearance should be kept to an absolute minimum.	N	-1	-1	-1	-1	-4

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			siltation and sedimentation of downslope drainage channels.								Temporary erosion measures should be employed at exposed areas. Exposed areas should be vegetated as soon as possible. The topsoil stockpiles must be managed according to a topsoil management plan and should be vegetated.						
	1, 2, 3, 4, 5, 6		Use of heavy machinery, trucks and vehicles for construction purposes, could lead to potential hydrocarbon spillages washed into downslope drainage channels.	N	#	#	-2	#	-8	CbA	Machinery, trucks and vehicles must be well maintained and serviced regularly as per a recommended service guide. Refuelling must be undertaken over hard park bunded areas that adequately sized to capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be employed under stationary machinery. Spillages should be reported immediately, and spill kits should be readily available at all times.	N	#	#	-1	#	-4
	2, 3		Alteration in the natural topography through the development of the pits and WRDs.	N	-2	-3	-3	-3	-11	CbA	Opencast Pits and WRDs should be kept to minimum footprint area. The creation of steep slopes should be avoided as far as possible. Culverts should be placed at topographically low positions to allow for suitable drainage.	N	-1	-2	-1	-1	-5
	-	Geohydrology	No direct impact during the construction phase.	-	-	-	-	-	-	-		-	-	-	-	-	-
	2, 3, 6	Heritage	The study area is known for the presence of graves and heritage artefacts. The Screening assessment also indicated the importance of paleontological themes. During the Phase 1 Site investigation no areas of concern were identified.	N	-3	-3	-3	-4	-13	CbA	In the event that any other heritage artefacts or graves are encountered during the excavation activities, all activities must cease and the SAHRA should be contacted to determine the way forward before construction may continue. The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP. This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must	N	-1	-1	-2	-1	-5

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Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below. • If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. • It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area. • The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP.						
											It is recommended that the Strategic exploration area should be subjected to a heritage walk through prior to development.						
											Graves and cemeteries (BH26 and BH27) should be retained in situ with access for family members and a sufficient buffer zone.						
											Although unlikely, the recorded stone cairns (BH12 and BH24) could represent graves and should be confirmed during the social consultation process.						
	2, 3, 4, 6	Visual	Removal of vegetation for the pits, WRDs and associated infrastructure. Stripping and stockpiling of topsoils, which will create dust.	N	-2	-1	-2	-2	-7	CbA	Vegetation clearance should be kept to an absolute minimum. Exposed areas should be vegetated as soon as possible. Dust suppression measures should be implemented to limit the generation of dust.	N	-1	-1	-1	-2	-5

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			The movement of vehicles and heavy machinery during the construction phase will create a visual presence and will generate dust.	N	-2	-1	-2	-2	-7	CbA	Machinery, trucks and vehicles are already present on the Mine site and are unlikely create any additional significant presence. Dust suppression measures should be implemented to limit the generation of dust.	N	-1	-1	-1	-1	-4
	1, 2, 3, 4, 5, 6	Air Quality	Direct impact: Dust-fallout	N	-2	-2	-3	-2	-9	CbA	Utilised the existing monitoring network to monitor dust fall out in and around the construction area, or adjust the monitoring network in line with the recommendations by the Air Quality Specialist. Strictly enforced speed limits on all roads - not to exceed 40km/ hr. All areas, especially with the exploration activities, should be rehabilitated once construction has been compiled, and in the case with the drilling pads, once the drilling activities at that pad had been concluded. Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast. Limit site clearance to designated areas.	N	-1	-1	-2	-1	-5
	1, 2, 3, 4, 5, 6	Noise	The area is located within the mining area. Noise impacts are not considered to be significant but can occur during excavation and construction activities.	N	-1	-2	-1	-1	-5	CbA	Equipment will be well maintained to reduce excessive noise creation. ·Maintenance of vehicles and machinery should be done regularly. Activities will be restricted to the day time.	N	-1	-1	-1	-1	-4
	1, 2, 3, 4, 5, 6	Social	A temporary increase in the concentration of workers will thus occur e.g., during the construction of the haul roads and decommissioning of the existing sections of haul roads, construction of the railway link line as well as the service relocations. New opportunities for short-term contract work could thus be generated for some periods of time as there would be around 20-70 unskilled personnel required at certain stages for the new mining infrastructure. This figure could increase with the construction of the railway link line and bridge at the R385. Locals could be part of the specialist contractor teams involved in the short-term contracts.	N	#	#	-3	#	-10	CbA	Contractors are expected to house their employees in existing housing facilities in Postmasburg and surrounds. Due to the number of individuals that would be involved on a temporary basis, no new accommodation facilities would be required. Prioritise any possible new local labour in the recruitment process as part of the company's own recruitment policy or as part of the contractor management plan and stipulate the procurement of new employees, especially in the unskilled category, from the local communities Provide up-skilling opportunities for unskilled and semi-skilled local workers during the construction phase to allow them to become more employable for operational activities. Explore possible placement of local construction workers in mining operations.	P	3	1	3	3	10
			The inflow of temporary workers, the inflow of individuals to the study area in search of employment, as well as the	N	#	#	-2	#	-8	CbA	Maximise the use of local labour and contractors where possible by developing a strategy to involve local labour in the construction process.	N	#	#	-2	#	-7

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			potential conflict between locals and individuals from outside the study area during the construction/start-up phase. Over time, the Tsantsabane Local Municipality has experienced high development backlogs as a result of the increasing population and socio-economic growth driven by the inflow of outsiders to the area in search of employment in the solar and mining sectors. This has resulted in massive pressure on the delivery of basic services within the municipal area. The proposed Beeshoek Optimisation project, however, has as purpose the continuation of the mining activities within the existing mining rights boundary and to sustain the existing production capacity over time. No new areas will be opened up for mining, no new significant open cast pits will be developed and mining activities will be undertaken within the existing mine boundary. As indicated under Section 7.1, there will be limited new employment opportunities during the construction period with subsequent limited direct and controlled inflow of people to the area. The informal population influx is difficult to mitigate and cannot be attributed to the Beeshoek Optimisation project, as it is an existing impact in the region. However, construction related projects and mining focused areas usually attract jobseekers from within the study area or even from other provinces even prior to construction commencing. This situation is usually worsened by exaggerated rumours of possible employment opportunities. It is thus likely that the area continues to have an informal inflow of some jobseekers to the Postmasburg and surrounding area, due to the various mining activities within the area, but no significant additional formal and informal inflow of jobseekers is expected as a direct result of this project.								The development, publication and widespread dissemination of a recruitment policy could serve to encourage local employment and reduce the potential influx of jobseekers to the area. The communication strategy should ensure that unrealistic employment expectations are not created. A representative of Beeshoek Mine could liaise with the local leaders and local councillors to either attend key community meetings arranged within the affected wards to discuss the possible employment and recruitment process; or liaise with the local leaders and local councillors to ensure that the correct information regarding this issue is portrayed to the communities. Beeshoek Mine should, where possible, support efforts by TLM to limit squatting and sub-letting in the area, e.g., no informal settlements should be allowed within the mining rights area. As per the Beeshoek SLP, the Beeshoek Mine has through the Khumani Housing Development Company, built 357 homes in the main residential areas of Postmasburg, namely Boichoko (51), Postdene (163) and Airfield (143). Beeshoek Mine plans to continue with this strategy and has stipulated the plans in the SLP. Beeshoek Mine must continue with their assistance in the provision of housing infrastructure as discussed in the Assmang Iron Ore Social and Labour Plan for Beeshoek Iron Ore Mine: 2019-2024. Review and updates of the SLP after 2024 must specify efforts by Beeshoek Mine to continue to seek sustainable and collective solutions to the issue of housing for employees and other housing challenges in the area. There should be ongoing engagements between Beeshoek Mine, the relevant housing forums and working groups, as well as the Tsantsabane Local Municipality with regards to housing policies, models and challenges.						

Name of Activity	Project	Impact Area	Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
	6		Traffic Movement Impacts - Traffic movement will be disturbed and possibly be delayed during the construction of the temporary road deviation when construction of the road bridge associated with the railway link line on the R385 commences. The R385 is used to access Beeshoek Mine, as well as Postmasburg. It further serves as link road to the access road to Kolomela Mine. The R385 thus serves public users, as well as mine related traffic volumes. The negative impact on the road users, however, will be of a short duration.	N	-2	-1	-4	-3	-10	CbA	Unauthorised entry onto the mining area must not be allowed. Access control should continue to be implemented. Mining areas must be secured and fenced. All construction vehicles should be in a good condition and adhere to road worthy standards. Construction vehicles must keep to speed limits. Limit construction hours to daylight hours e.g., 6am to 6 pm. Road users must be notified if delays would be experienced due to the road bridge construction. Warning signs with regards to the construction activities need to be erected at strategic places along the R385 and must be clearly visible at night. Road deviations must be clearly indicated by road signs and must be clearly visible at night. Access to the R385 and Olifantshoek Road to Kolomela Mine must be ensured at all times. Access to the Tommy's Field Airport must be ensured at all times. Temporary closure of the Tommy's Field Airport and the impact on flight patterns should be communicated to all parties involved and alternative available airport options must be finalised. Speed limits around the construction sites should be lowered for the duration of the construction period. The construction schedule of the railway link line and bridge on the R385 must be discussed and finalised in consultation with directly affected landowners and Kolomela Mine.	N	-2	-1	-2	-2	-7
	1, 2, 3, 4, 5, 6		Dust nuisance - please refer to air quality section.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4, 5, 6		Noise impacts - please refer to noise section.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Establishment of Infrastructure	-	Geology	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4, 5, 6	Topography	During the site clearance activity, the required storm water management systems and shaping of land would have been completed. Therefore no further impact on the topography is expected	-	-1	-3	-3	-2	-9	R	Activities should be constructed and developed within the approved design concepts. Note that laydown areas will only be constructed in areas which are demarcated for permanent activity construction to ensure that no additional areas are disturbed.	N	-1	-1	-2	-1	-5
	4, 6		Alteration in the natural topography through the construction of infrastructure	N	-2	-3	-3	-3	-11	CbA	Infrastructure should follow that natural topography where possible.	N	-1	-2	-1	-1	-5

Name of Activity			**Potential Impacts**	**Rating Pre Measures**							**Mitigation Type**	**Rating Post Measures**					
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SaM**
			associated with the two additional Plants, as well as the railway line.								The creation of steep slopes should be avoided as far as possible. Culverts should be placed at topographically low positions to allow for suitable drainage.						
	-	Soil, Land Use and Land Capability	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Terrestrial Ecology (Fauna & Flora)	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Riparian Habitat & Wetlands (Pans)	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Hydrology	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4, 5, 6	Geohydrology	Direct impact. The use of waste rock in the compaction of the roads and surface footprints should not lead to an impact on the groundwater resources as the material is not considered a pollutant.	-	-2	-3	-1	-1	-7	CbA	Groundwater monitoring should be undertaken to ensure that the facilities are operated in manner as not to result in pollution plumes.	N	-1	-2	-1	-1	-5
	4		Seepage from Dirty Water Dams and the Staging stockpile at the WHIMS Plant resulting in groundwater contamination.	-	-2	-3	-1	-1	-7	CbA	Groundwater monitoring should be undertaken to ensure that the facilities are operated in manner as not to result in pollution plumes. The Staging Stockpile and the Central Process Water Dam should be designed and constructed with a Class C liner.	N	-1	-2	-1	-1	-5
	-	Heritage	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	
	-	Visual	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	
	-	Air Quality	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	
	-	Noise	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	
	-	Social	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	
Placement of Enviroberms and Safety berms and preparation of WRD footprints	-	Geology	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	Topography	During the site clearance activity, the required storm water management	-	-1	-3	-1	-1	-6	R	Enviroberms should be implemented along the perimeter of the Opencast Pits.	N	-1	-1	-2	-1	-5

Name of Activity	Project	Impact Area	Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			systems and shaping of land would have been completed. The placement of the enviroberms will have a low impact on the environment in terms of topographic impacts.														
		Soil and Land Use	No impact, berms are implemented within haul road boundaries, or along the opencast perimeter. No additional soils are removed other than that for the roads and opencast pits.	-	-	-	-	-	-	R	Management measures for the establishment of roads and opencast pits should be adhered to (this should include erosion management of berms).	-	-	-	-	-	-
			Erosion on the side walls of enviro-berms.	N	-1	-2	-4	-2	-9	CbA	Enviro-berms should only be placed in demarcated areas around the opencast pits. Berm heights will be restricted to 5m. Erosion control measures will be implemented on all stockpiles and self-succession will be encouraged (latter required on enviroberms).	N	-1	-1	-1	-1	-4
		Ecology	No impact is foreseen, berms are implemented within haul road boundaries, or along the opencast perimeter. No vegetation clearance will take place as part of these activities.	N	-2	-3	-1	-3	-9	R	Management measures for the establishment of roads and opencast pits should be adhered to. No activities may take place within 100m of any watercourse or pans unless authorised in the WUL.	N	-1	-1	-1	-1	-4
			Presence of invader species could impact on the natural succession of vegetation on backfilled opencast pits.	N	-2	-3	-4	-4	-13	CbA	An AIP management plan must be implemented on site and enforced (this should include all berms as well). This programme must stipulate the monitoring plan, which should include capturing of areas where invader species are present; action plan to remove these; % successful removal).	N	-1	-1	-3	-2	-7
		Surface Water	Contamination and or siltation of water resources.	N	-1	-2	-1	-2	-6	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or as amended and approved. Incorporation of recommended storm water management measures and the maintenance of all Storm Water Management systems must be undertaken regularly on site.	N	-1	-1	-1	-2	-5
		Groundwater	Contamination of groundwater due to the seepage of water from Mine Residue Deposits used in the construction of berms. The 2017 Groundwater Risk Assessment conducted by GPT, states	N	-1	-1	-1	-2	-5	CbA	The current groundwater chemistry monitoring must be maintained with annual additional analyses of sewage and hydrocarbon related contamination. Vehicles must be well maintained.	N	-1	-1	-1	-1	-4

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			that: "Based on the groundwater quality analyses, solid waste analyses and liquid waste analyses, as well as the statistical analysis of the data, it can be deduced that the chemical signatures of the 3 mediums (groundwater, solid waste and liquid waste) are quite similar. It was found that the constituents found to exceed the relevant screening levels for each of the three mediums are also similar. Also, most of the sources are located within the dewatered area, directing any contaminants towards the active mining areas." It should also be noted that according to the GPT Monitoring Network Evaluation, 2016 the Nitrates are elevated in the groundwater naturally, based on background monitoring data. The nitrate concentrations found exceeded the SANS 241:2015 limits. However, it is proposed that this constituent be added to the monitored parameters in the WUL. The source of the naturally elevated nitrate in the groundwater is currently unknown and is presumed to be a by-product of the vegetation in the area.								All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site Any spills occurring during the collection process must be cleaned up immediately. Any significant spills must be captured in the incident reports and must be reported to the relevant department (NCDENC, WUA, CMA, DWS). A clean up procedure (i.e. Works Instruction) must be in place.						
		Heritage	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waste Management and Handling	-	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrocarbon spills within the Mining Area and the management of Domestic and Hazardous Waste	1, 2, 3, 4, 5, 6	Soils	Contamination of soil resources due to hydrocarbon spills.	N	-1	-2	-4	-4	-11	CbA	Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas.	N	-1	-2	-1	-1	-5

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Regular monitoring of site activities and machinery must be undertaken to identify spills or leaks. Spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans must be developed and be implemented. Withdraw equipment for maintenance if change in emission characteristics is noticeable. All contaminated material at the Exploration Activities, where applicable, must be contained in mobile sumps. The mobile sumps must maintain a suitable freeboard, to ensure when these are moved/transported, that no spillage will occur. All fuels and soils must be stored in appropriate containers. Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements. Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages. Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained. Spill kits (such as spill-sorb or a similar type of product) must be kept on site and used to clean up hydrocarbon spills in the event that they should occur. If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility. Safety signage must be used at designated storage areas. All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.						
			Contamination of soils as a result of a lack of sanitary services.	N	-1	-2	-4	-4	-11	CbA	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to	N	-1	-2	-1	-1	-5

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											remove any contaminated material and or wastes to licensed landfill sites.						
			Handling of building rubble	N	-2	-2	-1	-2	-7	CbA	Building rubble must be disposed of in line with the requirements of the NEMWA. Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. All waste must be removed by licensed contractors and disposed of at a licensed landfill site or be disposed of at a licensed landfill site. As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented. Recycling practices must be investigated and implemented on site where practical.	N	-1	-1	-1	-2	-5
		Ecology	The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	N	-2	-3	-3	-4	-12	CbA	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste. The landfill site at Beeshoek must be operated in line with the ECA license requirements and conditions. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	N	-1	-1	-2	-1	-5
		Surface Water	Handling of Hazardous Waste within workshops, water containment facilities and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.	N	-3	-2	-2	-4	-11	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter. A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. All contaminated material at the Exploration Activities must be contained in mobile sumps.	N	-1	-1	-2	-2	-6

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											The mobile sumps must maintain a suitable freeboard, to ensure when these are moved/transported, that no spillage will occur. Hazardous waste handling should only take place within bunded and/or lined areas. Hazardous waste should be removed by a licensed removal company and taken to a suitable and licenced landfill site. Clean spills, if occur within 24 hours. Documentation of removal and safe disposal must be available on site. The Mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in a legally compliant manner. Notify the relevant regulatory authorities in the event of the occurrence of a reportable incident. Weekly inspections of Storm Water Management systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.						
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	N/A	-1	-2	-3	-3	-9	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter. Waste management training must be implemented on site. Weekly inspections of Storm Water Management systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Access control must be strictly enforced. The landfill site at Beeshoek must be operated in line with the ECA license requirements and conditions. Recycling practices must be investigated and implemented on site.	N	-1	-1	-2	-1	-5
		Groundwater	Large scale hydrocarbon spills could be present at the mining area.	N	-3	-1	-4	-4	-12	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter. No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site. Any spills occurring during the collection process must be cleaned up immediately.	N	-2	-1	-2	-1	-6

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Any significant spills must be captured in the incident reports and must be reported to the relevant department (NCDENC, Catchment Management Agency/DWS).						
											All equipment and machinery should be kept in good working order.						
											A clean up procedure (i.e. Works Instruction) must be in place. Clean spills, if occur within 24 hours.						
			Handling or Hazardous Waste within workshops and general mine area.	N	-2	-2	-2	-4	-10	CbA	Clean and dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	N	-1	-1	-2	-2	-6
											The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators).						
											Waste management training must be implemented on site.						
											Clear signs informing staff of waste management practices must be implemented on site.						
											Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored.						
											Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.						
											Documentation of removal and safe disposal must be available on site.						
			Handling and Storing of Domestic Waste	N	-2	-2	-1	-2	-7	CbA	Clean and dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	N	-1	-1	-1	-2	-5
											Waste management training must be implemented on site.						
											Clear signs informing staff of waste management practices must be implemented on site.						
											All waste must be removed by licensed contractors and disposed of at a licensed landfill site.						
											As a duty of care and adoption of the cradle-to-grave principles, the Mine should regularly inspect disposal site to ensure that best practices are implemented.						
											Recycling practices must be investigated and implemented on site where practical.						

Name of Activity	Project	Impact Area	Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the landfill site can be detected.						
	-	Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4, 5, 6	Visual	Littering around the mining area could result in a reduction in the aesthetic nature of the environment.	N	-2	-3	-3	-2	-10	CbA	Regular inspections must be undertaken to ensure that littering along the mine fence area is managed.	N	-1	-1	-3	-1	-6
	-	Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 73: Potential Impacts and the calculated significance before and after management measures – Operational Phase

Name of Activity	Project	Impact Area	Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Removal of Resources (opencast pit mining)	3	Geology	The removal of iron ore via the opencast pits is a permanent impact on the geology as the mineral resource will not be able to be replaced.	N	-4	-3	-4	-3	-14	I	To ensure that the Mining Works Programme is continuously optimised to mine the minerals optimally. Ongoing research and exploration should be undertaken to ensure the optimal mining practices. These activities should take place within the stipulations of the EMP. Environmental Gap Assessments should be undertaken prior to the initiation of exploration activities or amendment to infrastructure design to ensure that such activities are undertaken in an environmentally lawful manner.	P	4	4	4	3	15
Removal of Resources (opencast pit mining)	3	Topography	Excavations in the landscape to the mining activities.	N	-1	-3	-4	-3	-11	R	Ongoing rehabilitation during opencast mining of the opencast pits, as well as detrital mining on the south mine should be undertaken, via the use of infill of the pits with excess mine residue. These areas should be shaped to be free draining, resembling the natural surface topography. In-fill the pits with excess mine residue. Shaping of the in-filled pits to be free draining, resembling the natural surface topography. Annually revisit the MWP in parallel with the Annual Rehabilitation and Final rehabilitation plan.	N	-2	-2	-2	-1	-7

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Stockpiling of Mine Residue (WRD)	2		Operation of WRD will significantly alter the topography of the area.	N	-3	-3	-4	-3	-13	R	The slopes of the WRD should be operated with a slope of at least 1:3. As far as possible involve ongoing rehabilitation of opencast pits into the mine plan - thereby reducing the requirement to stockpile or deposit mine residue on WRDs. Annually revisit the Mine Work Programme in parallel with the Annual Rehabilitation and Final Rehabilitation Plans.	N	-2	-2	-2	-1	-7
Removal of Resources (opencast pit mining)	3	Dolomite impact on pits	The presence of cavities below the base of Wolhaarkop Formation breccia has been shown to occur on the site. One such large cavern is present as exposed in the BN Pit annex. While this may be a once off occurrence, this cannot be assumed to be the case with any certainty. The occurrence of these is difficult to predict as they occur within the bedrock at the base of the Wolhaarkop chert breccia where solution cavities may be present. Although they are likely to be rare occurrences, they do pose a significant risk to mining activities.	N	-3	-3	-3	-3	-14	CbA	There is evidence that dewatering has had some effect on surface instability on the property. It is recommended that a study be conducted to explore techniques that will aid the identification of potential problems area. Such techniques include inter alia geophysical methods such as a gravity survey to identify low gravity anomalies that will aid identifying voids in bedrock. There is a suggestion from a dewatering borehole near the western pit that a similar cavity may exist at depth in this area too. Investigation of known or suspected features will give a good opportunity to test if such geophysical methods will indicate cavernous conditions and can be used in future to identify these ground conditions in advance so they can be mitigated. The eastern doline can be investigated in a similar fashion to confirm ground conditions that lead to these surface deformation events. The development of a Dolomite Risk Management Plan (DRMP) is recommended to mitigate the risks posed by dolomite related instability and involves devising an appropriate monitoring programme and reaction plan to incidents to mitigate against the risks. Specific recommendations are: • Surface mapping of outcrops and ancillary (potential) geological aspects (surface risk mapping) • Remote sensing/gravity surveys for near-surface and deep risk issues	N	-2	-2	-4	-2	-10
Stockpiling of Mine Residue (WRD) Beneficiation	3, 4, 5, 6	Dolomite impacts on infrastructure	The impact of dolomite related instability on infrastructure is likely to be the highest risk where dolomite bedrock is shallow or underlies a blanketing layer or layers of unconsolidated soils and deposits. This is particularly relevant where water-bearing services are involved and the	N	-3	-4	-3	-3	-13	CbA	Wet services, such as water supply and slurry pipelines delivering waste to the Slimes Dam and stormwater accumulation and ponding, should be monitored especially where they traverse ground where dolomite bedrock	N	-1	-2	-2	-3	-8

Name of Activity	Project	Impact Area	Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Plants Operation Water Management Infrastructure Operation Railway Line Operation			risk of leakage is always possible. Concentrations of surface water such as from stormwater or from unlined impoundments such as tailings storage facilities that are unlined pose a risk. Infrastructure such as roads bridges and pipelines will be at risk due to the presence of a blanketing layer of recent soils which overlie buried karst ground at depth. Leaking services and other concentration of water in the vicinity of infrastructure such as stormwater ponding result in water ingress into the ground causing subsurface erosion into receiving cavities in the dolomite bedrock. A geotechnical investigation of the Beeshoek Slimes embankment wall in a report titled "Beeshoek Iron Ore Mine Tailings Storage Facility - Geotechnical Investigation – SRK Report no. 547755" shows seepage to be occurring through the wall of the embankment. The CSIR InSAR deformation reports show two instances of subsidence within the basin of the Slimes Dam, which is underlain by dolomite at a shallow depth. The relationship between these observations and the risk to stability of the basin and embankments must be established by further investigation.								dolomite outcrops or occurs beneath a blanketing horizon of recent soils or deposits. Small scale surface mapping of which areas of the mine site are underlain or have inferred underlying dolomite will be necessary, if these are not already available, to characterise risk.						
Stockpiling of ROM Material Beneficiation Plants Operation Water Management Infrastructure Operation Railway Line Operation	1, 4, 5, 6	Soil and Land Use	Soil compaction due to the potential movement of service vehicles.	N	-1	-3	-2	-2	-8	CbA	All activities must remain within the approved footprints. A system must be implemented on site to address all significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation. As part of ongoing rehabilitation, compacted soils adjacent to the mining and associated infrastructure footprint should be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation.	N	-1	-1	-2	-1	-5
Stockpiling of Mine Residue (WRD) Removal of Resources (opencast pit mining)	2, 3			N	-1	-3	-3	-2	-9	CbA		N	-1	-1	-2	-1	-5
Stockpiling of Mine Residue (WRD)	2, 3		Soil Erosion Constant disturbances of soils, resulting in detachment of soil particles, reduced soil quality and risk of erosion,	N	-2	-3	-3	-3	-11	CbA	Stockpiled soils should be stored for a maximum of 5 years. Concurrent rehabilitation should strongly be considered to reduce the duration of stockpile storage to	N	-1	-1	-2	-1	-5

Name of Activity	Project		Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Removal of Resources (opencast pit mining)			attributed to mining activities. Ongoing disturbances to soils, resulting in increased sedimentation and risk of erosion, arising from mining activities.								ensure that the quality of stored soil material does not deteriorate excessively; especially with regard to leaching and acidification. Ensure the required erosion protection measures are monitored and corrected where necessary. Ensure the required erosion protection measures are monitored and corrected where necessary. Maintenance of all Storm Water Management systems must be undertaken regularly on site. Where erosion is observed, corrective measures must be put in place. The mine should implement adequate wet suppression techniques to limit dust release. Regulated speed limits of 40km/hr must be maintained on gravel roads to minimize dust generation.						
Stockpiling of ROM Material Beneficiation Plants Operation Water Management Infrastructure Operation Railway Line Operation	1, 4, 5, 6			N	-1	-3	-3	-2	-9		All disturbed areas adjacent to the expansion project infrastructural areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	N	-1	-1	-1	-1	-4
Stockpiling of Mine Residue (WRD) Removal of Resources (opencast pit mining)	2, 3		Soil Contamination due to potential seepage and runoff from mining infrastructure (e.g. overburden) to high potential agricultural soils within the footprint, as well as the potential leakages in equipment/machinery leading to contamination.	N	-1	-3	-3	-2	-9	CbA	Regular monitoring of site activities and machinery must be undertaken to identify spills or leaks.	N	-1	-1	-1	-1	-4
Stockpiling of ROM Material Beneficiation Plants	1, 4, 5, 6										All areas containing hazardous waste must be bunded with a capacity of at least 110% of stored volume. The spill prevention and emergency spill response plan, as well as dust suppression,						

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Operation Water Management Infrastructure Operation Railway Line Operation											and fire prevention plans must be implemented. Any spills occurring during the collection process must be cleaned up immediately. Soil that has been contaminated by spillages, seepages and leachates will be sampled and analysed. If necessary, the soils will be treated, ameliorated or removed for safe disposal. Withdraw equipment for maintenance if change in emission characteristics is noticeable. Spill kits (such as spill-sorb or a similar type of product) must be kept on site and used to clean up hydrocarbon spills in the event that they should occur. Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site.						
Removal of Resources (opencast pit mining)	3			N	-1	-3	-3	-2	-9			N	-1	-1	-1	-1	-4
Stockpiling of Mine Residue (WRD)	2			N	-2	-3	-3	-3	-11		Due to the extent of the proposed expansion projects, mining (i.e., opencast pits excavation) should done in a phased manner and concurrent rehabilitation should occur as far as practically possible. This will allow the post closure land uses to potentially commence on the rehabilitated portions.	N	-2	-2	-2	-2	-8
Stockpiling of ROM Material Beneficiation Plants Operation Water Management Infrastructure Operation	1 ,4, 5		Loss of Agricultural Land Capability due to Ongoing disturbances to soils, resulting in increased leaching of soil nutrients and risk of erosion, attributed to mining activities, potential increase in concentrations of contaminant concentration in the soil and ongoing disturbance as a result of maintenance activities, leading to altered terrestrial vegetation community structures, and consequently altering the quality and nutrient status of the soil	N	-1	-2	-2	-2	-7	CbA		N	-1	-1	-1	-1	-4
Railway Line Operation	6			N	-2	-3	-3	-5	-13		No construction or project related activities may be undertaken outside of the demarcated areas. Clean and dirty water systems must be established prior to construction. Due to the extent of the proposed expansion projects, mining (i.e., opencast pits	N	-1	-1	-2	-2	-6

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											excavation) should done in a phased manner and concurrent rehabilitation should occur as far as practically possible. This will allow the post closure land uses to potentially commence on the rehabilitated portions. Direct surface disturbance of the identified arable soils can be avoided where possible to minimise loss of arable soils.						
Stockpiling of ROM Material Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation Water Management Infrastructure Operation Railway line operation	1, 2, 3, 4, 5, 6	Ecology (fauna and flora)	Proliferation of AIP species that colonise areas of increased disturbances and that outcompete native species, including the ongoing transformation of adjacent or nearby natural and more sensitive habitat.	N	-2	-3	-4	-4	-13	CbA	Ongoing AIP monitoring and clearing/control should take place throughout all phases of the project activities and within a 20m buffer of all activities. The project perimeters should regularly be checked for AIP proliferation to prevent spread into surrounding natural areas. Management of AIPs during the construction-phase and operational-phase activities must be focused on limiting their introduction and preventing their spread. For example, roadsides should be monitored, as they serve as common corridors along which AIP species are introduced and dispersed, and disturbed areas should regularly be monitored for AIP recruitment until successfully rehabilitated.	N	-1	-1	-2	-2	-6
			Potential overexploitation through the removal and/or collection of important or sensitive floral SCC beyond the direct footprint area due to increased presence of employees and contractors on site.	N	-2	-3	-3	-4	-12		A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation.	N	-1	-2	-1	-1	-5
			Additional pressure on floral habitat by increased human movement associated with the proposed construction and operational activities, including increased vehicular movement, contributing to: • Overexploitation through the removal and/or collection of important or sensitive floral SCC beyond the direct footprint area; • Increased introduction and spread of AIPs; and • Increased risk of fire frequency	N	-2	-3	-4	-4	-13		No collection of indigenous floral or fauna species must be allowed by construction personnel, especially with regards to floral and faunal SCC. Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020) (see Section 4.3.2 of Annexure 7).	N	-1	-1	-2	-2	-6

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Activities		Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			Possible increased fire frequency during operational phase.	N	-2	-1	-2	-3	-8		No illicit fires must be allowed during the operational phases of the mine. Fire breaks should be maintained during the construction and operational phases.	N	-1	-1	-2	-1	-5
			Dust generated during construction and operational activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants4 and potentially further decreasing optimal growing /re-establishing conditions.	N	-2	-1	-2	-2	-7		An effective dust management plan must be designed and implemented to mitigate the impact of dust on flora throughout the operational phase. Dust pollution have been associated with poor photosynthetic functionality in plants5. There is evidence of dust pollution leading to a reduction in chlorophyll, including chlorophyll degradation and reduced photosynthetic activity, resulting from dust deposition on leaf surfaces. Dust deposition also result in stomata clogging, which causes a decreased rate of carbon dioxide exchange, carbon assimilation, transpiration, and therefore decreased net photosynthesis.	N	-1	-1	-1	-1	-4
			Please refer to the construction phase for impacts relating to clearance, should this be required during the operational phase.	-	-	-	-	-	-		All management measures association for clearance during the construction phase remains relevant should this be required during the operational phase.	-	-	-	-	-	-
			On-going disturbance during operational phase may lead to erosion and sedimentation of surrounding floral habitat.	N	-2	-3	-2	-2	-9		In terms of ongoing rehabilitation: Rehabilitation of natural vegetation should proceed in accordance with the rehabilitation plan – concurrent rehabilitation is recommended. This rehabilitation plan should consider all phases of the project indicating rehabilitation actions to be undertaken during and once construction has been completed, ongoing rehabilitation during the operational phase of the project as well as rehabilitation actions to be undertaken after operations have ceased. Appropriate shaping of disturbed areas is essential. To promote successful establishment of vegetation, the slopes must not be steeper than 1(V):5(H) or 1(V):3(H) (depending on engineering input and recommendations). New slopes should resemble/mimic the natural topography of the surrounding area. Where slopes are left steeper than what is recommended for whatever reason, additional measures will be required to prevent soil erosion and to appropriately manage stormwater.	N	-1	-1	-1	-2	-5

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Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
				N	-2	-3	-3	-4	-12		Any natural areas beyond the direct footprint, which have been affected by the construction or operational activities, must be rehabilitated using indigenous species. Floral monitoring should be done annually during operational activities. Please also refer to the monitoring guidelines in Section 5.5 (Annexure 7). Rehabilitation must be implemented concurrently as per the rehabilitation plan, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and costs associated with it. All soils compacted because of construction activities falling outside of the project area should be ripped and profiled. Special attention should be paid to AIP control within these areas. Maintain Storm Water Management measures in good order.						
			Impact on fauna due to mining the presence of operations.	N	-2	-3	-3	-4	-12		Strictly enforced speed limits on all roads - not to exceed 40km/ hr. Keep an animal fatality register on site. All vehicles must remain within demarcated footprint areas and haul roads. At a minimum a short herbaceous layer must be maintained around the Railway Line Link Project so that a semblance of faunal habitat is reinstated in these areas Monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations. Culverts under the railway lines should be placed in such a way to allow faunal species to move around these areas.	N	-1	-3	-1	-2	-7
Opencast Mining Operations	3	Freshwater Ecosystems	Operation of expanded Village Pit, including monitoring of sump in open pit and dewatering pipeline, and repairs if necessary, could result in: - Complete loss of CWs 15 and 21; - Increased risk of sediment transport in surface runoff or via wind from the overburden stockpile into	N	#	#	-3	#	-10	R	Pollution prevention through appropriate management and monitoring of pollution prevention systems, with specific mention of the management of clean and dirty water separation systems, in order to prevent, eliminate and/or control potential pollution of	N	#	#	-3	#	-6

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			neighbouring CWs, leading to altered water quality, altered vegetation community composition and potentially smothering biota and/or affecting egg banks; and - Increased risk of erosion, leading to further altered topography/geomorphology, in turn resulting in altered runoff patterns and formation of preferential flow paths.								soils, groundwater and surface water must be implemented. Include in the existing monitoring programme to detect and prevent the pollution of soils, surface water and groundwater. A detailed ongoing rehabilitation plan must be developed for the mine. This plan must include the following: - Continuous backfilling of opencast pit opportunities; - Rehabilitation trials to determine the most practical and suitable manner to rehabilitate waste rock dumps, unused haul roads, historically mined areas; - Offsetting and/or recreation of disturbed Cryptic Wetlands. If possible, the overburden stockpiles must not be located within the catchments of the identified watercourses and should be located in an area where they will not impact on any hydrological features of increased importance within the study area, nor on those within the greater MRA, and outside the 100m GN704 Zone of Regulation associated with any freshwater resources within the MRA. Where existing WRDs are to be extended, should they encroach on watercourses or the applicable Zone of Regulation, authorisation must be obtained prior to extension.						
			Blasting/mining activities in order to remove overburden and to extract the ore and removal of ore and overburden from the open cast pits, may result in: *Increase in dust; *Nitrates from blasting leading to potential eutrophication of the receiving environment and resulting in impairment of water quality within the catchment; *Complete loss of the CWs within the Village Pit expansion area.	N	#	#	-3	#	-9	CbA	In applying the risk assessment, it was assumed that the mitigation hierarchy as advocated by the DEA (2013) would be followed, i.e. impacts would first be avoided. As the proposed expansion of the Village Pit will result in the irreversible impacts on two CWs, this is not feasible. Conduct biennial soil monitoring around areas where mining is not being conducted (within the Mining Rights area) to determine the impact of blasting and the effectiveness of dust suppression on soil resources - the outcomes of the analysis should be compared with an unimpacted baseline soil area. Reduce airborne dust during blasting activities through damping dust generation areas with water (although not in sufficient quantities to generate runoff).	N	#	#	-2	#	-5

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			Increased risk of pollution of surface water resulting from decant from the open pit (not further assessed - no decant to occure. Risk of leaks along the dewatering pipeline, potentially leading to contamination of ground and surface water, contamination of soil, and formation of preferential flow paths if not attended to.	N	#	#	-3	#	-8	CbA	Measures to contain and reuse as much water as possible within the mine process water system must be sought, and very strict control of water consumption must take place. Detailed monitoring must be implemented and maintained to ensure that all water usage is continuously optimised. The pipeline must be regularly inspected for leaks. Should any leaks be detected, pumping must be stopped immediately whilst the leak is repaired; the event of any leaks/spills, all possible steps are to be taken to prevent the pollution of the receiving freshwater environment and the surrounding environment during repair.	N	#	#	-2	#	-5
			Risk of formation of a cone of depression along the open cast area.	N	#	#	-3	#	-12	R	Groundwater monitoring should be undertaken to determine the impact of dewatering on groundwater levels. Dewatering should only be undertaken if absolutely necessary and in line with the WUL.	N	#	#	-3	#	-11
			Operation of drill rigs, may result in increased risk of pollution of surface water resulting from spills (hydrocarbons) from drill rigs, and the increased risk of sediment transport due to movement of drill rigs and activities within freshwater resources (Sedimentation of cryptic wetlands could lead to altered water quality, altered vegetation community composition smothering of macroinvertebrate egg banks).	N	-1	-2	-3	-2	-8	CbA	Drilling must not take place within the delineated boundaries of cryptic wetlands (within the MRA) or their associated catchments, which must be determined by a suitably qualified specialist. Operation of drill rigs must preferably only take place during the dry winter period in order to minimise the risk of sedimentation. A spill prevention and emergency spill response plan should be compiled to guide the drilling works; and an emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur. Drill muds and fluids used must be chemically environmentally friendly.	N	-1	-1	-2	-1	-5
			The drilling activities my result tin the alteration of the hydrological characteristics of the cryptic wetlands due to disturbances directly within the delineated boundaries of the CWs and/or their respective catchments.	N	-1	-2	-3	-2	-8	CbA	Operation of drill rigs near Cryptic Wetlands and recharge zones must preferably only take place during the dry winter period in order to minimise the risk of sedimentation.	N	-1	-1	-2	-1	-5
			Mining in the detrital area will lead to the damage to or outright loss of vegetation, leading to exposure and compaction of soil, in turn leading to increased risk of wind erosion and wind-borne sediment reaching downgradient episodic drainage line. Other impacts may also include: Increased sedimentation of the episodic drainage line may	N	-1	-2	-3	-3	-9	CbA	Retain as much indigenous vegetation as possible as this will aid in preventing runoff from reaching the episodic drainage line. Please also refer to the construction management measures for clearance in this regard.	N	-1	-2	-2	-1	-6

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SaM**
			lead to changes to habitat, potentially altered surface water quality, smothering of vegetation and/or altered vegetation composition; Decreased ecoservice provision; Decreased ability to support biodiversity; and Proliferation of alien vegetation as a result of disturbances.								Reduce airborne dust during mining activities through damping dust generation areas with water (although not in sufficient quantities to generate runoff).						
Stockpiling of Mine Residue (WRD)	2		Please refer to the construction phase for impacts relating to clearance, should this be required during the operational phase.	-	-	-	-	-	-	CbA	All management measures association for clearance during the construction phase remains relevant should this be required during the operational phase.	-	-	-	-	-	-
			Seepage and runoff from WRDs, which could result in increased risk of pollution of groundwater, potentially leading to the formation of a contaminated groundwater plume, which may migrate downgradient of the WRD, thus possibly affecting the downgradient CWs and the increased risk of sediment transport in surface runoff (low risk due to climate) or via wind from the WRD to CWs, leading to altered water quality and sedimentation of CWs. Potential impacts may include: *Possible contamination of surface and ground water, leading to impaired water quality and salinations of soil (CWs are not driven by groundwater; risk is therefore considered negligible) (this is highly unlikely due to the characteristics of the waste rock and the outcomes of the hydrogeological report; and *Sedimentation of CWs could lead to altered water quality, altered vegetation community composition and smothering of macroinvertebrate taxa and/or their egg banks.	N	-1	-2	-2	-2	-7	CbA	Water to be collected by means of stormwater trenches/berms, and recycled and utilised within the Beeshoek water circuit, or pumped to a Pollution Control facility for evaporation. Implement monitoring programme to detect and determine the formation and/or extent of any potential groundwater pollution plume as per an approved groundwater management plan.	N	-1	-1	-1	-1	-4
			Alteration of the hydrological characteristics of the local catchment due to the deposition of the waste rock, which could lead to potential erosion of terrestrial areas as preferential flow paths are formed in the landscape and the altered runoff peaks leading to changes in the pattern, flow and timing of water in the landscape.	N	-1	-3	-3	-3	-10	CbA	All Storm Water Management Measures must be maintained. Monitoring of erosion must take place throughout the life of mine, in order to prevent the formation of erosion gullies as a result of altered flow paths, and the possible sedimentation of the receiving freshwater environment.	N	-1	-1	-2	-1	-5
			Loss of catchment yield due to stormwater containment, which could result in the reduction in volume of water entering the CWs, potentially impacting vegetation and macroinvertebrate communities	N	-1	-3	-3	-3	-10	ID	Determination of the loss of catchment yield did not form part of the scope of this study, however, due to the semi-arid climate and high evaporation rates of the region, loss of catchment yield is expected to be negligible. All Storm Water Management Measures must be maintained in line with GN704 requirements.	N	-1	-1	-3	-2	-7
			Operation of drill rigs, may result in increased risk of pollution of surface water resulting from spills	N	-1	-2	-3	-2	-8	CbA	Drilling must not take place within the delineated boundaries of Cryptic Wetlands	N	-1	-1	-1	-1	-4

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			(hydrocarbons) from drill rigs, and the increased risk of sediment transport due to movement of drill rigs and activities within freshwater resources (Sedimentation of cryptic wetlands could lead to altered water quality, altered vegetation community composition smothering of macroinvertebrate egg banks).								(within the MRA) or their associated catchments, which must be determined by a suitably qualified specialist. Operation of drill rigs must preferably only take place during the dry winter period in order to minimise the risk of sedimentation. A spill prevention and emergency spill response plan should be compiled to guide the drilling works; and an emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur. Drill muds and fluids used must be biodegradable.						
			The drilling activities my result tin the alteration of the hydrological characteristics of the cryptic wetlands due to disturbances directly within the delineated boundaries of the CWs and/or their respective catchments.	N	-2	-3	-3	-3	-11	CbA	Operation of drill rigs near Cryptic Wetlands and recharge zones must preferably only take place during the dry winter period in order to minimise the risk of sedimentation.	N	-1	-1	-1	-2	-5
			Mining in the detrital area will lead to the damage to or outright loss of vegetation, leading to exposure and compaction of soil, in turn leading to increased risk of wind erosion and wind-borne sediment reaching downgradient episodic drainage line. Other impacts may also include: Increased sedimentation of the episodic drainage line may lead to changes to habitat, potentially altered surface water quality, smothering of vegetation and/or altered vegetation composition; Decreased ecoservice provision; Decreased ability to support biodiversity; and Proliferation of alien vegetation as a result of disturbances.	N	-2	-2	-3	-3	-10	R	Retain as much indigenous vegetation as possible as this will aid in preventing runoff from reaching the episodic drainage line. Reduce airborne dust during mining activities through damping dust generation areas with water (although not in sufficient quantities to generate runoff).	N	-1	-1	-2	-2	-6
Stockpiling of ROM Material Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation Water Management	1, 2, 3, 4, 5, 6	Hydrology	Contamination of surface water resources. There are no surface water resources in the area, however, the natural runoff, which must be managed internally on site could become impacted	N	-1	-2	-1	-2	-6	CbA	Clean and dirty water separation systems should be incorporated in terms of the 2016 SWMP. Excess water will be pumped out of the pit and stored as dirty water in the Slimes Dam. Surface water monitoring must continue in accordance with the approved WUL. The opencast operations should be undertaken in line with the approved Mining Work Programme and EMP. Enviroberms should be implemented along the perimeter of the Opencast Pits. Erosion Control should be implemented on the Enviroberms to ensure the maintenance of its integrity. Maintenance of all Storm Water Management systems must be undertaken regularly on site.	N	-1	-1	-1	-2	-5

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Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Infrastructure Operation Railway line operation																	
Stockpiling of Mine Residue (WRD) Removal of Resources (opencast pit mining)	2,3		Alteration in the natural topography through the development of the pits and WRDs.	N	-2	-3	-3	-3	-11	R	Expansion of Opencast Pits and WRDs footprint areas should be kept to minimum footprint area. The creation of steep slopes should be avoided as far as possible. Avoidance of exploration activities taking place within the 1:50 year floodlines or within a 100m horizontal distance of a drainage line as required by GN704 Regulations. Avoidance of prospecting activities taking place near or within wetlands, seasonal depressions and recharge zone.	N	-1	-2	-1	-1	-5
Stockpiling of ROM Material Opencast Mining Operations Stockpiling of Mine Residue (WRD) Railway line operation	1,2,3,6		Potential hydrocarbon spillages washed into drainage lines and depressions	N	-2	-3	-2	-3	-10	CbA	Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide. Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be used under leaking machinery. Spillages should be reported immediately and spill kits should be readily available at all times.	N	-1	-1	-2	-1	-5
Stockpiling of ROM Material Opencast Mining Operations Railway line operation	1,3,6		Loss of water quantity to downstream users. Due to the arid climate this is likely to be a very small to negligible impact.	N	-2	-3	-2	-1	-8	CbA	Berms placed around the pits to divert runoff around the pits. Backfilling of the pits. Reuse of runoff captured in the pits. Culverts should be maintained at the railway line to ensure that surface water runoff is not impacted detrimentally.	N	-1	-2	-1	-1	-5
Beneficiation Plants operation Water Management Circuit	4, 5		Siltation of existing Storm Water Management systems.	N	-1	-3	-3	-2	-9	CbA	The required clean and dirty water measures must be put in place around the two proposed plants, and where reworking activities are undertaken in order to rather contribute to the improvement of the overall water management circuit. Silt traps must be implemented in accordance with the SWMP, and these must be managed	N	-1	-1	-2	-1	-5

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											regularly to ensure that the capacity of the dams is not compromised by silt build up.						
			Potential contamination of clean water areas	N	-2	-3	-3	-3	-11	CbA	No water may be released directly into the environment without the necessary GN704 and NWA approvals. Any dirty water spills/discharges beyond the mine boundary should be reported to the DWS and DMRE and measures to rectify the occurrence of these discharges should be implemented. Level meters must be available at each of the dirty dams, to ensure that a proactive approach can be taken when the levels are reaching capacity. Record dam level readings at least weekly. All containment dams will be maintained to ensure that no leakages occur. A freeboard of 0.8m must be maintained. Overflow pipes will be kept clean. Sumps will be kept clean and all pumps will be maintained. Slurry pipelines must be regularly inspected for spills and/or leaks. All significant spills must be reported to the relevant authority	N	-1	-1	-2	-1	-5
			Optimisation of water use circuit.	N	-2	-3	-3	-3	-11	CbA	The water balance must be updated annually, or as stipulated within the WUL conditions, with a strong focus on improving the management of the internal water circuit on site. All containment dams will be maintained to ensure that no leakages occur. A freeboard of 0.8m must be maintained. Overflow pipes will be kept clean. Sumps will be kept clean and all pumps will be maintained. The water circuit must be managed at one central location to ensure that there is integration between the plant, Slimes Dam, and general surface water needs and requirements.	P	2	3	3	3	11
Opencast Mining Operations	3	Hydrogeology	For this iron ore mines in dolomitic areas, groundwater drawdown is the most severe impact on the groundwater environment. With high hydraulic conductivities in the dolomite, cones of groundwater depressions are large, stretching over tens of kilometres. In comparison, groundwater contamination is minor due to the chemical inactive iron ore.	N	-3	-3	-3	-4	-13	CbA	There are no obvious means of mitigating the impact of groundwater lowering by mining, except for monitoring surrounding boreholes and replacing lost groundwater extraction potential where applicable (where it can be demonstrated that external groundwater users have been impacted upon by the mine). Dewatering is primarily achieved through	N	-3	-3	-3	-2	-11

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Activities			**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SaM**
			During the operational phase, it is expected that the main impact on the groundwater environment will be dewatering of the surrounding aquifer. Water entering the mining areas will have to be pumped out to enable mining activities. This will cause a lowering in the groundwater table in- and adjacent to the pits being actively mined. Mining in this area has been ongoing for many decades, and there are historical impacts on the surrounding aquifer which are impractical to simulate in a numerical model. Thus, the currently prevailing groundwater levels (obtained from N&Z telemetric data from the UWQ website, mine monitoring data and the WIMS/Tshiping database) have been used as baseline for this study, and all dewatering impacts related to the current water levels. It was assumed that mining at Kolomela Mine will continue to be mined at least for the lifetime of Beeshoek. The following observations were made: - No drawdown is expected for further mining at East Pit as the declining groundwater levels is predicted to be below the bottom of mining. - Drawdown at Village pit is predicted to extent to up to 2km from the pit in a mostly westerly direction, for an insignificant drawdown of 5 – 10 metres. Areas of significant drawdown is expected only in in the immediate vicinity of the pit, which could even decline with time as Leeuwfontein mining impacts northward into this area. - HF Pit is predicted to have a minor impact limited to the immediate surroundings of the pit itself. - The BN Pit will have the biggest area of impact due to substantial increase in mining depth. - Drawdown of groundwater levels will be up to about 100 m but limited to an area of about 1 km around the pit.								wellfields of abstraction boreholes and in pit dewatering points, and the combination thereof functions with the purpose of keeping the pit floor dry by creating a cone of depression around the excavation. The pit floor was thus modelled as a drain, which in MODFLOW uses the bottom elevation of the drain as the hydraulic head that controls flow into the drain. In this way the individual position of dewatering boreholes has no effect on the extent of the cone of depression or groundwater level lowering. Dewatering borehole positions may be changed without notice as objectively they will be placed as close as possible to the excavation to maintain a dry pit floor. Currently, no additional groundwater is to be abstracted from the catchment as part of this project expansion. The groundwater monitoring programme must be implemented and undertaken in accordance with the approved WUL. Establish the extent and nature of groundwater draw down zones with opencast mining over the remaining operational life of Mine, to determine the possible adverse yield effects on the local groundwater users. Excess water will be pumped out of opencast pits and stored as dirty water in the slimes dam (or licensed water tanks for reuse). Dewatering of opencast pits should only be undertaken were absolutely necessity to ensure safe mining conditions. A detailed Water Balance and Water Conservation and Demand Management Plan must be developed annually and continuously assessed to ensure that water is used in the most effective and conservative manner. The Mine must include the measurement of groundwater levels on the farm Aucampsrus and conduct a once off pump test, prior to the expansion of the Village Opencast Pit. A communication forum must be established between Kolomela and Beeshoek to monitor the cumulative impact of dewatering on the region.						
			Surface water structures in this area is limited and serve mostly only as stormwater conduits. Furthermore,	-	-	-	-	-	-	-	No impact.	-	-	-	-	-	-

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			groundwater levels in the area are generally deep below surface, well beyond the depth of streams. Streams are not supported by baseflow (i.e. groundwater discharge into streams/rivers). It will thus not be affected by lowering of the groundwater levels.														
Stockpiling of ROM Material Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation Water Management Infrastructure Operation Railway line operation	1, 2, 3, 4, 5, 6		There have been several studies in the past proving that there is very little contamination potential at the mine. Nevertheless, the flow of a hypothetical contamination has been modelled to be thorough. A contaminant with a concentration of 100 (reflecting a value of 100% of initial contamination) has been modelled and projected 50 years into the future as if mining will extend that long. The flow in the aquifer will be directed mainly towards the mine at this stage and very little groundwater pollution is thus expected. some contamination could escape from the source in the north-east but is drawn into BN and Village Pit cone of depression. It is thus concluded that no contamination of the surrounding aquifer could take place during mining. This phase is not expected to influence the groundwater qualities. With the exception of minor oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality.	N	-2	-3	-2	-2	-9	CbA	Identify and where possible, maximise areas of the mine that will result in clean storm water runoff (for example open veld areas) as well as infrastructure associated with the mine (for example office areas) and ensure that runoff from these areas is routed directly to natural watercourses and not contained or contaminated. Ensure that clean storm water is only contained if the volume of the runoff poses a risk, if the water cannot be discharged to watercourses by gravitation, for attenuation purposes, or when the clean area is small and located within a large dirty area. This contained clean water should then be released into natural watercourses under controlled conditions. Ensure the minimisation of contaminated areas, reuse of dirty water wherever possible and planning to ensure that clean areas are not lost to the catchment unnecessarily. Ensure that seepage losses from storage facilities (such as polluted dams) are minimised and overflows are prevented. Ensure that all possible sources of dirty water have been identified and that appropriate collection and containment systems have been implemented and that these do not result in further unnecessary water quality deterioration. This specifically relates to the WHIMS Plant dirty water infrastructure (Central Process Water Dam and Staging Stockpiles) and the new Section 21(g) water tanks. Where contaminants are transported along construction roads, emergency containment and mitigation measures must be developed to minimize impacts should accidental spillages occur along the transport routes. All water containment facilities, must maintain a 0.8m freeboard and comply with GN704 requirements.	N	-1	-1	-2	-1	-5

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Activities		Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Store all potential sources of contamination in secure facilities with appropriate Storm Water management systems in place to ensure that contaminants are not released to the water resource through Storm Water runoff.						
											Separate and collect all storm water that has a quality potentially poorer than the water quality specified and negotiated for the specific catchment into dirty water storage facilities for reuse within the mining operations.						
											Ensure that all storm water structures that are designed to keep dirty and clean water separate can accommodate a defined precipitation event. (The magnitude of the precipitation event used in such an objective statement must, as a minimum, adhere to the relevant legal requirements.)						
											Route all clean storm water directly to natural watercourses without increasing the risk of a negative impact on safety and infrastructure, e.g. loss of life or damage to property due to an increase in the peak runoff flow.						
											Ensure that the maximum volume of clean water runoff is diverted directly to watercourses and the minimum amount of storm water reports to the pit floor of an open cast mine.						
											The size of unrehabilitated areas (pit, spoils, unvegetated areas) that produce contaminated runoff should be minimised.						
											Monitoring of water storage facilities, particularly pollution control dams, is imperative to manage the risk of spillage from the dams. Stage-storage (elevation-capacity) curves are useful tools to monitor the remaining capacity within a water storage facility.						
											Prevent the erosion or leaching of materials from any residue deposit or stockpile from any area and contain material or substances so eroded or leached in such area by providing suitable barrier dams, evaporation dams or any other effective measures to prevent this material or substance from entering and polluting any water resources.						

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Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Water quantity and quality data should be collected on a regular, ongoing basis during mine operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the catchment management agency.						
											Water that has been in contact with residue, and must therefore be considered polluted, must be kept within the confines of the Mine Residue Deposit until evaporated, treated to rendered acceptable for release, or re-used in some other way.						
											A system of storm water drains must be designed and constructed to ensure that all water that falls outside the area of the Mine Residue Deposit is diverted clear of the deposit. Provision must be made for the maximum precipitation to be expected over a period of 24 hours with a probability of once in one hundred years. A freeboard of at least 0.5 m must be provided throughout the system above the predicted maximum water level. This requirement applies to all Mine Residue Deposits, both fine and coarse-grained WRDs.						
											Ensure that the water use practices on and around the Mine Residue Deposit do not result in unnecessary water quality deterioration, e.g. use of the return water dam for storage of poorer quality water.						
											Where material spills take place along conveyors and railway systems, these should be collected and the area cleaned.						
Stockpiling of Mine Residue (WRD)	2		Rehabilitated WRDs	N	-2	-3	-2	-2	-9	CbA	The groundwater monitoring programme must be implemented and undertaken in accordance with the approved WUL.	N	-1	-2	-1	-1	-5
											Vegetation establishment must be monitored to ensure self-succession takes place.						
											Any signs of erosion on rehabilitated WRDs must be rehabilitated immediately.						

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Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			Decommissioned WRDs (West WRD partially rehabilitated.	N	-2	-3	-3	-2	-10		A rehabilitation plan for the decommissioned WRDs must be formulated to ensure that timeframes and actions are in place.	N	-1	-2	-1	-1	-5
Beneficiation Plants Operation	4		Poor management of the slimes dam and improper monitoring of the geotechnical setting may result in contamination of groundwater.	N	-1	-2	-2	-4	-9	CbA	A risk monitoring, surveillance and audit system (including boreholes for environmental monitoring) should be implemented for the life cycle of the slimes dam. The critical parameters should be monitored and analysed on a routine basis. The Numerical Groundwater Model should be updated in line with the approved WUL. The Slimes Dam will be maintained to ensure that no leakages occur. Overflow pipes will be kept clean. Feed water piping and return water piping will be maintained. The disposal of slimes from the WHIMS Plant should fulfil the facilities Code of Practice. The final rehabilitation strategy for the Slimes Dam will be dependent on the rehabilitation practices, for this reason the mine will reassess the rehabilitation strategy for the Slimes Dam annually with the closure cost assessment.	N	-1	-2	-1	-2	-6
			Presence of additional Conservancy Tanks.	N	-1	-1	-3	-1	-6	CbA	The impact of the Conservancy Tanks is minimal considering the size and that these fall within the General Authorisation Limits. These limits should not be exceeded and no additional sewage sumps to those stipulated in the WUL should be constructed. The sludge from the Conservancy Tanks must be removed by licensed contractors and should be disposed of at a licensed facility fit for such purpose. Sporadic monitoring must be undertaken to determine whether any bacteriological contamination is present in the boreholes in proximity to the Conservancy Tanks. Records of removal and safe disposal certificates must be available at the mine at any given time. Any spills occurring during the collection process must be cleaned up immediately. A clean up procedure (i.e. Works Instruction) must be in place.	N	-1	-1	-2	-1	-5
ROM Stockpiling	1		For the ROM Stockpiles:	N	-1	-1	-2	-1	-5	CbA	Install air quality monitoring stations that determine fallout and respirable dust (PM10)	N	-1	-1	-2	-1	-5

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Activities		Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			- Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative. - For PM10, PM2.5 and dust fallout the extent of the potential impact is limited to the ROMs and does not extend beyond the mine boundary. - The predicted ambient concentrations resulting from the consolidated ROM activities are very low and the intensity is rated as very low for PM10, PM2.5 and dust fallout. - Although the intensity is very low, any impact will endure for the life of the consolidated ROM activities. The duration is therefore long term. - The consequence of the potential impact is very low for PM10, PM2.5 and dust fallout from the consolidated ROM activities. - As the intensity is low, the probability of air quality impacts beyond the mine boundary from the consolidated ROM are improbable for all pollutants. - The significance rating is considered low for PM10, PM2.5 and dust fallout.								concentrations that could arise from the mining activities. Dust suppression should be undertaken where and when dust is present.						
Waste Rock Dump Operation	2		For the WRDs: - Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative. - For PM10, PM2.5 and dust fallout the extent of the potential impact is limited to the WRDs and does not extend beyond the mine boundary. - The predicted ambient concentrations resulting from the amended WRD emissions are very low and the intensity is rated as very low for PM10, PM2.5 and dust fallout. - Although the intensity is low, any impact will endure for the life of the amended WRD. The duration is therefore long term. - The consequence of the potential impact is therefore very low for PM10, PM2.5 and dust fallout from the amended WRD. - As the intensity is low, the probability of air quality impacts from the amended WRD beyond the mine are improbable for all pollutants. - The significance rating is considered low for PM10, PM2.5 and dust fallout.	N	-2	-2	-2	-2	-8		Strictly enforce speed limits on all mine roads. Limiting site clearance to design areas. Rehabilitate all areas on completion of construction activities. Implement dust control measures in the form of ensuring slope stability and implementation of a re-vegetation programme.	N	-1	-1	-2	-1	-5
Opencast Operation	3		In terms of the opencast operations: - Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative.	N	-2	-1	-3	-2	-8		Monitoring of activities causing high dust fallout and manage these specific activities accordingly by actively using the existing dust fallout network.	N	-1	-1	-3	-1	-6

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Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			• For PM10, PM2.5 and dust fallout the extent of the potential impact is concentrated over the Village Pit and extends over the eastern mine boundary. It does not extend to commercial or residential areas. • The predicted ambient concentrations resulting from the increased opencast emissions are low and the intensity is rated as low for PM10, PM2.5 and dust fallout. • Although the intensity is low, any impact will endure for the life of the increased opencast. The duration is therefore long term. • The consequence of the potential impact is therefore low for PM10, PM2.5 and dust fallout from the increased opencast. • The intensity is regarded as low, but as the predicted concentrations are exceeded beyond the eastern mine boundary air quality impacts from the increased opencast are probable for PM10. • The significance rating is considered medium for PM10 and low for PM2.5 and dust fallout.														
Beneficiation Plants Operation	4		Beneficiation projects may result in the following impacts: • Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative. • For PM10, PM2.5 and dust fallout the extent of the potential impact is limited to the jig plant and does not extend beyond the mine boundary. • The predicted ambient concentrations resulting from the jig plant emissions are very low and the intensity is rated as very low for PM10, PM2.5 and dust fallout. • Although the intensity is very low, any impact will endure for the life of the jig plant. The duration is therefore long term. • The consequence of the potential impact is therefore very low for PM10, PM2.5 and dust fallout from the Jig Plant. • As the intensity is very low, the probability of air quality impacts from the increased opencast are improbable for all pollutants. • The significance rating is considered low for PM10, PM2.5 and dust fallout.	N	#	#	-3	#	-10	CbA	Installation, operation and maintenance of dust extraction systems at the secondary and tertiary crushing and screening plants. For crushing and screening operations at mineral processing plants, fugitive dust can be controlled with dust extraction systems and water sprayers. The application of chemical dust suppression systems at the primary crushing and screening plants, as well as the Jig and WHIMS Plants. Where excessive dust is observed or analysed for in the dust monitoring programme, effective measure must be put in place to reduce such dust fall out. Covering all product transported by vehicles using tarpaulins.	N	#	#	-2	#	-5
Railway Line Operation	6		The activities will be undertaken within existing authorised sidings (at TFR and Beeshoek). Limited increase in air quality is foreseen	N	-1	-1	-2	-1	-5	CbA	Install air quality monitoring stations that determine fallout and respirable dust (PM10) concentrations that could arise from the mining activities.	N	-1	-1	-2	-1	-5

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Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Opencast Mining Operations Beneficiation Plants Operation Railway line operation	3, 4, 6	Noise and Vibration	The undertaking of mining activities, operation of vehicles and machinery may lead to increased noise levels in the area, even though the mine has been operational in this area.	N	-2	-1	-3	-3	-9	CbA	Machinery and vehicles will be well maintained to prevent excessive nose and to comply with national and provincial regulations. All employees working within the area will be issued with protective gear. Blasting and train loading activities should be restricted to the day time as far as practically possible. Blasting arrangements and procedures must be in place to ensure that surrounding landowners are informed of blasting schedules. Property owners whose dwellings have been negatively affected should be compensated by the responsible mining company once it has been scientifically determined that such structures have been negatively affected by blasting activities related to mining activities. Seismological monitoring should be undertaken on the boundaries of the mine, especially to the east and west of the mining area (near East Pit, Village Pit and near HF Pit) The mine must retain the 500m blasting radius around privately owned properties. Where the 500m buffer cannot be retained, the mine should engage with the impacted parties, and obtain written approval from the DMRE. To mitigate the concern, it is recommended that vibration monitoring be undertaken on the boundary of the mine – The Drill and Blast Supervisor is in the process together with the Technical Services Department to acquire and additional Seismograph for further monitoring. Beeshoek has already set up a seismograph to measure the vibration in this area.	N	-1	-1	-2	-1	-5
-	-	Heritage	No further impacts foreseen during the operational phase. Please refer to the construction phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation	2, 3, 4	Visual	Alteration in the current topography through the development of the pits and WRDs.	N	-3	-3	-3	-2	-11	CbA	The opencast pits should be backfilled where possible. The WRDs should be vegetated as soon as practicably possible. Dust suppression measures should be implemented to limit the generation of dust.	N	-2	-2	-1	-1	-6
			The presence of additional Mine infrastructure such as the WHIMS and Jig Plants as well as the expansion of the pits	N	-3	-3	-2	-2	-10	CbA	The natural landscape of the area has already been altered by mining. The proposed mine infrastructure is in line with the current land	N	-2	-2	-1	-1	-6

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Plants Operation			and increase in the heights of the WRDs leading to impact on the cultural and heritage landscape.								use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed infrastructure. However, it is recommended that should the plant and other proposed infrastructure be painted, that earthy colours are used to blend in with the surrounding landscape. It is further recommended that the opencast pits are backfilled where possible and that the WRDs are vegetated upon rehabilitation.						
			Additional night lighting from proposed infrastructure.	N	-3	-3	-2	-3	-11	CbA	Down lighting and lighting shields should be used as far as possible., especially on the WRDs.		-2	-1	-1	-1	-5
			The movement of vehicles and heavy machinery during the operational phase will create a visual presence and will generate dust.	N	-2	-3	-2	-2	-9	CbA	Machinery, trucks and vehicles are already present on the Mine site and are unlikely create any additional significant presence. Dust suppression measures should be implemented to limit the generation of dust.	N	-1	-1	-2	-1	-5
Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation	2, 3, 5	Social	It must be noted that the proposed developments at Village Pit and the East Pit are in close proximity to the residential area of Boichoko. Residents of Boichoko have complained about asthma related illnesses and the impact of mining on their overall health. The air quality study specifically considers the potential impact in terms of PM10 and 2.5 on sensitive receptors. No impacts in this regard has been found on sensitive receptors.	Neutral	-	-	-	-	-	No impact identified.	Install air quality monitoring stations that determine fallout and respirable dust (PM10) concentrations that could arise from the mining activities.	-	-	-	-	-	-
			The dust pollution can be a nuisance factor to nearby communities and can impact negatively on the vegetation. The findings of the Air Quality Assessment indicated that the predicted concentrations (PM2.5 and PM10) and dust fallout are significantly below the respective NAAQS for all sensitive receptors. The impacts of the dust concentrations associated with the RoM consolidation and the WRD amendments, as well as for the Jig Plant and WHIMS would only occur in the immediately vicinity of these individual sources and within the mine boundary. These impacts were thus rated as low. The Air Quality Impact Assessment further found that the dust impacts in the vicinity of the Village Pit will mainly occur within the mine boundary, but can exceed over the southern and eastern mine boundary. The relatively high predicted concentrations are as a result of dust generated on the haul roads. These dust impacts, however, are not	N	-2	-2	-2	-2	-8	CbA	Beeshoek Mine to keep a grievance register that is easily accessible and regularly monitored. Dust suppression methods as recommended in the Air Quality Assessment should be strictly implemented as required. On-going dust fall out monitoring must be undertaken to monitor emissions from the project.	N	-1	-1	-2	-1	-5

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			anticipated to reach residential or business areas. The impact was rated as medium prior to mitigation measures being implemented.														
Stockpiling of ROM Material Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation Water Management Infrastructure Operation Railway line operation	1, 2, 3, 4, 5, 6		The existing employment profile and staff compliment will be sustained during the operational period. No significant additional inflow of workers is thus expected. Beeshoek will function in a way as to continue the constant positive impact in terms of employment through their procurement and Human Resources department, who manages the employment in line with the relevant Score Cards.	N	-2	-3	-2	-3	-10	CbA	Beeshoek Mine must continue to prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of the Contractor Management Plan. Sub-contractors should adopt a recruitment policy to enhance employment positive impacts, limit in-migration of outside jobseekers and mitigate the potential impact of residual in-migration. Communities within the Tsantsabane Local Municipality area should be given preference if any new employment opportunities will be created, as these communities will be mostly affected by the existing approved mining activities and proposed infrastructure development. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally be available. Beeshoek Mine, through their SLP, must continue to provide skills development opportunities for employees that could include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training. Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community. Beeshoek Mine to continue to adhere to the Statutory Plans such as the Spatial Development Framework (SDF) with regards to infrastructure and housing. Beeshoek Mine to continue with the mine's LED programme with the aim of strengthening the local economy and assist with socio-economic upliftment through sustainable initiatives. Beeshoek Mine to continue to adhere to the SLPs as per the Regulation 46 of the MPRDA and the Mining Charter (2018).	P	3	2	3	4	12

Name of Activity	Project	Impact Area	Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			Further continued economic benefits to the area will materialise through taxes, procurement of local goods and services, continued spending of employees and downstream employment creation. The latter can include the production of mining supplies (e.g. tools, protective clothing, steel and chemical products etc.) and other types of services to the mine e.g. catering, security services and so forth.	N	#	#	-2	#	-10	CbA	Beeshoek Mine must continue to prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of the Contractor Management Plan. Sub-contractors should adopt a recruitment policy to enhance employment positive impacts, limit in-migration of outside jobseekers and mitigate the potential impact of residual in-migration. Communities within the TLM area should be given preference if any new employment opportunities will be created, as these communities will be mostly affected by the existing approved mining activities and proposed infrastructure development. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally be available. Beeshoek Mine, through their SLP, must continue to provide skills development opportunities for employees that could include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training. Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community. Beeshoek Mine to continue to adhere to the Statutory Plans such as the Spatial Development Framework (SDF) with regards to infrastructure and housing. Beeshoek Mine to continue with the mine's LED programme with the aim of strengthening the local economy and assist with socio-economic upliftment through sustainable initiatives. Beeshoek Mine to continue to adhere to the Social and Labour Plans as per the Regulation 46 of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) and the Mining Charter (2018). Beeshoek Mine to continue with its Local Economic Development (LED) programme to	P	3	2	3	4	12

Name of Activity	Project	Impact Area	Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											strengthen the local economy and assist with projects that will uplift the community as a whole with local, sustainable initiatives relating to community and enterprise development, as well as infrastructural development. Beeshoek Mine's Social Development Fund to be aligned with the requirements as set out in the Mining Charter of 2018.						
			Sense of Place: The presence of additional Mine infrastructure such as the WHIMS and Jig Plants as well as the expansion of the pits and increase in the heights of the WRDs leading to impact on the cultural and heritage landscape.	N	-3	-3	-2	-2	-10	CbA	The mitigation measures of the Visual Impact Assessment should be implemented.	N	-2	-2	-1	-1	-6
			Sense of Place: Additional night lighting from proposed infrastructure.	N	-3	-3	-2	-3	-11	CbA	The mitigation measures of the Visual Impact Assessment should be implemented.		-2	-1	-1	-1	-5
Opencast Pit Operations	3		Impact of dewatering on the yield of boreholes on the farm Aucampsrus	N	-2	-3	-3	-3	-11	CbA	The mine must include the measurement of groundwater levels on the farm Aucampsrus and conduct a once off pump test, prior to the expansion of the Village Opencast Pit.	N	-2	-3	-2	-1	-8
			Impact on dewatering on the groundwater resources of the overall municipality (specifically considering the Boichoko properties). The following observations were made: • No drawdown is expected for further mining at East Pit as the declining groundwater levels is predicted to be below the bottom of mining. • Drawdown at Village pit is predicted to extent to up to 2km from the pit in a mostly westerly direction, for an insignificant drawdown of 5 – 10 metres. Areas of significant drawdown is expected only in in the immediate vicinity of the pit, which could even decline with time as Leeuwfontein mining impacts northward into this area. • HF Pit is predicted to have a minor impact limited to the immediate surroundings of the pit itself. • The BN Pit will have the biggest area of impact due to substantial increase in mining depth. Drawdown of groundwater levels will be up to about 100 m but limited to an area of about 1 km around the pit.	Neutral	0	0	0	0	0	No impact identified.	Ongoing groundwater monitoring and level monitoring must be undertaken. Develop a resource use plan with the specific objective to minimise the mining operations' energy and water use as far practical Beeshoek Mine to ensure that the water quality and quantity issues are managed appropriately through engineering controls and through regular and required quality and quantity groundwater monitoring. The forum already established (if not yet in place) where the TLM, Sedibeng Water, DWS and all mining companies in the Postmasburg area should remain in order to discuss mitigation measures and the way forward in terms of the impacts of mining on the water resources. The management and mitigation measures of the Hydrological Assessment and Numerical Groundwater Assessment must be strictly implemented.	Neutral	0	0	0	0	0
Stockpiling of ROM Material Opencast Mining Operations	1, 2, 3, 4, 5, 6		Community Safety and Security Related Impacts As limited additional employees are foreseen and as the optimisation projects would be located within the mining rights area, few added safety and security risks are foreseen in the long term.	N	-2	-2	-3	-3	-10	CbA	· A Fire/Emergency Management Plan should be developed and implemented, if not yet in place. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine	N	-2	-2	-2	-2	-8

Name of Activity	Project		Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation Water Management Infrastructure Operation Railway line operation			Neighbouring residents however would remain concerned about the possible indirect impact of the increase in crime and trespassing on private properties due to a possible increase in people movement. Increased criminal activity (due to mining activities in the area and in general) could have increased negative impacts on livestock farming due to increased security costs such as electric fencing, additional costs to safeguard livestock and so forth. Concerns are further that some individuals involved with mining activities (e.g. casual labour) and/or jobseekers do remain in the area. Such practices result in unauthorised sub-letting which, if not contained, could not only become an indirect intensifying safety and security problem but also cause additional environmental pollution in the residential areas. Various heavy vehicles and general traffic make use of the R385 and the construction activities associated with the road bridge and railway link line could increase the risk of accidents. Warning signs would have to be posted to alert residents and road users to possible dangers.								management and affected communities as well as neighbouring landowners. · Unauthorised entry onto the mining area must not be allowed. Access control should continue to be implemented. · Mining areas must be secured and fenced. Warning signs would have to be posted to alert residents and road users to possible dangers associated with the construction of the road bridge on the R385. Fences must be regularly inspected and damage to fences repaired.						
Opencast Mining Operations Beneficiation Plants Operation Railway line operation	3, 4, 6		The undertaking of mining activities, operation of vehicles and machinery may lead to increased noise levels in the area, even though the mine has been operational in this area.	N	-2	-1	-3	-3	-9	CbA	Machinery and vehicles will be well maintained to prevent excessive nose and to comply with national and provincial regulations. All employees working within the area will be issued with protective gear. Blasting and train loading activities should be restricted to the day time as far as practically possible. Blasting arrangements and procedures must be in place to ensure that surrounding landowners are informed of blasting schedules. Property owners whose dwellings have been negatively affected should be compensated by the responsible mining company once it has been scientifically determined that such structures have been negatively affected by blasting activities related to mining activities. A Blasting and Vibrations Study must be considered. The aim of such as study would be to record and assess the conditions of the current structures in the area and how it could be affected by blasting activities. Seismological monitoring should be undertaken on the boundaries of the mine,	N	-1	-1	-2	-1	-5

Name of Activity	Project	Impact Area	Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											especially to the east and west of the mining area (near East Pit, Village Pit and near HF Pit) The mine must retain the 500m blasting radius around privately owned properties. Where the 500m buffer cannot be retained, the mine should engage with the impacted parties, and obtain written approval from the DMRE. To mitigate the concern, it is recommended that vibration monitoring be undertaken on the boundary of the mine – The Drill and Blast Supervisor is in the process together with the Technical Services Department to acquire and additional Seismograph for further monitoring. Beeshoek has already set up a seismograph to measure the vibration in this area.						
Waste Management		All	Please refer to Construction Phase measures	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 74: Potential Impacts and the calculated significance before and after management measures – Decommissioning Phase

Name of Activity	Project	Impact Area	Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Legal Requirements (Environmental Permits)	1, 2, 3, 4, 5, 6	Legal Compliance	Unlawful activities could lead to NWA Directives and Section 24G Rectification fines.	N	-4	-3	-2	-5	-14	CbA	A legal assessment of all activities must be undertaken annually to ensure that all are licensed are in place and the team responsible for rehabilitation is aware of the latest legal requirements. A detailed closure plan must be developed five (5) years prior to closure and submitted to the relevant departments for approval. All legally appointed personnel responsible or involved in activities on site must receive training on the requirements of the Environmental Authorisations and EMPs/ EMPRs. Quarterly audits must be undertaken, on the lawful implementation of the Environmental Authorisation. Environmental Authorisations must be available on site at all times. The legal register must be updated to indicate all updated activities.	P	4	3	5	5	17
	-	Geology	No direct impact	-	-	-	-	-	-		-	-	-	-	-	-	-

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
General Surface Rehabilitation	1, 4, 5, 6	Topography	Removal of infrastructure may impact on the topography.	N	-2	-3	-4	-4	-13	CbA	Linear infrastructure constructed by the Mine (roads, conveyors, railway lines, power lines) will be removed if it proves to inhibit land use at decommissioning. Where possible infrastructure will remain for social investment opportunities, this will be decided in conjunction with the Integrated Development Plan of the area and the local authorities. All haul roads and access roads will be rehabilitated by ripping these structures to a depth of 500mm or where hard rock is encountered. The overland conveyors and railway lines, if not used as a community initiative, will be dissembled and the components removed from the site. The material can either be sold as a unit or the components sold as scrap to the community initiative, will be dissembled and the components removed from the site. The material can either be sold as a unit or the components sold as scrap. The overland conveyors and railway lines, if not used as a community initiative, will be dissembled and the components removed from the site. The material can either be sold as a unit or the components sold as scrap. Ensure the entire site remains fenced for the duration of rehabilitation. Retain security access control to the site for the duration of rehabilitation. All fixed assets that can be profitably removed will be removed for salvage or resale (the salvage and resale value have however not been incorporated into the closure cost estimate as per the legislative requirements). All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the DMRE. All surface infrastructure (pipelines, roads, temporary foundations) would be demolished and removed to a depth of 1m. Any infrastructure below 500cm will be sealed, made safe and left in situ. The Slimes Dam will be sloped to blend into the environment as far as practically possible. All fences erected around the infrastructure be dismantled and either disposed of at a permitted disposal site or sold off as scrap (provided that these structures will no longer be required by the post mining	P	3	3	4	4	14

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											land owner). Fences erected to cordon off dangerous excavations will remain in place and will be maintained as and when required. Water pollution control structures will remain until the completion of all demolition and associated rehabilitation activities where after these will be rehabilitated.						
		Landscape character	Rehabilitation towards final land use may not be achieved without the necessary planning.	N	-3	-3	-2	-4	-12	R	All haul roads and access roads will be rehabilitated by ripping these structures to a depth of 500mm. All infrastructure will be removed and rehabilitated, should no alternative use be found for the structures. Foundations will be removed to a depth of 500cm below surface or until hard rock is encountered. Compacted soils will be ripped and topsoil (where required) will be replaced. After ripping has been completed or the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. Drainage systems should subsequently be restored to reduce erosion and return flow patterns. Water diversion channels that have no further purpose will be backfilled and revegetated (where self-succession does not take place). Mining areas could be rehabilitated to a wilderness final state with a final land capability of about 60% of the original land capability according to the 2009 EMP. The overland conveyors and railway lines, if not used as a community initiative, will be dissembled and the components removed from the site. The material can either be sold as a unit or the components sold as scrap.	P	3	3	4	5	15
		Soil, Land Use and Land Capability	Spills in the area (hydrocarbons and tailings spills) may result in the contamination of soils.	N	-1	-2	-4	-4	-11	CbA	Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately. Regular monitoring of site activities and machinery must be undertaken to identify spills or leaks spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans must be developed and be implemented. Withdraw equipment for maintenance if change in emission characteristics is noticeable. Spill kits (such as spill-sorb or a similar type of product) must be kept on site and used to clean up hydrocarbon spills in the event that they should occur.	-	-1	-2	-1	-1	-5

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site.						
			Loss of soils due to decommissioning activities present on site.	N	-1	-2	-4	-4	-11	CbA	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas. Implement a strict penalty fine system for rule breaking with regard to vehicular movement. Maintain clean and dirty water systems and undertake regular monitoring and maintenance thereof.	N	-1	-2	-1	-1	-5
			The placement of soils as part of the rehabilitation programme must be undertaken a manner to protect the integrity of these resources. Incorrect placement and management could result in the loss of soil resources for rehabilitation.	N	-1	-3	-4	-3	-11	CbA	Soil must be placed in line with an approved rehabilitation programme, where deemed necessary. The rehabilitated areas should be demarcated to prohibit access to these sites until vegetation establishment has succeeded. Chemical analysis must be imitated to determine the fertilisation and/or amelioration requirements if any. Any signs of erosion must be rehabilitated immediately.	N	-1	-1	-2	-2	-6
			The rehabilitation activities will ensure that the area be rehabilitated to its final land use.	N	-2	-3	-4	-3	-12	R	All compacted areas must be ripped. Topsoil must be place in line with an approved rehabilitation programme. The rehabilitated areas should be demarcated to prohibit access to these sites until vegetation establishment has succeeded. Monthly inspections of the rehabilitation activities must be undertaken. Storm Water Management systems must remain in place up until rehabilitation in that area has succeeded. A detailed rehabilitation programme must be implemented and audited. All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible. Compacted soils adjacent to the mining and associated infrastructure footprint should be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation. During the decommissioning phase the footprint should be thoroughly cleaned, and all building material should be removed to a suitable disposal facility	P	2	3	4	5	14

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											During the operational phase the mine would have conducted various rehabilitation trials. The most successful rehabilitation options recorded during the operational phase must be implemented on site.						
											A short-term fertilizer program should be based on the soil chemical status after levelling and should consists of a pre-seeding lime and fertilizer application, an application with the seeding process as well as a maintenance application for 2 to 3 years after rehabilitation or until the area can be declared as self-sustaining by an appropriately qualified soil scientist.						
		Ecology and Freshwater Ecosystems	The establishment of Weeds and Invader Species.	N	-2	-3	-4	-4	-13		An AIP must be implemented on site and enforced. This programme must stipulate the monitoring plan, which should include capturing of areas where invader species are present; action plan to remove these; % successful removal).	N	-1	-1	-2	-1	-5
											Where self-succession does not establish, harvested seeds and plants must be used in concurrent rehabilitation for any areas along the area which may be affected.						
			Unplanned loss of floral and faunal species of conservation importance	N	-2	-4	-4	-4	-14	CbA	Ensure that no further clearing of faunal habitat occurs.	N	-2	-1	-1	-2	-6
											All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated as per the post-closure objective						
											Rehabilitation efforts must be implemented for a period of at least five years after decommissioning and closure;						
											The rehabilitation plan should consider all development phases of the project indicating rehabilitation actions to be undertaken during and once construction or operation has been completed. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and cost.						
											No hunting/trapping or collecting of faunal species is allowed.						
											Following heavy rains, all stormwater structures and erosion susceptible areas must be inspected, and any damage or early onset erosion rectified.						
											Monitor the success of rehabilitation efforts of all areas that were disturbed and revegetated during the operational phase.						
											Prior to the removal of plant species, an ecologist should investigate the site (if not already done) to record all species of importance which should be removed under tree or plant removal permits. All such species should be demarcated by signage or tape.						

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Obtain tree removal permit prior to the removal of any protected species.						
											All employees, or contractors on site, involved in this project, should receive a detailed induction on the expectations for the protection of fauna and flora on site.						
											No open fires must be allowed.						
											Harvesting of plants and poaching of animals will be prohibited and a fine system will be developed for any person not complying.						
											Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the closure/ decommissioning phase, and the immediate surrounding area (30m from the perimeters) should be regularly checked during the decommissioning phase for alien vegetation proliferation to prevent spread into surrounding natural areas. Alien vegetation control must be monitored. The alien floral control plan must be implemented for a period of at least 5 years after decommissioning and closure;						
			Accidental death of animals on the roads.	N	-2	-3	-3	-4	-13	CbA	Clearly marked signs will be erected along the transportation routes to create awareness of animal crossings.	N	-1	-3	-1	-2	-7
											A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes.						
											A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads.						
											Vehicles may only travel on demarcated roads on site.						
		Surface Water	Erosion control over rehabilitated areas and the prevention of erosion gullies.	N	-2	-3	-2	-3	-10	CbA	The topography of all disturbed areas must be rehabilitated in such a manner that the surrounding natural area blends naturally with the rehabilitated areas well as to be free-draining. This will reduce soil erosion and improve natural re-vegetation.	N	-1	-1	-2	-2	-6
											Temporary erosion measures should be employed at exposed areas until vegetated. The topography should be returned to its former state (as far as practically possible).						
											Exposed areas should be vegetated as soon as possible.						

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											The soil stockpiles should be used to fill in areas and to create a suitable substrate to re-vegetate areas.						
			Contamination of surface water as a result of removal of infrastructure.	N	-2	-2	-4	-3	-11	Cba	No water may be discharged into watercourses, if this water has not been treated to the correct quality OR if approval from the DWS for such activity has not been obtained. An alternative, would be to evaporate the water from these facilities. Once the dams are empty, any silt remaining in the dams should be disposed of on the approved Slimes Dam after chemical analysis proofs that the quality of the silt is in line with the disposal qualities in the approved WUL. If this is not the case the silt will either have to be treated, or disposed of at a licensed facility. The dams should be demolished, and the liner and rubble should be classified to determine the type of landfill site suitable to cater for this material. The containment dams will only be demolished should the area proof to be free draining with no pollution potential after rehabilitation.	N	-1	-1	-2	-2	-6
			Natural runoff in the area must remain free flowing, which could be impacted if the opencast pits are not backfilled and compacted correctly. In the event that the opencast pits are not backfilled the runoff from the surrounding area can accumulate in the pits reducing the run off in the area.	N	-2	-3	-4	-3	-12	CbA	If opencast pits are not backfilled, enviroberms or a similar structure should be implemented to keep runoff from the opencast pits. Where backfilling is undertaken, only material as approved in the WUL may be used for such purpose. Backfilled areas must be compacted and shaped to ensure that subsidence is avoided. Backfilled areas must be demarcated to avoid any unauthorised access to these areas. Where self-succession does not establish, it is recommended that the Mine investigate a seeding programme. Weekly inspection must be implemented to monitor and measure the progress of rehabilitation. Clean and dirty water systems must remain in the area until rehabilitation has been completed.	P	2	3	4	5	14
			Rubble and waste from site could pollute local water resources.	N	-1	-1	-4	-2	-8	CbA	Waste must be removed to a licenced landfill site, if not possible to lawfully dispose on site.	N	-1	-1	-2	-2	-6
		Geohydrology	No direct impact	-	0	0	0	0	0	-	-	-	0	0	0	0	0
		Heritage	Areas of the north mine can be demarcated as historical mining sites.	N	-3	-3	-3	-4	-13	R	Demarcate portions of the mining area which has a heritage value and preserve these in terms of a heritage plan, which includes the historical mining workings, and infrastructure associated with the North Mine.	P	3	3	4	4	14
		Visual	Fugitive dust emissions as a result of infrastructure removal and associated exposed/bare areas may	N	-2	-2	-4	-3	-11	CbA	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road	N	-2	-1	-3	1	-5

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			have an impact in terms of air quality and visual characteristics.								dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity. Establish and implement a dust suppression plan in consultation with the environmental control officer and an air quality specialist as part of the contractor's responsibility.						
		Air Quality	All activities associated with the removal of infrastructure and rehabilitation has the potential to release dust.	N	-2	-2	-4	1	-7	CbA	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity.	N	-2	-1	-3	1	-5
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	N	-2	-2	-4	1	-7	CbA	The removal of all infrastructure is to take place during daytime periods only. Where noise becomes a nuisance, management measures will be investigated and implemented to address these.	N	-2	-1	-3	1	-5
		Social	Disruption and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts.	N	-2	-2	-4	1	-7	CbA	Local residents, with the focus on the surrounding landowners, should receive accurate information with regards to the project status, timeframes for decommissioning and other relevant information about issues that could influence their daily living and movement patterns.	N	-2	-1	-3	1	-5
Earth Moving, shaping and ripping of ground	1, 2, 3, 4, 5, 6	Geology	No direct impact	-	0	0	0	0	0	-	-	-	0	0	0	0	0
		Topography	The shaping of the site should be undertaken in such a manner that it improves the overall topography of the site.	P	1	3	4	5	13	CbA	Pre-mining topography should be reasonably restored through shaping and landscaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas.	-	1	3	5	5	14
			Soil erosion	N	-6	-3	-4	-3	-16	CbA	Re-vegetate as soon as possible .	N	-2	-1	-3	1	-5
			Ripping and topsoil replacement will restore the soil physical characteristics prior to re-vegetation.	P	1	3	4	5	13	CbA	Compacted soils will be ripped and topsoil will be replaced. After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. Where sites have been alienated of vegetation or where soils have been compacted or covered with concretes, these sites will be ripped and ploughed.	P	1	3	5	5	14

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											The soils with the appropriate seedbed as stripped during the construction and operational phases will be placed over these areas to a depth as specified by a qualified specialist, should this be required. The soils shall be appropriately ameliorated to allow vegetation to grow rapidly if required – it should be noted that the mine will encourage self-succession of vegetation, if this does not take place effectively a re-vegetation project will be implemented						
		Terrestrial Ecology (Fauna & Flora)	The rehabilitation of the site will allow reestablishment of natural vegetation.	P	1	2	3	4	10	CbA	Compacted soils will be ripped and topsoil will be replaced. After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. Remove alien vegetation post decommissioning, with long term follow-up afterwards. On-going AIAP species control are required through all phases of rehabilitation. If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil needs to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification Access to rehabilitated areas should be restricted to vehicles/machinery specifically required for the implementation of the closure plan.	P	3	3	3	4	13
		Hydrology	Runoff from rehabilitated areas will impact on sensitive pan systems especially during intensive rainstorms especially if the area is not free draining.	N	-2	-1	-3	1	-5		The areas will be landscaped to be free draining in line with the approved storm water management plan. Berms, should they be necessary, must remain upstream and downstream of the areas to ensure that clean water is kept separate from dirty water until the area is free draining and re-vegetation has occurred.	P	3	3	3	4	13
		Geohydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-		-	-	-	-	-	-	-
		Visual	The rehabilitation (ripping, topsoil replacement and landscaping) will remove the visual incongruity.	P	2	4	4	1	11	CbA	An overall visual improvement will be noticed once all mining related infrastructure has been demolished and the area has been landscaped and re-vegetated.	P	2	4	4	3	13

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Demarcate the decommissioning area and limit the decommissioning activities as far as possible.						
											Final shaping will be implemented such that the final profile of the rehabilitated areas is formed to emulate natural contours of the area.						
											Any foundations will be removed to a depth of 1m below the surface and the area rehabilitated.						
											All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site, or made available to the local community as building materials (provided they are in a satisfactory condition following demolition).						
											Linear infrastructure constructed by the mine (i.e. roads, conveyors, railway lines and power lines) will be removed if it proves to inhibit land use at decommissioning.						
											All fences erected around the TSF and RWD will be dismantled and disposed of at a permitted disposal site.						
		Air Quality	All activities associated with the removal of infrastructure has the potential to release dust.	N	-2	-2	-4	1	-7	CbA	Dust sampling will be undertaken on a monthly basis.	N	-2	-1	-3	1	-5
											Monthly monitoring reports will be generated by the mine or through a suitably qualified air quality specialist.						
											In the event that air quality or dust issues are identified based on the monitoring programme, an independent specialist should be appointed to determine the best course of action to ameliorate the situation.						
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	N	-2	-1	-4	3	-4	CbA	The removal of all infrastructure is to take place during daytime periods only. Where noise becomes a nuisance, management measures will be investigated and implemented to address these.	N	-2	-1	-3	1	-5
											Machinery with low noise levels and maintained in a good order to be used and to comply with the						

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											International Finance Corporation's (IFC) Health and Safety Regulations. Speed control measures will be implemented by the Mine through the placement of adequate signage. Implement a penalty system for non-compliance to speed control measures and ensure that all workers are made aware of the penalty systems. Gravel roads to be maintained in as good and smooth a condition as possible.						
		Social	No direct impact	-	-	-	-	-	-		-	-	-	-	-	-	-
Specifics: Rehabilitation of Waste Rock Dumps and Slimes Dam	2, 4	Topography	Reinstate the natural runoff to limit seepage from the closed slimes dam.	N	-3	-3	-2	-4	-12	R	Ensure the WRDs are closed in line with the approved designs. Manage erosion on the slopes of the facilities to retain rehabilitated material. Provide suitable cover on the modified outer slope.	p	3	3	4	5	15
		Ecology	Presence of invader species could impact on the natural succession of vegetation on the slopes of WRDs.	N	-2	-3	-4	-4	-13	CbA	A AIP control programme must be implemented on site and enforced. This programme must stipulate the monitoring plan, which should include capturing of areas where invader species are present; action plan to remove these; % successful removal).	N	-1	-1	-3	-2	-7
		Surface Water	Erosion of the side walls of the WRD could lead not only to instability, but also siltation of water resources.	N	-2	-3	-3	-3	-11	CbA	The side walls should be sloped to a degree which will allow stability and self-succession of vegetation. The WRD must be shaped to be free draining and to blend in with the natural topography of the area. Where self-succession does not establish, it is recommended that the mine investigate a seeding programme. Clean and dirty water measures must be implemented around and on top of the facilities to manage water and runoff on and around the facility.	P	2	3	4	5	14
		Groundwater	Long term seepage, although indicated in the Waste Classification that it should not have a significant impact, can be reduced to improve the groundwater quality in the area.	N	-2	-3	-1	-1	-7	R	The side walls should be sloped to a degree which will allow stability and self-succession of vegetation. The WRD must be shaped to be free draining and to blend in with the natural topography of the area. Where self-succession does not establish, it is recommended that the mine investigate a seeding programme. Any signs of erosion must be rehabilitated immediately. Clean and dirty water measures must be implemented around and on top of the facilities to manage water and runoff on and around the facility. Groundwater monitoring must continue up until closure is obtained.	P	2	3	4	5	14

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			Decommissioning and removal of facilities could lead to the infiltration of dirty water to groundwater resources.	N	-2	-3	-1	-1	-7	CbA	No water may be discharged into watercourses, if this water has not been treated to the correct quality OR if approval from the DWS for such activity has not been obtained. Once the dams are empty, any silt remaining in the dams should be disposed of on the lined Slimes Dam. The dams should be demolished, and the liner and rubble should be classified to determine the type of landfill site suitable to cater for this material. Groundwater monitoring must continue up until closure is obtained.	P	2	3	4	5	14
			Contamination of soil resources due to hydrocarbon spills.	N	-1	-1	-2	-2	-6	R	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP. Vehicles must be well maintained. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site Any spills occurring during the collection process must be cleaned up immediately. Any significant spills must be captured in the incident reports and must be reported to the relevant department (NCDENC, WUA, CMA, DWS). A clean up procedure (i.e. Works Instruction) must be in place.	N	-1	-1	-2	-1	-5
Specifics: Rehabilitation of Opencast Pits	3	Surface Water	Natural runoff in the area must remain free flowing, which could be impacted if the opencast pits are not backfilled and compacted correctly. In the event that the opencast pits are not backfilled the runoff from the surrounding area can accumulate in the pits reducing the run off in the area.	N	-2	-3	-4	-3	-12	CbA	If opencast pits are not backfilled, enviroberms or a similar structure should be implemented to keep runoff from the opencast pits. The shape of the outer slopes of the opencast pits will be 16 degrees. Where backfilling is undertaken, only material as approved in the WUL may be used for such purpose. Backfilled areas must be compacted and shaped to ensure that subsidence is avoided and that the area is free draining, resembling the natural surface topography. Backfilled areas must be demarcated to avoid any unauthorised access to these areas. Where self-succession does not establish, it is recommended that the mine investigate a seeding programme. Weekly inspection must be implemented to monitor and measure the progress of rehabilitation. Clean and dirty water systems must remain in the area until rehabilitation has been completed.	P	2	3	4	5	14
		Groundwater	Natural runoff in the area must remain free flowing, to avoid unnecessary ponding	N	-1	-3	-4	-3	-11	CbA	If opencast pits are not backfilled, enviroberms or a similar structure should be implemented to keep runoff from the opencast pits.	P	2	3	4	5	14

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			in the opencast pits. In the event that the opencast pits are not backfilled the runoff from the surrounding area can accumulate in the pits reducing the run off in the area.								Where backfilling is undertaken, only material as approved in the WU may be used for such purpose. Backfilled areas must be shaped to ensure that subsidence is avoided. Backfilled areas must be demarcated to avoid any unauthorised access to these areas. Where self-succession does not establish, it is recommended that the mine investigate a seeding programme. Weekly inspection must be implemented to monitor and measure the progress of rehabilitation. Clean and dirty water systems must remain in the area until rehabilitation has been completed. Groundwater monitoring should continue up until closure has been obtained.						
		Ecology	Presence of invader species could impact on the natural succession of vegetation on the slopes of WRDs.	N	-2	-3	-4	-4	-13	CbA	A weed eradication programme must be implemented on site and enforced. This programme must stipulate the monitoring plan, which should include capturing of areas where invader species are present; action plan to remove these; % successful removal).	N	-1	-1	-3	-2	-7
Cessation of Labour Contracts	1, 2, 3, 4, 5, 6	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil, Land Use and Land Capability	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Terrestrial Ecology (Fauna & Flora)	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Wetland	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Geohydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	Infrastructure areas could benefit the local community.	N	-3	-3	-4	-5	-15	CbA	Instead of demolition of certain areas, these areas could be sold off as commercial property for use in the local community. All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the DMRE.	P	3	3	4	4	14

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			Loss of Employment.	N	-3	-3	-4	-5	-15	CbA	The mine should continue with the skills development programme and Social and Labour Plan commitments to empower the workforce to undertake other economically viable activities.	P	2	3	3	3	11
			Other impacts identified as part of the SIA includes: • Decline in the sustainability of the local economy as a result of the loss of employment, household income and capital investments; • Reduced economic activities within the area with subsequent negative impacts on smaller businesses; • A decline in the local economy would also have a direct impact on the financial status of the Tsantsabane Local Municipality; • Negative impact on the revenue base of the Tsantsabane Local Municipality; • Population changes and out-migration of people from the area, as well as relocation of families; • Negative impact on the social fabric and social networks; • A new class of jobseekers targeting other mines in the area; • Skilled workers moving out of the area in search of employment elsewhere; • Decrease in the quality of life of the surrounding communities due to the discontinuation of social development support and local economic development programmes;	N	-3	-3	-4	-5	-15	CbA	Decommissioning and its associated closure programmes must ensure that communities are not left stranded without alternative forms of livelihoods, with subsequent degradation of the communities' socio-economic quality of life. As the timing with regards to decommissioning or the replacement of the infrastructure cannot be determined at this stage, it is recommended that a detailed Social Impact Assessment be undertaken at the time of decommissioning to determine the actual impacts on the changing social environment at that stage.	N	-3	-3	-2	-2	-10

Name of Activity			Potential Impacts	Rating Pre Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	R, ID, CbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			• Negative impact on infrastructure development and maintenance; • A change in community infrastructure; • Disruptions and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts; • Increased safety risks associated with the decommissioning of the infrastructure; • Possible negative impact on the crime levels due to increased unemployment rate; • Remnants of possible environmental impacts; and • Remaining visual impact as a result of mining.														
Waste Management		All	Please refer to Construction Phase measures	-	-	-	-	-	-	-	-	-	-	-	-	-	-

2.h Summary of Specialist Reports

For the purposes of the environmental authorisation related to this application, numerous detailed specialist studies were undertaken. Please refer to Appendix 6 for these reports. The table below presents a concise snapshot of what the outcomes of these studies.

Table 75: Summary of findings from specialist studies undertaken

List of studies undertaken	Recommendations of specialist reports	Specialist recommendation s that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Soils, Land Use and Capability,	**General Discussion** The dominant land use within the Mining Optimisation Project is wildlife/wilderness, access roads and services roads as well as existing expansion project. No cultivated commercial agricultural activities were observed within the focus area and the immediate vicinity. For the railway line area the dominant land uses in the surrounding areas include mining, airfield, wildlife/wilderness, access roads and services roads as well as existing railway line. No cultivated commercial agricultural activities were observed within the study area and the immediate vicinity. The Mining Optimisation Project area traverses a Calcic and Anthropic catena with Coega/Knersvlakte, Mispah/Glenrosa being the dominant soil forms within the total investigated focus area. The remaining portions are occupied by Plooysburg/Vaalbos/Nkonkoni soil forms which occur in small patches within the focus area, with the Railway Line area comprising about 6.3% of these soils. The majority of the investigated Mining Optimisation Project area comprises extensively disturbed soils classified as Witbank/Cullinan formation which cover approximately 54.5%. These soils are considered as having poor physical characteristics which are not suitable for cultivated agricultural practices. The shallow soils of Coega/Knersvlakte (Cg) and Mispah/Glenrosa (Ms/Gs) formations collectively cover approximately 35.6% of the total investigated focus area. The occurrence of Hardrock/Lithic and Hard Carbonate material near and/or at the surface on these soil forms restricts root growth and creates conditions that are not conducive to the cultivation of most cultivated crops. Only 9.8% of the total investigated area is considered suitable for cultivated agricultural practices under intensive management practices (i.e. irrigation). For the Railway Line area shallow soils of Coega/Knersvlakte (Cg), Prieska/Addo and Mispah/Glenrosa (Ms/Gs) formations collectively cover approximately 51.9% of the total investigated study area and can be considered as having poor physical characteristics ideal in supporting cultivation agricultural practices. This is attributed to the occurrence of Hardrock/Lithic and Hard Carbonate material near and/or at the surface which restricts root growth and development. This creates conditions that are not conducive to the cultivation of most cultivated crops. Some portions of the study area are comprised of extensively disturbed soils classified as Witbank formation (41.8%). The relevant soil limiting factors within the focus area for land capability and land use potential include the following: - Shallow effective rooting depth due to shallow indurated bedrock of the Mispah/Glenrosa, Coega/Knersvlakte soil forms. As such, these soils are not considered to contribute significantly to agricultural productivity; - Seasonal waterlogging of the Kolke and Lepallane soil forms within the associated with the seasonal wetland features. Preservation of these soils for conservation purposes takes precedence, according to the National Water Act, 1998 (Act No. 36 of 1998); and - Lack of soil medium for plants and crop growth for the rocky outcrop, mine infrastructure, surface water areas and Witbank (Anthrosols) soil types. From a land capability point of view, the proposed Mine Optimisation project footprint is largely dominated by shallow soils with low agricultural potential soils with only minor areas comprising of High agricultural potential. At best, the Coega/Knersvlakte, Mispah/Glenrosa soil forms are suitable for marginal grazing. Although arable soils occur with the expansion project footprint (Plooysburg), given the climatic constraints of the area (Rainfall less than 400 mm) and lack of irrigation options, these soils are not likely to contribute substantially to national food production. Furthermore, high temperatures occurring in this area are	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.4 & Section 2.e.iii.16 for the Soils, Land Use and Capability Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 6: Soils, Land Use and Land Capability

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	also likely to cause crop wilting, thus affecting crop yield. Given these constraints the extent of the high productivity soils is not considered sufficient for viable cultivated commercial farming. Livestock commercial farming is marginal for one (1) landowner for the proposed area extent to be affected by mining activities, due to the grazing capacity low grazing capacity for this area (14 Hectares per animal). Although the grazing capacity indicated in the existing database is 14ha/LSU, based on the field investigation considering the veld condition (i.e., sparsity and palatability of grass) and occurring soils the grazing capacity is anticipated to be lower than indicated. Therefore, this area it is not considered sufficient for viable commercial farming unless intensive management practices are implemented. **Impact Statement** The proposed expansion projects will impact the soil resources in varying severities, with project 3 posing the highest impact significance due to its extent as well as the encroachment on high agricultural potential soils. Project 2 is anticipated to have the second highest impact while the remaining projects are anticipated to a limited impact since the majority of the development will occur on previously disturbed soils. Although there is occurrence of arable soils, low potential crop yields are foreseen for this area due to climatic constraints (i.e., limited rainfall) and lack of irrigation options. Nevertheless, protection of high agricultural resources (where feasible) is deemed imperative in efforts to conserve the finite agricultural resources in line with the CARA (CARA), 1983 (Act No. 43 of 1983). The surrounding areas within which the proposed expansion project is to occur are dominated by Iron Ore mines, and no cultivated agricultural activities occur in the immediate vicinity. This is largely attributable to the dominance of rocky outcrops and shallow soils which are not ideal for cultivated agricultural production. The proposed Mine Optimisation Project area is anticipated to lead to a relatively low cumulative loss of arable land and medium low cumulative loss of natural grasslands for grazing. Therefore, from a soil and land capability point of view, the addition to the cumulative impact footprint of the region is considered relatively minor. In terms of the railway line area, the proposed project is anticipated to lead to a relatively low cumulative loss of arable land and medium low cumulative loss of natural grasslands for grazing. Therefore, from a soil and land capability point of view, the addition to the cumulative impact footprint of the region is considered relatively minor. **Management Measures** The management measures presented in this report, focusses on: - Soil Stripping and Stockpile Management; - Soil Erosion and Dust Emission Management; - Soil Compaction Management; - Soil Contamination Management; and - Loss of Land Capability Management. **Specialist Opinion** The surrounding areas within which the proposed railway is to occur are dominated by Iron Ore mines, and no cultivated agricultural activities occur in the immediate vicinity. This is largely attributable to the dominance of rocky outcrops and shallow soils which are not ideal for cultivated agricultural production. In addition, lack of rainfall as well as limited irrigation options further disqualifies the area from being ideal for agricultural production. Therefore, based on the above-mentioned limiting factors, the proposed project is anticipated to lead to a relatively low cumulative loss of arable land and medium low cumulative loss of natural grasslands for grazing. Therefore, from a soil and land capability point of view, the addition to the cumulative impact footprint of the region is considered relatively minor.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Ecological Assessment	The mine is situated within the Savanna Biome and within the Eastern Kalahari Bushveld Bioregion. The mine occurs in three vegetation types, namely the Postmasburg Thornveld (western Portion), Kuruman Thornveld (Eastern Portion) and the Kuruman Mountain Bushveld (Eastern Boundary) – all three vegetation types are Least Concern ecosystems and currently Poorly Protected. For the Terrestrial Biodiversity Theme (Online Web Based National Environmental Screening Tool), the Beeshoek Mine is considered to have a very high sensitivity. The triggered sensitivity features include an Ecological Support Areas (ESA), and a Freshwater ecosystem priority area. The Beeshoek Mine is further located in the Griqualand West Centre (GWC) of plant endemism and the Gamagara Corridor. Based on the results of the field investigation six (6) broad habitat units were distinguished for the Beeshoek Mine Optimisation Project: 7. Calcrete Shrubland: 8. Modified Habitat Unit: 9. Moisture-driven Habitat: 10. Open Thornveld Habitat Unit: 11. Rupicolous Habitat Unit: 12. Non-watercourse habitat: Of the AIPs recorded during the field assessment, 12 species are listed under NEMBA Category 1b and two under Category 2. The remaining species are not listed under NEMBA but species such as *Bidens bipinnata, Chenopodium album* and *Tagetes minuta* are considered problem plants having a negative impact on indigenous floral communities within disturbed and degraded areas. Based on conservation significance, presence of various SCC (refer to Section 2.e.iii.5.h) and the level of habitat degradation, the floral sensitivity of the habitat units indicate that the Modified Habitat Unit is of **Low and Moderately Low Sensitivity**, the Calcrete Shrubland is of **Intermediate Sensitivity**, the Watercourses (Cryptic Wetlands and Episodic Drainage lines) of **Moderately High Sensitivity**, the Non-watercourses (Preferential Flow Paths, Seasonal Depressions and Recharge zone) of **Moderately Low and Intermediate Sensitivity**, the Open Thornveld varied between **Intermediate and Moderately Low Sensitivities**, and the Rupicolous Habitat varied between **Moderately Low and Moderately High Sensitivities**. The proposed Beeshoek Mine activities will impact on these habitat units to varying degrees. When considering the conservation significance, presence of SCC and the level of habitat degradation (refer to Section 2.e.iii.5.h), at the Mine Optimisation Project the faunal sensitivity of the habitat units indicate that the Modified Habitat Unit is of **Low and Moderately Low Sensitivity**, the Natural Habitats are of **Intermediate Sensitivity** and the Watercourses and Non-watercourses of **Moderately High Sensitivity**. From a fauna perspective, the proposed Railway Line Link Project will result in the clearance of faunal habitat (vegetation) that predominantly ranges from **intermediate** to **low sensitivity**. The preferential flow path is deemed to be of **moderately high sensitivity** for fauna, and will be impacted upon at the various road and railway crossing point. This preferential flow path provides niche habitat and surface water for fauna in the local area and as such, is considered to be of increased importance, even though artificial. **Impact Statement** Floral SCC recorded within the focus area included species protected under the National Forest Act, 1998 (Act No. 84 of 1998, as amended in September 2011) (NFA), NEMBA TOPS regulations, and Schedule 2 protected species of the NCNCA. Mining activities associated with Project 1, 2 and especially Project 3 are anticipated to have an unfavourable impact on floral SCC. Projects 4 and 5 will minimally impact on floral SCC. Faunal SCC observed and expected to occur on site include species protected under TOPS as well as being listed either as protected or specially protected in Schedules 1 and 2 of the NCNCA. Project 3 will have the greatest impact on potential faunal SCC as a result of the increased areas where vegetation clearance will take place.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.5 for the Ecological Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 7: Ecological Study

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Separately, the five projects will vary considerably in the significance of the impact ratings on floral and faunal ecology associated with the Beeshoek Mine. Collectively, the impacts are anticipated to be significant on both floral and faunal habitat and diversity, as well as on SCC. Most significant impacts to affect the floral and faunal habitat integrity and species diversity within the Beeshoek Mine include, but are not limited to, the following: - Mining activities within sensitive habitat such as Cryptic Wetlands (though limited to only two pans), species-rich Rupicolous Habitat (floral) and large stretches of untransformed Calcrete Shrubland. Considering that the Postmasburg Thornveld, Kuruman Thornveld and Kuruman Mountain Bushveld are endemic vegetation types (Skowno et al, 2019) and the fact that there are several additional mining expansions planned in the region, further impact on the remaining extent of the currently least concern, but poorly protected, vegetation types could increase their threat status; - Continued expansion resulting in fragmented habitat, the loss of movement corridors and breeding habitat for faunal species; - Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; - AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora, altering favourable habitat conditions for the establishment of indigenous species and limiting faunal species utilisation of these area; - Rehabilitation efforts are likely to result in sub-optimal recovery of the landscape to pre-mining conditions, resulting in residual impacts to floral and faunal communities; - Increased human populations in the surrounding area leading to greater pressure on natural floral and faunal habitat both within the Beeshoek Mine and the surroundings, whilst increased human numbers are likely to lead to increase persecution rates on fauna, notably snaring and informal hunting activities; - Placement of mining infrastructure within floral and faunal SCC habitat; - Destruction, removal or harvesting of floral SCC during construction and operational activities; and - Potentially poorly implemented and monitored rescue and relocation of SCC that will be affected by the proposed project, leading to unsuccessful rescue efforts and loss of SCC individuals. Most significant impacts at the Railway line project are considered to be: - Clearance of habitat with numerous individuals of nationally and provincially protected floral species; - Habitat fragmented and resulting in reduced movement of species and reduced dispersal opportunities for plant species; - Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; - AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. - Disturbance, fragmentation and alteration of floral SCC habitat; - Destruction, removal or harvesting of floral SCC during construction and operational activities; and - Potentially poorly implemented and monitored rescue and relocation of SCC that will be affected by the proposed project, leading to unsuccessful rescue efforts and loss of SCC individuals. **Management Measures** - Habitat Diversity Management - AIP Management - Edge Effect Management - Faunal SCC Management		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	- Rehabilitation **Specialist Opinion** It is the opinion of the ecologists that this study provides the relevant information required to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the project area will be made in support of the principle of sustainable development.		
Freshwater Ecosystems	**General Description** According to the screening tool the overall aquatic sensitivity of the Beeshoek Mine and surrounds is very high due to the area being classified as a FEPA catchment, the presence of wetlands and the Beeshoek Mine falling within a strategic water source area. The FEPA catchment and numerous wetlands corresponds with the NFEPA Database (2011) and the NBA 2018 Dataset. According to the Strategic Water Source Areas (SWSA) Database (2017) the south eastern portion of the Beeshoek Mine Boundary is located within the Southern Ghaap Plateau groundwater SWSA. Numerous (over 50) potential areas of increased wet response were identified in the study area. Twenty-one of these possessed unique characteristics not observed in other features, including floral species and aquatic macroinvertebrates which led to their characterisation as “cryptic wetlands” (as defined by Day et al, 2010), whilst one was characterised as an episodic drainage line with a weakly defined riparian zone. Both the cryptic wetlands and the episodic drainage line were classified as watercourses from an ecological perspective and thus assessed as such. The remaining features were characterised as seasonal depressions, preferential flow paths and a “recharge zone” associated with a small unnamed tributary of the Groenwaterspruit, none of which were classified as watercourses. These were excluded from further assessment. The 21 cryptic wetlands identified within the proposed mine expansion footprint were found to be of increased ecological integrity, and of moderate ecological importance and sensitivity (EIS). Although true hydrophytic vegetation was absent from all but one of these cryptic wetlands, additional biotic and abiotic factors were used to define, delineate and characterise these features, including the presence of macroinvertebrate communities within two of the features. It is likely that all identified cryptic wetlands are primarily important in terms of biodiversity maintenance and habitat provision for threatened or protected species. No watercourses, as defined by the National Water Act, 1998 (Act No. 36 of 1998) were identified within 500 m of the proposed railway line. Due to the nature of the proposed development and the location thereof in relation to any identifiable drainage systems (in excess of 1 km from the proposed railway line), the development of the railway is considered to pose little to no risk to any freshwater ecosystems in the region. Therefore, it is the opinion of the specialist that there is no reason, from a freshwater resource management point of view, for the development to not be authorised. **Impact Statement** Based on the layout provided to the specialist in July 2021, two of the 21 cryptic wetlands will be irreversibly lost should the proposed expansion of the Village Pit and future opencast areas proceed. Whilst the results of the risk assessment indicate that the associated risk significance is ‘medium’ it is the specialist’s opinion that this is understated due to the impact only occurring once, and therefore the score is ‘1’; thus a more accurate representation of the risk significance is ‘high’. Restoration of the affected cryptic wetlands will not be practical nor viable, therefore the proponent must engage with the relevant authorities to implement appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent with regards to the outright loss of the affected CWs.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.6 for the Freshwater Ecological Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 8: Freshwater Ecosystems

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	The expansion of the existing Waste Rock Dumps and detrital area, and proposed activities within already disturbed areas are anticipated to have a 'low' or even negligible risk significance, provided that strict enforcement of mitigation measures takes place. Therefore, those activities may be considered acceptable from a freshwater ecological management perspective. The cryptic wetlands and episodic drainage line identified in the Beeshoek Mine boundary are deemed to be in a natural to largely natural condition, since few discernible impacts have occurred. Although not necessarily important for the provision of ecological services such as flood attenuation, these systems are deemed important for biodiversity maintenance, and may potentially provide important breeding and foraging habitat for various fauna, particularly since the presence of macroinvertebrates was confirmed at two cryptic wetlands. These cryptic wetlands may provide habitat for floral SCC. Responsible implementation of the mitigation hierarchy as well as strict adherence to cogent, well-developed mitigation measures must take place throughout all phases of the proposed mining expansion to minimise the significance of impacts to the receiving freshwater environment. This is particularly important in a semi-arid region to protect the scarce water resources of the region. Should the proponent commit to such adherence to the mitigation hierarchy and mitigation measures, the significance of potential impacts arising from some of the proposed mining activities can be reduced although the direct impact to those cryptic wetlands which will be mined through is irreversible. Restoration of the affected cryptic wetlands will not be practical nor viable, therefore the proponent must engage with the relevant authorities to implement appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent with regards to the outright loss of the affected CWs. **Management Measures** The catchments of all identified watercourses must be determined by a suitably qualified specialist, and as far as feasible, no activities must be permitted within the delineated catchments. Retain as much indigenous vegetation as possible. The watercourse areas and their associated catchments beyond the proposed footprint of expansion should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas. It is strongly recommended that sampling of the cryptic wetlands to determine the presence (or absence) of macroinvertebrates be undertaken. Sampling under dry conditions can be achieved by obtaining soil samples from the top layer (0-50 mm) of soil within each CW, which would hold the egg banks of any invertebrates present. These soils samples are then processed under laboratory conditions to hatch out and enumerate the invertebrate taxa present. Should invertebrate taxa be present, a detailed rescue and relocation plan should be developed by a suitably qualified specialist, to relocate egg banks, either to cryptic wetlands that will be undisturbed, or to recreated wetlands. Such a rescue and relocation plan could potentially form part of and offset initiative, should it be required by the relevant authority. It is worth nothing that should the exploration drilling within the Future Strategic Exploration Block latterly translate to open cast mining, CW14 could, potentially, be mined out. Due consideration must be given to this possibility during future planning phases to ensure that engagement with the relevant authorities takes place to ensure that appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent can be planned for and implemented appropriately. Management measure to be discussed with authorities in the event that the mine proceed with future mining activities in this area could include that cryptic wetlands will be undisturbed, or to recreated wetlands. Activities associated with Projects 1, 2, 3, 4 and 5 will pose a negligible risk to CW19, as none of the proposed activities will occur within proximity to the CW, although the general increase in mining activity is likely to result in increased dust generation, potentially posing a moderate to high risk significance to the wetland. Therefore, dust suppression must be implemented throughout the life of mine to minimise the risk of wind-borne sediment reaching this, and other, cryptic wetlands.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Specialist Opinion Due to the outright loss of two cryptic wetlands, it is the specialist's opinion that the proposed mining expansion has the potential to result in impacts of very high significance on the receiving freshwater environment, particularly of a wetland type which is under-researched and of scientific interest. It is however noted that, based on the layout provided at the time of preparing this report, the extent of direct impact will be contained to the local area and will equate to less than 3 ha of wetland habitat. Thus, consideration of the value of this landscape must be considered from a freshwater and terrestrial biodiversity resource management point of view and juxtaposed with the responsibility to comply with Regulation 23 of the Mining and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) MPRDA pertaining to the optimisation of the Mining Right as well as the socio-economic and socio-cultural impact the project will have and the decision should be made and aligned with the principles of sustainable development and Integrated Environmental Management. The expansion of the existing Waste Rock Dumps and detrital area, proposed exploration drilling and proposed activities within already disturbed areas are anticipated to have a 'low' or even negligible risk significance, provided that strict enforcement of mitigation measures takes place. Therefore, those activities may be considered acceptable from a freshwater ecology management perspective.		
Hydrology	**General Description** The climate of Beeshoek can be described as semi-arid to arid, with evaporation far exceeding rainfall. The Mine is located in an endoreic catchment, and therefore, surface water runoff is limited. The general topography of the MRA is flat and the soils consist mostly of semi-permeable to permeable soils. Shallow ephemeral drainage lines occur in the south-east of the MRA and drain towards the Groenwaterspruit. A number of pan like features occur in the west and south of the MRA and have been classified as Cryptic wetlands and seasonal depressions in the Freshwater Ecological Assessment (SAS, 2021). Beeshoek is located in quaternary catchment D73A within the Vaal Water Management Area. According to the Water Resources of South Africa Study 2012 (WR 2012), quaternary catchment D73A is endoreic, meaning that surface water runoff does not flow out of the catchment, and that water is lost to evaporation and infiltration. This is mostly due to the low rainfall and high evaporation of the area. Surface water quality is monitored at the dams/tanks, pits and pipelines. According to Aquatico (2021), the general surface water quality during the 2020 period was classified as being neutral, saline and very hard. Low salt concentrations, metal concentrations and nutrient concentrations were detected at all of the sampling localities. Elevated bacteriological counts occurred at some of the sampling locations. According to GPT (2021), groundwater levels range between 5 metres below ground level (mbgl) in the unaffected mining areas, to 180 - 200 mbgl in the dewatered areas due to groundwater abstraction for dewatering and water supply. The effect of dewatering is more pronounced to the south of the mine. The direction of groundwater flow is south to south easterly from the mining area. A cone of depression has developed within the active mining area with flow directed towards the mining excavation due to the active mining areas. The general groundwater quality is good; however, elevated nitrate does occur at some of the sampling boreholes due to expected mining related impacts (Aquatico, 2021). The only natural defined drainage channel occurs in the south-east of the MRA. A 1:50 and 1:100 year floodline determination was undertaken on this drainage line, as according to Regulation 4 (b) of GN704, prospecting should not take place within the 1:50 year floodline unless exemption is obtained from the DWS. The proposed activities will not be undertaken within this area. No watercourses were identified in the vicinity of the railway line project. **Impact Statement** The impact assessment indicated that all identified impacts would have a medium significance pre-mitigation, and that these impacts can be mitigated to a low significance should mitigation measures be adhered to. Typical impacts identified include:	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.7 for the Hydrological Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 9: Hydrology

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• Erosion of exposed soils leading to siltation and sedimentation of downslope drainage channels. • Potential hydrocarbon spillages washed into downslope drainage channels. • Alteration in natural drainage patterns leading to erosion and siltation. • Loss of hydrological connection and water quantity. • Loss of natural seasonal storage areas. • Loss of water quantity to downstream users. Due to the arid climate this is likely to be a very small to negligible impact. Management Measures The determined floodline is connected to what has been delineated as a recharge zone in the Freshwater Ecological Assessment (SAS, 2021). It is recommended that future prospecting activities do not take place within the 1:50 year floodline as required by GN704 Regulations. It is further recommended that future prospecting activities remain outside of the recharge zone pending further investigation and understanding of this area. The following are proposed stormwater measures: • Berms should be placed around the proposed ROM Stockpile consolidation area, as is the case with other ROM Stockpiles onsite. Waste rock can be used to construct the berms, as it has been authorised for such purposes in the Mines amended WUL. This will ensure that any clean water runoff is diverted away. • No stormwater measures to contain runoff were recommended around the existing WRDs due to the low rainfall, high evaporation and waste classification which indicated non-hazardous material (SWS, 2016). Furthermore, waste rock has been exempted from regulation 5 of GN704 (which pertains to "Restrictions on the use of material") for the construction of berms and haul roads. Based on the above, it is not foreseen that runoff from the WRD expansion areas would need to be contained. However, WRDs close to sensitive areas such as wetlands and depressions should be contained. • Berms should be placed around the proposed pits and Detrital mining areas, as is the case with the other existing pits, to ensure that no clean water flows into the voids. Seepage and dirty water runoff collected within the voids should be managed by recycling and reusing dirty water as far as practicably possible. • The WHIMS and Jig Plants should be operated as dirty areas. Dirty water runoff from the WHIMS and Jig Plants should be directed via lined channels to lined sumps or Pollution Control Dams (PCDs). The water collected within the sumps/PCDs should be recycled and reused as process water. Both the WHIMS and Jig Plants will be located on topographically elevated areas surrounded by disturbed areas, and therefore, the diversion of clean runoff around these areas is not foreseen. • Water levels and sufficient freeboard within the proposed dirty water dams/tanks, should be monitored and reported on. Dirty water storage facilities must be sufficiently lined with adequate capacity, in accordance with GN704 regulations. • Monitoring plans have been proposed under section 2.h of this EMPr (Part B) report. **Specialist Opinion** Based on the findings and outcomes of this study, it is the opinion of the specialist that from a surface water perspective, the proposed projects and activities can commence, provided that the recommendations and mitigation measures provided in this report are adhered to. It is important that future prospecting activities in the southern and western extent of the MRA should avoid the wetlands, depressions, recharge zone and drainage lines.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Hydrogeology	**General Discussion** The hydrogeology in the Postmasburg/Beeshoek area is extremely heterogeneous due to the complex geology of the area. Karoo Supergroup sediments, volcanics and karstic (dolomitic) formations are the main components of the groundwater regime in the area. Hydraulic conductivity varies spatially and vertically, and the modelled conductivities vary by at least six orders of magnitude, from 10^{-3} m/d to 10^{+2} m/d (0.001m/d to 100m/d). Groundwater levels range between 5mbgl in unaffected areas to 180 - 200mbgl in dewatered areas due to groundwater abstraction for dewatering and water supply. The effect of dewatering is more pronounced to the south of the mine (south of Olynfontein). The direction of groundwater flow is south to south easterly from the mining area. A cone of depression has developed within the active mining area with flow directed towards the mining excavation due to the active mining areas. The leachable concentrations of solid waste were compared to the leachable concentration threshold (LCT) limits to determine the leachability of the different waste types at the mine. Solid waste types were described as either "type 4" or "type 3" waste types which are low hazard waste types with regards to the likelihood to release contaminants in dissolved phase. Generally, the groundwater resources at all the sampling localities are described as being neutral to alkaline (pH levels between 7.8 and 8.0), non-saline to saline (TDS between 445.5mg/l and 563.8mg/l), and the hardness can be classified as very hard (> 300mg $CaCO_3$/l). Water hardness at Beeshoek mine is not unlike most other boreholes in the area, resulting from the calcareous/dolomitic underlying geology characteristic of many parts of the Northern Cape. Metal concentrations were below detection limit or low at all the monitoring boreholes. Nitrate as N and combined nitrate and nitrite exceed the drinking water limit in the majority of external user boreholes regardless of location. The WUL identified nitrates as a contaminant of concern in relation to mining activity due to the use of N-based emulsions for blasting. Through the analysis of N-isotopes from nitrates, a contamination assessment was conducted in 2019 and it was concluded that mine's contribution to nitrate levels in and around the mine was minimal (<1%). The aquifer can be classified as a minor aquifer system, with medium level protection required. **Impact Statement** The potential influences on groundwater quality were identified as opencast mining, fuel storage and handling, sewage management, solid and liquid mining-related waste management at the mine (i.e. ore discards and impounded mine water). The construction phase is not expected to influence the groundwater levels. With the exception of minor oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality. During the operational phase, it is expected that the main impact on the groundwater environment will be dewatering of the surrounding aquifer. Water entering the mining areas will have to be pumped out to enable mining activities. This will cause a lowering in the groundwater table in- and adjacent to the mine.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.8 for the Groundwater Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 10: Hydrogeology

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Mining in this area has been ongoing for many decades, and there are historical impacts on the surrounding aquifer which are impractical to simulate in a numerical model. Thus, current groundwater levels (obtained from various sources) have been used as baseline for this impact assessment, and all dewatering impacts related to the current water levels as a starting point. Considering the impact associated with each mining pit, the following observations were made: - The area to the south of the mining rights area is characterised by deep groundwater levels (>100 m) associated with large-scale dewatering at the neighbouring Kolomela Mine. - No drawdown is expected for further mining at East Pit as the declining groundwater levels is predicted to be below the bottom of mining. - Drawdown at Village pit is predicted to extent to up to 2km from the pit in a mostly westerly direction, for an insignificant drawdown of 5 – 10 metres. Areas of significant drawdown is expected only in in the immediate vicinity of the pit, which could even decline with time as Leeuwfontein mining impacts northward into this area. - HF Pit is predicted to have a minor impact limited to the immediate surroundings of the pit itself. - The BN Pit is predicted to have the largest area of impact due to substantial increase in mining depth. Drawdown of groundwater levels will be up to about 100 m but limited to an area of about 1 km around the pit. This is mainly due to different hydraulic characteristics in the area around the pit. - No groundwater-related impacts are expected on surface water resources. After closure and cessation of dewatering/groundwater abstraction, the water table will rise in the mine to reinstate equilibrium with the surrounding groundwater systems. The rebound period also depends on regional activity as large-scale dewatering is occurring at the neighbouring mines as well. Following the closure of the opencasts and the cessation of the dewatering it is assumed to lead to groundwater rebound and potential decanting. However, due to naturally deep-lying groundwater levels, no decant is predicted. The rise of solute concentrations in groundwater is expected to occur slowly in a south to south-westerly direction, at about 100 metres per year. No adverse effects are predicted on receptor boreholes with regards to increasing solute concentrations in groundwater. **Management Measures** The Mine was awarded a WUL in August 2018, licence number 10/D73A/ABGJ/2592 (read with update 2019). The WUL covers Section 21(a), 21(b), 21(g) and 21(j) of the NWA. The conditions as set out in the WUL serve as the guidelines for monitoring data interpretation and reporting for authorised activities. A monitoring programme is in place which entails quarterly water quality monitoring and monthly manual water level and daily telemetric/auto-level water level monitoring at select locations. The current water quality and water level monitoring network is considered adequate to detect and quantify the presence and migration of any contaminants in groundwater and measure the effects of large-scale groundwater abstraction for mining purposes on groundwater levels. A groundwater monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. The boreholes can be grouped or classified according to the following purposes: - Source monitoring: Monitoring boreholes are placed close to or in the source of contamination to evaluate the impact thereof on the groundwater chemistry. Monitoring boreholes within the mining area satisfy this condition. - Pathway monitoring: Monitoring boreholes are placed in the primary groundwater migration pathways to evaluate the migration rates and chemical changes along the pathway. Monitoring boreholes located along groundwater flow paths satisfy this condition. - Impact monitoring: Monitoring of possible impacts of contaminated groundwater on sensitive ecosystems or other receptors. These monitoring points are also installed as early warning systems for contamination break-through at areas of concern. External user boreholes and monitoring placed in positions to detect and monitor impacts on groundwater availability and quality satisfy this condition. - Background monitoring: Background groundwater quality is essential to evaluate the impact of a specific action/pollution source on the groundwater chemistry. Monitoring boreholes located up-gradient/upstream of the mining area satisfy this condition.		

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<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th><th>Specialist recommendations that have been included in the EIA report</th><th>Reference to applicable section of report where specialist recommendations have been included.</th></tr>
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Dewatering is primarily achieved through wellfields of abstraction boreholes and in pit dewatering points, and the combination thereof functions with the purpose of keeping the pit floor dry by creating a cone of depression around the excavation. The pit floor was thus modelled as a drain, which in MODFLOW uses the bottom elevation of the drain as the hydraulic head that controls flow into the drain. In this way the individual position of dewatering boreholes has no effect on the extent of the cone of depression or groundwater level lowering. Dewatering borehole positions may be changed without notice as objectively they will be placed as close as possible to the excavation to maintain a dry pit floor.
Specialist Opinion
Beeshoek is currently operating in a dynamic mining environment. Water levels are also impacted by various external sources, which directly impacts the water levels at Beeshoek. Currently, no additional groundwater is to be abstracted from the catchment as part of this project expansion. However, due to the nature of the environment in which the mine is operating, regular numerical model updates must be undertaken to determine whether the volumes for dewatering will still be sufficient to also supply the mine with the required volumes as approved in the Section 21a water uses.
</td><td></td><td></td></tr>
<tr><td>Air Quality</td><td>
General Discussion
In 2020, 76% of all winds were either calm or light with and 76% of all winds were less than 3.6 m/s, i.e. (6 658 hours of the possible 8 760 hours in a year). 24% of winds exceeded 3.6 m/s with just 0.1% of winds reaching more than 8.8 m/s, i.e. for just longer than 8 hours. The predominant wind direction in 2020 was from the sector east-northeast (ENE) to easterly (E), accounting for approximately 36% of all winds.
The predominant wind direction is northwest to north-northeast with winds from other sectors less frequent. Winds are generally light with most of hourly winds less than 3.4 m/s. Stronger winds reaching more than 8 m/s are occur occasionally from the west-northwest to north-northwest sector.
Beeshoek Mine has been measuring dust fallout since 2005. Monitoring is currently done at nine sites using the SANS 1929:2005 and ASTM Standard, D1739-98: Standard Test Method for the Collection and Measurement of Dust fall (Settleable Particulate Matter).
The measured dust fallout is generally low compared with the limit value of the dust fallout standard of 1200 mg/m^2/day.
The total estimate emission of total suspended particulates (TSP) from Beeshoek Mine activities in 2019 was 5 224 tons. The estimate emission from PM10 was 1 545 tons in 2019 and for PM2.5 was 172 tons per annum. The largest source of particulates is vehicle entrainment from the mine roads. Assuming that mine roads are watered twice daily, approximately 90% of all TSP and PM10 emissions are attributed to the entrainment of dust by vehicles, and 80% of the PM2.5 emission. Crushing and screening is the second largest source of particulate emissions at Beeshoek, but it is relatively small and accounts for only 5.4% of the total TSP and PM10 emission. The total emission of particulates increases with the implementation of the optimisation projects.
Particulate emissions in tonnes per annum for the current year of assessment in 2019
<table>
<tr><th>Mining activity</th><th>TSP</th><th>PM10</th><th>PM2.5</th></tr>
<tr><td>2019 Emissions</td><td>5 224</td><td>1 545</td><td>172</td></tr>
<tr><td>Emissions post optimisation projects</td><td>7 039</td><td>2 118</td><td>230</td></tr>
</table>
The US-EPA approved and DFEE recommended CALPUFF dispersion model was used to predict the ambient particulate concentrations and dust fallout rates from the four optimisation projects and from the Beeshoek Mine after their implementation.
The maximum predicted ambient PM10 and PM2.5 concentrations and TSP deposition for the optimisation projects and for Beeshoek Mine following their implementation are presented in the following table. In all cases the predicted maximum occurs close to the respective project site on the mine property.
</td><td>Yes</td><td>
Table 85 to Table 89 for the impacts and management measures
Section 2.e.iii.9 for the Air Quality Description
Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures
Annexure 11: Air Quality; Annexure 10: Hydrogeology
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List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.

Exceedance of the NAAQS (shown in bold) are predicted for Project 3: Opencast Pits and result from haul road emissions. This contribution implies that the predicted ambient concentrations for Beeshoek Mine following the implementation of the projects are also exceeded at the point of maximum.

Maximum predicted annual average and 99th percentile of 24-hour PM10 and PM2.5 concentrations in µg/m3 and maximum dust fallout in mg/m2/day

	Annual PM10	24-hour PM10	Annual PM2.5	24-hour PM2.5	Dust fallout
Project 1: Consolidation of ROM stockpiles	7.2	30	2.8	11.6	16.3
Project 2: Amendments to WRDs	1.4	4.4	0.2	0.7	2.8
Project 3: Opencast footprints	**439**	**1 239**	**45**	**127**	1 175
Project 4: Beneficiation plant upgrade	33	271	6.5	21	509
Beeshoek Mine post improvements	**793**	**2 617**	**80**	**263**	2 457

Impact Statement

The predicted maximum ambient concentration at identified sensitive receptors are shown in the following table and compared with the NAAQS. Noteworthy is that in all case they are well below the respective NAAQS at all sensitive receptors.

Predicted annual average and 99th percentile of 24-hour PM10 and PM2.5 concentrations in µg/m3 and dust fallout in mg/m2/day at sensitive receptors.

Receptor	Annual PM10	24-hour PM10	Annual PM2.5	24-hour PM2.5	Dust fallout
Aucampsrus	8.0	65.0	0.8	7.0	75
Boichoko	2.1	21.1	0.2	2.0	22
Maranteng	1.1	12.3	0.1	1.3	12
Newtown	1.4	14.7	0.2	1.5	15
Postdene	0.9	10.1	0.1	0.9	12
Postmasburg-North	1.1	13.0	0.1	1.3	13
Postmasburg-South	1.2	13.2	0.1	1.4	14
NAAQS	40	75	20	40	600

The following points on the predicted ambient PM10 concentrations are noteworthy:

- The predicted annual PM10 concentrations from Project 1 (ROM consolidation), Project 2 (WRD amendments) and Project 4 (beneficiation plants) are low and below the NAAQS. The highest concentrations for each of these source projects occur in the immediately vicinity of these individual sources.

The predicted annual PM10 concentrations for Project 3 (pit expansion) exceed the NAAQS. The exceedances are predicted in the vicinity of the Village Pit and occur within the mine boundary. The relatively high predicted concentrations are a result of dust generated on the haul roads.

- The predicted annual PM10 concentrations resulting from emissions from all sources at the Beeshoek Mine following implementation of the optimisation projects exceed the NAAQS over most of the mine and extend a little beyond the southern and eastern boundary of the mine. The exceedances do not extend into any commercial or residential areas.

The following points on the predicted ambient PM2.5 concentrations are noteworthy:

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	- The predicted annual PM2.5 concentrations from Project 1 (ROM consolidation), Project 2 (WRD amendments) and Project 4 (beneficiation plants) are low and below the NAAQS. The highest concentrations for each of these source projects occur in the immediately vicinity of these individual sources. - The predicted annual PM10 concentrations for Project 3 (pit expansion) exceed the NAAQS at the Village Pit. The relatively high predicted concentrations here are a result of dust generated on the haul roads. - The predicted annual PM10 concentrations resulting from emissions from all sources at the Beeshoek Mine following implementation of the optimisation projects exceed the NAAQS over the Village Pit and the East Pit. The predicted exceedances occur within the mine boundary. The following points on the predicted dust fallout rates are noteworthy: - The predicted dust fallout resulting from Project 1 (ROM consolidation) and Project 2 (WRD amendments) and Project 4 (beneficiation plants) is low relative to standards and highest fallout rates occur in the immediately vicinity of these individual sources. - The predicted dust fallout for Project 3 (pit expansion) is low relative to the national standard for non-residential areas. The highest fallout rates compare with the residential standard and occur in the immediate vicinity of the Village Pit where the non-residential standard is shown by the red line. - The predicted dust fallout resulting from emissions from all sources at the Beeshoek Mine following implementation of the optimisation projects are relatively low and comply with the standard for residential areas. The only predicted exceedance of the non-residential standard occurs within the mine perimeter and over the Village Pit where the residential standard is also predicted to be exceeded. The dust fallout standard for residential areas is also predicted to be exceeded over the East Pit. The significance of air quality impacts associated with the optimisation projects and for Beeshoek after the optimisation were assessed using the predicted ambient concentrations. **Management Measures** The development and implementation of a fugitive dust management plan (FDMP) is recommended. The FDMP must define the responsible persons and should include, but not be limited to the following. - Strict enforce speed limits on all mine roads. - Limiting site clearance to design areas. - Rehabilitation of all areas on completion of construction activities. - Routine damping of denuded areas during construction, particularly when strong winds are forecast. - Monitoring of activities causing high dust fallout and manage these specific activities accordingly by actively using the existing dust fallout network. - Implementation of dust control measures in the form of slope stability and a vegetation program. - Installation, operation and maintenance of dust extraction systems at the secondary and tertiary crushing and screening plants. For crushing and screening operations at mineral processing plants, fugitive dust can be controlled with dust extraction systems and water sprayers. - The application of chemical dust suppression systems at the primary crushing and screening plants. - Covering all product transported by vehicles using tarpaulins. **Specialist Opinion**		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	From an air quality perspective, it is the reasonable opinion that the Beeshoek Mine optimisation project should be authorised considering the findings of this assessment.		
Heritage and Palaeontology	**General Description** A Heritage Impact Assessment (HIA) was conducted for the project and the study area was assessed on desktop level and by a non-intrusive pedestrian field survey. Key findings of the assessment include: <u>Mine Optimisation Project Area</u> - Large sections of the study area are disturbed by existing mining activities; - Archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for Stone Age sites/finds. This pattern was corroborated during the survey where isolated artefacts were recorded (in undisturbed areas) with a higher frequency of background scatter of artefacts in the southern section (Strategic exploration area) where several pans dot the area; - Dense vegetation after exceptionally high rainfall limited archaeological visibility, this limitation can be successfully mitigated as outlined under the recommendations; - The heritage survey recorded a range of heritage features including Stone Age artefacts, Ruins, Stone cairns and cemeteries; - Two cemeteries were recorded located outside of the mining footprints in addition to stone cairns of unknown purpose within the mining footprint. The stone cairns are most probably the result of clearing or construction activities and although unlikely these can represent graves. Graves and cemeteries are of high social significance and should be avoided and retained in situ. - In terms of the palaeontological component, the area is of high paleontological sensitivity and a separate study was conducted for this aspect (Bamford 2019 & 2021). This study concluded that it is extremely unlikely that any fossils would be preserved in the Campbell Rand Subgroup stromatolites or in the loose sands of the Quaternary. There is however a very small chance that fossil may occur in palaeopans in the ancient rocks. <u>Railway Line Area</u> - The surrounding area has been disturbed by mining activities, Tommy's airfield, road and railway developments; - Stone Age material is on record in the general area where archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for archaeological finds and specifically Stone Age sites, as these areas were utilized for settlement of base camps close to water and hunting ranges; - None of the above-mentioned focal points occur in the study area although the heritage survey recorded two observation points, the first is an isolated find dating to the Earlier Stone Age and the second is a low-density scatter of lithics possibly dating to the Middle and Later Stone Age. The lithics that are in a deflated context, impacted on by the surrounding developments and found in low densities, forming part of the archaeological background scatter (Orton 2016) and are of low significance apart from providing evidence of use of the wider landscape from as early as >200 ka. No other heritage sites of significance were recorded within the proposed impact areas; - In terms of the palaeontological component, the area is of moderate paleontological sensitivity and a separate study was conducted for this aspect (Bamford 2021). This study concluded that it is extremely unlikely that any fossils would be preserved in the Campbell Rand Subgroup stromatolites or in the loose sands of the Quaternary. There is however a very small chance that fossil may occur in palaeopans in the ancient rocks;	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.11 for the Cultural, Heritage, and Paleontological Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 12: Heritage and Palaeontological StudyAnnexure 10: Hydrogeology

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	The project is in line with surrounding land use and the impact to heritage resources can be mitigated to an acceptable level. The project can commence provided that the recommendations in this report are adhered to and based on the South African Heritage Resource Authority (SAHRA) ’s approval. **Impact Statement** Loss of resources in the case of a chance find. **Management Measures** • Implementation of a chance find procedure (heritage and palaeontology) for the project; • It is recommended that the Strategic exploration area should be subjected to a heritage walk through prior to development; • Graves and cemeteries (BH26 and BH27) should be retained in situ with access for family members and a sufficient buffer zone; • Although unlikely, the recorded stone cairns (BH12 and BH24) could represent graves and should be confirmed during the social consultation process. **Specialist Opinion** The project is in line with surrounding land use and the impact to heritage resources can be mitigated to an acceptable level. The project can commence provided that the recommendations in this report are adhered to and based on the SAHRA’s approval.		
Visual	**General Description** Beeshoek is located approximately 7 kilometres (km) west of the town of Postmasburg in the Northern Cape. The Mine is divided into two areas that are separated by the R385 regional road that runs in a north-westerly direction between the towns of Postmasburg and Olifantshoek. The North Mine is located to the north of the R385, whilst the South Mine is located to the south. Due to the flat topography and short shrubby vegetation of the region, the study area for this assessment was defined as a 10 km radius around the Mine dumps that are proposed to be raised. The main features within a 10 km radius of Beeshoek include the town of Postmasburg to the east, Kolomela Mine to the south, a number of smaller mines to the west and north, and scattered farmhouses. **Impact Statement** The following were the main findings of the study: • The proposed infrastructure will be located within the existing Beeshoek MRA; • Mining activities, primarily from two large iron ore mines in the area, namely, Beeshoek and Kolomela Mine, largely characterise the landscape to the west and south-west of Postmasburg. Their large mine dumps have been constructed in a region that has flat topography, surrounded by short vegetation. Mining dominates the landscape of these areas, and the sense of place has been altered from a natural open landscape, to one associated with mine dumps and bare areas. • Due to the general flat topography and short vegetation of the area, the proposed raised Mine dumps will be visible over a large area.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.12 for the Visual Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 13: Visual

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th><th>Specialist recommendations that have been included in the EIA report</th><th>Reference to applicable section of report where specialist recommendations have been included.</th></tr>
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The visual quality was determined to be medium in the flat natural areas away from the mining areas, and high in the natural mountainous areas particularly to the north-west of the study area. The town of Postmasburg has a medium scenic quality, whilst the immediate outer lying areas have a low scenic quality, due to the dusty nature and large amount of litter noted as well as informal settlements that characterise the area.

The mining areas, particularly to the centre and south of the study area were assigned a low scenic quality.

The Visual Absorption Capacity (VAC) in general was determined to be low, particularly to the west of Beeshoek. The north – south ridge located to the east of Beeshoek, has a high VAC in concealing and blending the proposed increase in the mine dumps into the landscape. The trees and buildings within Postmasburg will have a high VAC in concealing any views of the dumps.
The visual intrusion of the proposed project was determined to be low, due to mine dumps and mining activities already taking place at Beeshoek as well as in the surrounding area. The proposed Project is in line with the current land use of the area.
Visual receptors include houses and farmsteads in the rural areas, residents of Postmasburg, motorists on the roads surrounding Beeshoek, and an aerodrome. The viewer sensitivity of the farmsteads and rural houses was determined to be moderate, and low for the remaining visual receptors due to the already existing mine infrastructure in the area.
The impact assessment indicated that all impacts would have a medium significance pre-mitigation, with most achieving a low significance post-mitigation.

Management Measures

Vegetation clearance should be kept to an absolute minimum. Exposed areas should be vegetated as soon as possible. Dust suppression measures should be implemented to limit the generation of dust.
Machinery, trucks and vehicles are already present on the Mine site and are unlikely create any additional significant presence.
The pits should be backfilled where possible. The WRDs should be vegetated as soon as practicably possible. Dust suppression measures should be implemented to limit the generation of dust.
The natural landscape of the area has already been altered by mining. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed infrastructure. However, it is recommended that should the plant and other proposed infrastructure be painted, that earthy colours are used to blend in with the surrounding landscape. It is further recommended that the pits are backfilled where possible and that the WRDs are vegetated upon rehabilitation.
Down lighting and lighting shields should be used as far as possible.
The removal of Mine infrastructure should be undertaken. The pits should be backfilled where possible. The WRDs should be vegetated.

Specialist Opinion
In conclusion, the natural landscape of the area has already been altered by mining activities. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed infrastructure. It is therefore the opinion of the specialist that the project can commence, provided that the recommendations and mitigation measures.
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List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Socio Economic	**General Description** The study area falls within the boundaries of the ZF Mgcawu District Municipality and under the jurisdiction of the Tsantsabane Local Municipality. The municipality is divided into seven wards, with the study area falling within Ward 6 and a section of Ward 7 with Wards 1, 2, 3, 4 and 5 in very close proximity. The key Municipal priorities as set out in the TLM's IDP include: - Bulk Infrastructure services; - Revenue Collection and Enhancement; - Provision of Sustainable Basic Services (Water, Electricity & Sanitation); - Local Economic Development and Job Creation; - Education: access to land for educational purposes; - Access to land for residential and business erven; - Library services for rural areas; - Refurbishment of community halls; and - Access to health services. The TLM's population indicates a predominantly young age structure with 34% of the population under 18 years and 62% between 18 and 64 years. The median age is 26 years with the highest percentage (23%) of people falling between 20 and 29 years of age. The proportion of the adult population within the Tsantsabane Local Municipal area with no schooling amounts to 7%, with only 2% having obtained a tertiary level of education. Approximately 36%, however has a matric certificate, which is about 20% higher than the rate in the district and 10% higher than the provincial rate. With the low number of the population having a tertiary qualification or having completed Grade 12, it can be assumed that the skills levels are also low. This results in a very low probability for employment. Unemployment and low skills remain a major concern within the TLM area. The mining sector, followed by the agricultural sector, is the main employment sectors within the local study area. The mining industry's contribution to the GDP of TLM increased from R1,5bn in 2002 to R3,9bn in 2012. During 2012 the mining industry employed 54.5% (6 648 persons) of the employed population. **Impact Statement** Based on the social assessment, the following concluding remarks should be noted: - In view of the fact that mining activities are already undertaken in the area and that the Beeshoek Optimisation Project would be situated within the mining rights area, the proposed mining activities do not constitute a separate activity. It would rather be perceived as development associated with an existing activity. - The mining activities and associated infrastructure by itself will thus not introduce new social risks and hazards, but only increase the probability and scale of those already associated with the existing mining activities. - Limited direct negative impacts on the social environment are, at this stage, anticipated. - No negative social impacts that could be classified as fatal have been identified and there are also no impacts of such a high significance that they could prevent the project from continuing. It is thus concluded that the proposed project is acceptable from a social point of view, provided that mitigation measures are implemented.	Yes	Table 85 to Table 89 for the impacts and management measures Section 2.e.iii.13 for the Socio-Economic Description Section 2.e.iv.3.h, Section 2.e.iv.3.i & Section 2.i.iii for the summary of impacts and management measures Annexure 14: Socio-Economic

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Management Measures - Mitigation and enhancement measures proposed should be noted as recommendation measures and should be included as part of the EMPr. - The use of local labour, if any additional labour would be required, should be maximised as it could assist in mitigating various other social impacts, but would also enhance the potential benefits of the proposed project to the local community members. - Local procurement, especially during the operational phase, would have various trickle down positive socio-economic impacts on the beneficiary communities and local businesses. This aspect should thus be pursued as far as possible. - Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other similar environments. - The mine should engage the TLM to develop a culture of cooperative support and accountability in order to continue to facilitate and support a variety of socio-economic needs in the area. - Local residents, with the focus on the surrounding landowners and communities, should receive accurate information with regards to the project status, timeframes for construction and other relevant information about issues that could influence their daily living and movement patterns. - Socio-economic issues and concerns could arise during the implementation of the project. These should be thoroughly dealt with taking the sensitivities into consideration. **Specialist Opinion** Should the proposed project not proceed, the status quo in terms of the existing social impacts in the area would therefore remain. The Life of Mine would then not be extended and the mine would cease to operate over a shorter period of time. The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region. As the Beeshoek mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact. The 'no-go alternative' should thus not be considered from a social point of view as the negative social impacts anticipated with the Beeshoek optimisation project are deemed low. The negative impacts would further respond to mitigation as proposed. The proposed activities further fall within the mining rights area and the area is already characterised by and surrounded by various mining infrastructure. From a social perspective it can be concluded that the socio-economic benefits associated with the project outweigh the negative social impacts. The Beeshoek Optimisation project is anticipated to facilitate the continuation of economic benefits to the local area, currently faced with high rates of unemployment and poverty.		

2.i Environmental Impact Statement

2.i.i Summary of the key findings of the EIA

Below, please find a summary of the key findings pertaining to the environmental authorisation application based on the outcomes of the specialist investigations:

2.i.i.1 Other License Requirements

2.i.i.1.a Water Use Licence

A Water Use Licence Application (WULA) has not yet been submitted. A WULA will be submitted on the online DWS EWULAAS Portal, during the submission of the final EIA, and prior to the commencement of the proposed project. No activities may be undertaken without the necessary approvals.

The mine has an approved WUL, 2015 (amended 2018). For this project, the following activities are trigger water uses as indicated:

- Section 21(a) & (j) amendment applications, for the relocation of boreholes and the update of the dewatering requirements;
- Section 21(c) & (i) applications for the presence of the Cryptic Wetlands;
- Section 21(b) for the storage of water;
- Section 21(g) for the storage of dirty water;
- Section 21(g) for the amendment to the WRD designs and backfilling of opencast pits; and
- GN704 exemption for the location of infrastructure within the 100m buffer from watercourses, as well as for backfilling.

2.i.i.1.b Removal of protected plant species

Numerous provincially protected species, i.e., those listed in Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA), were recorded in the Calcrete Shrubland, with several additional species likely occurring within this habitat unit. Schedule 2 Protected Plants recorded in this habitat unit included the below:

- Species from the Aizoaceae family, *Mestoklema tuberosum, Ruschia cf. griquensis* and *Ruschia calcarea*.;
- Species from the protected Iridaceae family, namely *Babiana cf. bainesii*;
- Numerous individuals from the protected genus *Boscia*, i.e., *Boscia albitrunca*;
- Species of the protected family Oleaceae, namely *Olea europaea subsp. africana*; and
- Species of *Oxalis cf. lawsonii*.

Numerous provincially protected species, i.e., those listed in Schedule 2 of the NCNCA, were recorded within Rupicolous habitat unit and are listed below:

- Species from the Aizoaceae family, *Mestoklema tuberosum, Ruschia calcarea*) and *Tridentea* sp ;
- Species from the protected Asphodelaceae family, namely *Aloe grandidentata* and *Aloe hereroense*;
- Species from the protected Amaryllidaceae family, namely *Boophone disticha* and *Ammocharis* cf. *coranica;*
- Species in the protected genus *Anacampseros,* namely *Anacampseros filamentosa;*
- Scattered individuals from the protected genus *Boscia,* i.e., *Boscia albitrunca*;
- Numerous individuals from the protected Iridaceae family, especially *Babiana cf. bainesii* but also individuals of *Gladiolus permeabilis* subsp. *edulis*;
- Species from the protected genus *Euphorbia*, namely *Euphorbia cf. rhombifolia*;
- Species of the protected family Oleaceae, namely *Olea europaea* subsp. *africana*;
- The protected species *Nymania capensis*; and
- Species of *Oxalis* cf. *lawsonii*.

Numerous provincially protected species, i.e., those listed in Schedule 1 and 2 of the NCNCA, were recorded in the Open Thornveld, with several additional species likely occurring within this habitat unit. Schedule 2 Protected Plants recorded in this habitat unit included the below:

- Species from the Aizoaceae family, Mestoklema tuberosum, Ruschia cf. griquensis and Ruschia calcarea (more in the mixed veld with some calcrete also present);
- Species from the protected Amaryllidaceae family, namely Boophone disticha;
- Scattered individuals from the protected genus Boscia, i.e., Boscia albitrunca;
- Species from the protected genus Euphorbia, namely Euphorbia cf. duseimata;
- Species of the protected family Apocynaceae, namely Orbea species;
- One individual was found from the specially protected Hoodia gordonii; and
- Species of Oxalis cf. lawsonii.

The Non-watercourse Habitat only included a small number of SCC which comprised of commonly occurring species such as *Boscia albitrunca* and *Boophone disticha*.

Additional species potentially occurring within this habitat unit, which are known from the region and that are listed as Schedule 2 protected species (NCNCA), include *Bulbine abyssinica* and *Trachyandra saltii*.

Permits from DENC and DFFE should be obtained to remove, cut or destroy the above-mentioned protected species before any vegetation clearing may take place.

Please refer to Annexure 7 for the detailed ecological assessment.

2.i.i.1.c Removal of protected faunal species

Only one faunal SCC was observed on site during the field assessments, namely *Ardeotis kori* (Kori Bustard, VU, TOPS). This species was observed in the Calcrete Shrubland in the southern section of the mine, however, given its inherent mobility, is likely to utilise large sections of natural habitat within the mining property, notably for foraging. A burrow of what may be *Pterinochilus sp* (Baboon Spider) was observed along the western boundary of the East Pit WRD in the southern portion of the mine, however this could not be confirmed. This species is listed as Specially Protected under the NCNCA (2009) and as such, may require permits to rescue and relocate prior to any ground clearing activities taking place.

2.i.i.2 Need and Desirability of the Projects

As mentioned before (Section 2.d) the proposed projects have various benefits for not only the Mine, but also the local, regional and national economic. The benefits can be characterised into the following:

- Economic Benefit;
- Social Benefit;
- Giving effect to Waste Reduction;
- Giving effect to an approved Environmental Activity as part of Environmental Management and Impact Reduction; and
- Logistics to Improve infrastructure to supply Export Market demands.

Section 23(1)(a) of the MPRDA states in Section 1(a), that subject to subsection (4), the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. This project specifically gives rise to this requirement, and results in the optimisation of mineral waste deposition, beneficiation, water management and the logistical requirements for product transportation.

Various optimisation activities are planned for the mine as previously discussed. By not allowing this project to proceed, the mine will lose the opportunity to rework current waste streams and thereby reducing the dirty water footprint.

In addition to this, this project plans to optimise the exploration of mineral resources to which the mine has the Mineral Rights to. By not allowing the expansion of opencast operations, the mine will not be in a position to optimally work within its allocated Mineral Resource boundaries.

The opportunity to effectively and efficiently export iron ore resources via the Saldanha port will further be lost should the allowance for the railway line link not realise.

The projects in question will have a substantial socio-economic benefit within the local area, but also regionally. No fatal flaws or environmental concerns, which cannot be addressed with sound and proper management have been identified. Should the proposed project not proceed, the status quo in terms of the existing social impacts in the area would therefore remain. The Life of Mine would then not be extended and the mine would cease to operate over a shorter period of time.

The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region.

As the Beeshoek Mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

The ‘no-go alternative’ should thus not be considered from a social point of view as the negative social impacts anticipated with the Beeshoek optimisation project are deemed low. The negative impacts would further respond to mitigation as proposed. The proposed activities further fall within the mining rights area and the area is already characterised by and surrounded by various mining infrastructure.

The Beeshoek Optimisation project will extend the life of mine and will result in the continuation of the existing operations and by not allowing this project, the following opportunities will be lost:

- The continuation of job and income opportunities with subsequent positive economic spin-offs;
- Continuation of central tax revenues;
- Positive impact in terms of the socio-economic development of the area and reducing poverty levels through continued employment; and
- Socio-economic investments targeted at the local community through local economic development projects, as well as through capacity building and training.

2.i.i.3 Specific Project Impact Statements

2.i.i.3.a Project 1

In areas where individual ROM stockpiles are located, these will be consolidated to allow for further capacity and operational management. The table before highlights the stockpiles applicable to the consolidation. The sites required by the mine include:

- South Run of Mine Stockpiles (ROM Stockpile, South Contaminated ROM 1 and Contaminated Dump 2) and the South BIS Stockpile.

The following is a summary of the project specific impacts:

- Topography
  - Existing mining areas and ROM placement – no significant impact identified
- Geology
  - Existing mining areas and ROM placement – no significant impact identified
- Soils
  - These areas will not require any additional clearance as it is located within an overall cleared area within the active mining areas.
- Ecology
  - These areas will not require any additional clearance as it is located within an overall cleared area within the active mining areas.
- Freshwater
  - No significant impact identified.
- Hydrology
  - No significant impact identified.
- Hydrogeology
- Air Quality
  - The predicted annual PM10 concentrations from Project 1, are low and below the NAAQS. The highest concentrations occur in the immediately vicinity of these individual sources.
  - The predicted annual PM2.5 concentrations from Project 1 are low and below the NAAQS. The highest concentrations occur in the immediately vicinity of these individual sources.
  - The predicted dust fallout resulting from Project 1 is low relative to standards and highest fallout rates occur in the immediately vicinity of these individual sources.
  - The impact significance for Project 1 is considered low.
- Noise
  - No significant impact identified.
- Cultural and Heritage (including Palaeontology)

- No significant impact identified.

- Visual
    - No significant impact identified.
- Socio Economic
    - No significant impact identified.

2.i.i.3.b Project 2

The Mine indicated the need to update the heights and designs of certain WRDs on site to take into consideration rehabilitation requirements. These include:

- HF WRD;
- GF WRD;
- Discard Dump (for this an operational layout will suffice);
- Village Pit North Waste Rock Dump (VP1) WRD;
- West Pit WRD (now referred to as the Village Pit South WRD);
- East Pit WRD.

The increase in the heights as well as achieving the planned rehabilitation slopes will also require the increase in the footprint areas.

The following is a summary of the project specific impacts:

- Geology
    - The impact of dolomite related instability on infrastructure is likely to be the highest risk where dolomite bedrock is shallow or underlies a blanketing layer or layers of unconsolidated soils and deposits. This is particularly relevant where water-bearing services are involved, and the risk of leakage is always possible. Concentrations of surface water such as from stormwater or from unlined impoundments such as tailings storge facilities that are unlined pose a risk.
    - Infrastructure such as roads, bridges and pipelines will be a risk due to the presence of a blanketing layer of recent soils which overlie buried karst ground at depth. Leaking services and other concertation of water in the vicinity of infrastructure such as stormwater ponding result in water ingress into the ground causing subsurface erosion into receiving cavities in the dolomite bedrock.
    - The January 2021 WRD Review report, specifically Section 1.5.2 (Geotechnical Summary) states that the analysis indicated that the five WRD's at Beeshoek are well within the required limits for long term stability. To reduce the need for assumptions and ensure a high level of confidence in the analysis, conservative material parameters were selected for the models. The minimum safety factor required for long-term stability is 1.3, as taken from the work conducted by Stacey (2009).
- Soils
    - Project 2 is anticipated to have the second highest impact while the remaining projects are anticipated to a limited impact since the majority of the development will occur on previously disturbed soils. Although there is occurrence of arable soils, low potential crop yields are foreseen for this area due to climatic constraints (i.e., limited rainfall) and lack of irrigation options. Nevertheless, protection of high agricultural resources (where feasible) is deemed imperative in efforts to conserve the finite agricultural resources in line with the CARA (CARA), 1983 (Act No. 43 of 1983).
- Ecology
    - The activities related to Project 2 are limited in extent and will in many instances impact on habitat that is already degraded (due to edge effect from current mining activities, or their fragmentation from larger, intact habitat). There will, however, be loss of floral habitat from especially the Calcrete Shrubland (Village Pit North Waste Rock Dump and East Pit Waste Rock Dump) and Open Thornveld (Village Pit South Waste Rock Dump and East Pit Waste Rock Dump), which will result in localised impact on floral diversity and habitat given that mitigation measures are sufficiently implemented.
    - To guarantee impacts remain localised, it must be ensured that planned and authorised footprints do not increase as mining activities continue. Edge effects from mining activities and AIP proliferation must be strictly managed.
    - Mining activities associated with Project 2 are anticipated to have an unfavourable impact on floral SCC.

   - The activities related to Project 2 are limited in extent and will in many instances impact on habitat that is already degraded due to edge effects and / or habitat fragmentation from current mining activities. There will, however, still be a loss of faunal habitat, especially from the Calcrete Shrubland and Open Thornveld, which, provided that mitigation measures are implemented, will result in localised impact on faunal species diversity and habitat. To ensure impacts remain localised, it must be ensured that no footprint creep occurs as mining activities continue. Edge effects from mining activities and AIP proliferation must be managed.
- Freshwater
   - Expansion of the Village Pit, West Pit and East Pit WRDs only will impact on freshwater resources. The expansion of the GF and HF WRDs will not affect the identified watercourses. Adherence to all mitigation measures provided in this report will aid in reducing the risk significance of most anticipated indirect impacts arising from the expansion of the WRDs and detrital area.
   - The expansion of the existing WRDs within already disturbed areas are anticipated to have a 'low' or even negligible risk significance, provided that strict enforcement of mitigation measures takes place.
- Hydrology
   - No significant impacts have been identified.
- Hydrogeology
   - The leachable concentrations of solid waste were compared to the LCT limits to determine the leachability of the different waste types at the mine. Solid waste types were described as either "Type 4" or "Type 3" waste types which are low hazard waste types with regards to the likelihood to release contaminants in dissolved phase.
- Air Quality
   - The predicted annual PM10 concentrations from Project 2, are low and below the NAAQS. The highest concentrations occur in the immediately vicinity of these individual sources.
   - The predicted annual PM2.5 concentrations from Project 2 are low and below the NAAQS. The highest concentrations occur in the immediately vicinity of these individual sources.
   - The predicted dust fallout resulting from Project 2 is low relative to standards and highest fallout rates occur in the immediately vicinity of these individual sources.
   - The impact significance for Project 2 is considered low.
- Noise
   - The activities are undertaken within the existing mining area and an environment characterised by heavy machinery and earth moving equipment. No significant impact has been identified.
- Cultural and Heritage (including Palaeontology)
   - No impact has been identified.
- Visual and Topography
   - Due to the general flat topography and short vegetation of the area, the proposed raised Mine dumps will be visible over a large area.
   - The visual quality was determined to be medium in the flat natural areas away from the mining areas, and high in the natural mountainous areas particularly to the north-west of the study area. The town of Postmasburg has a medium scenic quality, whilst the immediate outer lying areas have a low scenic quality, due to the dusty nature and large amount of litter noted as well as informal settlements that characterise the area.
   - The mining areas, particularly to the centre and south of the study area were assigned a low scenic quality.
   - Visual receptors include houses and farmsteads in the rural areas, residents of Postmasburg, motorists on the roads surrounding Beeshoek, and an aerodrome. The viewer sensitivity of the farmsteads and rural houses was determined to be moderate, and low for the remaining visual receptors due to the already existing mine infrastructure in the area.
   - The impact assessment indicated that all impacts would have a medium significance pre-mitigation, with most achieving a low significance post-mitigation.
- Socio Economic
   - In view of the fact that mining activities are already undertaken in the area and that the Beeshoek Optimisation Project would be situated within the mining rights area, the proposed mining activities do not constitute a separate activity. It would rather be perceived as development associated with an existing activity.

- The mining activities and associated infrastructure by itself will thus not introduce new social risks and hazards, but only increase the probability and scale of those already associated with the existing mining activities.
- Limited direct negative impacts on the social environment are, at this stage, anticipated.
- The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region. As the Beeshoek mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

2.i.i.3.c Project 3

The mine would like to make use of the opportunity to optimise active pits and also implement two new satellite pits, by either increasing the footprints or by increasing the depth of mining. The pits in question include:

- BN Pit Expansion;
- Village North Pit Expansion;
- BF Pit Expansion;
- East Pit depth expansion; and
- Detrital area.

Two (2) new satellite pits will be established as part of the Village North Pit optimisation:

- New Village East Pit;
- New Village South Pit;

In addition to the opencast pit optimisation the mine will further investigate large scale strategic exploration activities on the South Mine:

- Village Pit West Expansion Area; and
- South Mine Strategic Expansion Area.

The earlier approved EMPr's of the Mine did not demarcate the required detrital mining areas, or stipulated required management measures. For this reason, the dolomite karst areas will be explored and where possible mined. The depth can vary from 4m to 25m deep. The detrital mining strategy and the depth is only determined once excavation start and the quality of iron ore is inspected within a karst deposition area.

The current mining methodology will continue for the opencast optimisation project. This will comprise of conventional opencast mining techniques (drilling-blasting-load-haul).

The following is a summary of the project specific impacts:

- Geology
  - The presence of cavities below the base of Wolhaarkop breccia has been shown to occur on the site. One such large cavern is present as exposed in the BN Pit annex. While this may be a once off occurrence, tis cannot be assumed to be the case with any certainty. The occurrence of this is difficult to predict as they occur within the bedrock at the base of the Wolhaarkop chert breccia where solution cavities may be present. Although they are likely to be rare occurrences, the do pose a significant risk to mining activities.
  - There is evidence that dewatering has had some effect on surface instability on the property. It is recommended that a study be conducted to explore techniques that will aid the identification of potential problem areas. Such techniques include inter alia a geophysical methods such as a gravity survey to identify low gravity anomalies that will aid identifying voids in bedrock. This is specific to areas west of the West Pit, where strategic exploration will be undertaken.
- Soils
  - The proposed expansion projects will impact the soil resources in varying severities, with project 3 posing the highest impact significance due to its extent as well as the encroachment on high agricultural potential soils. Although there is occurrence of arable soils, low potential crop yields are foreseen for this area due to climatic constraints (i.e., limited rainfall) and lack of irrigation options. Nevertheless, protection of high agricultural resources (where feasible)

is deemed imperative in efforts to conserve the finite agricultural resources in line with the CARA (Act No. 43 of 1983).

- Ecology
  - The activities associated with Project 3 will result in greater loss of natural habitat areas when compared to the other proposed projects. The Calcrete Shrubland, Open Thornveld Habitat, and the Rupicolous Habitat Units will be directly impacted. The extent of habitat lost will result in declines in floral diversity and habitat within the Beeshoek Mine area; however, impacts are likely to only be of local extent for the current Beeshoek Mine Optimisation Project (projects 1 – 5). If future expansions will occur, these habitat types will be threatened on a larger scale, especially if the closure and rehabilitation phases of the project cannot achieve the pre-mined state.
  - Loss of natural habitat areas such as the Calcrete Shrublands, Open Thornveld and Rupicolous Habitat will be unfavourable and will result in local loss of floral habitat and diversity. These habitat units are representative of their reference states, albeit somewhat modified due to current and historic disturbances. Considering that the Postmasburg Thornveld, Kuruman Thornveld and Kuruman Mountain Bushveld are endemic vegetation types (Skowno et al, 2019) and the fact that there are several additional mining expansions planned in the region, further impact on the remaining extent of the currently least concern, but poorly protected, vegetation types could increase their threat status. Loss of Cryptic Wetlands are restricted to two pans impacted by the Village Pit Expansion; thus, the impact will be restricted to a local scale. However, as far as possible, no additional Cryptic Wetlands should be impacted as these are significant biodiversity features for which impacts cannot be fully mitigated or restricted to the local scale.
  - Mining activities associated with Project 3 are anticipated to have an unfavourable impact on floral SCC.
  - The activities associated with Project 3 will result in significant impacts to the faunal ecology (species diversity, abundance, and habitat) within the SRA, as Project 3 activities encompass the greatest area and will account for the largest extent of habitat disturbance and loss. Loss of natural habitat areas such as the Calcrete Shrublands, open Thornveld and rupicolous Habitat will result in the displacement of faunal species in these areas, or worst case, the death of species herein, especially smaller less mobile fauna. The proposed pit expansion adjacent to Village and BF Pits will result in the loss of two cryptic wetlands and four seasonal depressions. Given that these habitats will be lost as part of the pit expansion program, it is important to ensure that the remaining cryptic wetlands and seasonal depressions in the southern portion of the SRA, are not impacted upon by future exploration activities.
  - Overall, a low diversity of SCC is expected within the focus area, likely due to the inherent arid nature of the region and the pre-existing impacts stemming from mining and farming activities. Mining activities associated with Project 3 are anticipated to impact on faunal SCC to a greater extent in comparison to Projects 1, 2, 4 and 5, and as such, care must be taken to ensure that all mitigation and management measures are carried out.
- Freshwater
  - The loss of cryptic wetland habitat as a result of the expansion of Village Pit cannot be mitigated. Due to the outright loss of two cryptic wetlands, it is the specialist's opinion that the proposed mining expansion has the potential to result in impacts of very high significance on the receiving freshwater environment, particularly of a wetland type which is under-researched and of scientific interest. It is however noted that, based on the layout provided at the time of preparing this report, the extent of direct impact will be contained to the local area and will equate to less than 3 ha of wetland habitat. Thus, consideration of the value of this landscape must be considered from a freshwater and terrestrial biodiversity resource management point of view and juxtaposed with the responsibility to comply with Regulation 23 of the MPRDA pertaining to the optimisation of the Mining Right as well as the socio-economic and socio-cultural impact the project will have and the decision should be made and aligned with the principles of sustainable development and Integrated Environmental Management.
  - The expansion of the detrital area, proposed exploration drilling and proposed activities within already disturbed areas are anticipated to have a 'low' or even negligible risk significance, provided that strict enforcement of mitigation measures takes place.
- Hydrology

- A number of pan like features occur in the west and south of the MRA and have been classified as Cryptic Wetlands and seasonal depressions in the Freshwater Ecological Assessment (SAS, 2021) (see impact summary above).
- The only natural defined drainage channel occurs in the south-east of the MRA. A 1:50 and 1:100 year floodline determination was undertaken on this drainage line, as according to Regulation 4 (b) of GN704, prospecting should not take place within the 1:50 year floodline unless exemption is obtained from the DWS. The determined floodline is connected to what has been delineated as a recharge zone in the Freshwater Ecological Assessment (SAS, 2021). It is recommended that future prospecting activities do not take place within the 1:50 year floodline as required by GN704 Regulations.

- Hydrogeology
  - Mining in this area has been ongoing for many decades, and there are historical impacts on the surrounding aquifer which are impractical to simulate in a numerical model. Thus, current groundwater levels (obtained from various sources) have been used as baseline for this impact assessment, and all dewatering impacts related to the current water levels as a starting point. Considering the impact associated with each mining pit, the following observations were made:
    - The area to the south of the mining rights area is characterised by deep groundwater levels (>100 m) associated with large-scale dewatering at the neighbouring Kolomela Mine.
    - No drawdown is expected for further mining at East Pit as the declining groundwater levels is predicted to be below the bottom of mining.
    - Drawdown at Village pit is predicted to extent to up to 2km from the pit in a mostly westerly direction, for an insignificant drawdown of 5 – 10 metres. Areas of significant drawdown is expected only in in the immediate vicinity of the pit, which could even decline with time as Leeuwfontein mining impacts northward into this area.
    - HF Pit is predicted to have a minor impact limited to the immediate surroundings of the pit itself.
    - The BN Pit is predicted to have the largest area of impact due to substantial increase in mining depth. Drawdown of groundwater levels will be up to about 100 m but limited to an area of about 1 km around the pit. This is mainly due to different hydraulic characteristics in the area around the pit.
    - No groundwater-related impacts are expected on surface water resources.
    - Due to naturally deep-lying groundwater levels, no decant is predicted.
- Air Quality:
  - The predicted annual PM10 concentrations for Project 3 exceed the NAAQS. The exceedances are predicted in the vicinity of the Village Pit and occur within the mine boundary. The relatively high predicted concentrations are a result of dust generated on the haul roads.
  - The predicted annual PM2.5 concentrations for Project 3 exceed the NAAQS at the Village Pit. The relatively high predicted concentrations here are a result of dust generated on the haul roads. They exceedances do not extend into any commercial or residential areas. The maximum predicted 24-hour ambient PM2.5 concentration at the homestead on the farm Aucampsrus is 7.0 $\mu g/m^3$, which is below the NAAQS of 40 $\mu g/m^3$.
  - The predicted dust fallout for Project 3 is low relative to the national standard for non-residential areas. The highest fallout rates compare with the residential standard and occur in the immediate vicinity of the Village Pit where the non-residential standard is shown by the red line.
- Noise
  - The activities are undertaken within the existing mining area and an environment characterised by heavy machinery and earth moving equipment. No significant impact has been identified.
- Cultural and Heritage (including Palaeontology)
  - Various ruins (BH4, BH19) have been identified in the strategic exploration areas. The presence of graves should be confirmed during social consultation. The area should be monitored during construction. All areas have been classified as low significance, however if proven to be graves a high social significance will result).
  - Various ruins/cairns (BH21, BH22, BH23, BH24) have been identified in the Village Pit Expansion and BN Pit areas. The presence of graves should be confirmed during social

consultation. The area should be monitored during construction. All areas have been classified as low significance, however if proven to be graves a high social significance will result).

- Visual and Topography
  - No significant impact has been identified, with the exception of potential increase in dust generated should management measures not be implemented.
  - The opencast pits may have a permanent impact on the topography should backfilling not be achieved.
- Socio Economic
  - In view of the fact that mining activities are already undertaken in the area and that the Beeshoek Optimisation Project would be situated within the mining rights area, the proposed mining activities do not constitute a separate activity. It would rather be perceived as development associated with an existing activity.
  - The mining activities and associated infrastructure by itself will thus not introduce new social risks and hazards, but only increase the probability and scale of those already associated with the existing mining activities.
  - Limited direct negative impacts on the social environment are, at this stage, anticipated.
  - In view of the fact that mining activities are already undertaken in the area and that the Beeshoek Optimisation Project would be situated within the mining rights area, the proposed mining activities do not constitute a separate activity. It would rather be perceived as development associated with an existing activity.
  - The mining activities and associated infrastructure by itself will thus not introduce new social risks and hazards, but only increase the probability and scale of those already associated with the existing mining activities.
  - Limited direct negative impacts on the social environment are, at this stage, anticipated.
  - The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region. As the Beeshoek mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

2.i.i.3.d Project 4

Beeshoek has identified the opportunity to formalise the recovery and economically beneficiation of existing and arising low-grade resources.

The intent being the construction, commissioning and bringing into production two (2) additional beneficiation sections (new Jig Plant and WHIMS Plant) capable of processing ≈ 520tph of material to produce ≈ 1.5Mtpa of export quality product.

The proposed Beeshoek Low-Grade Beneficiation Optimisation Project is planned to allow Beeshoek Mine to optimise the mining process and reduce mineral waste on site (in line with the National Waste Management Hierarchy), by implementing two (2) additional Beneficiation Projects.

The two plants will involve a new Jig Plant to rework the existing low-grade stockpile (Discard Dump and low-grade material derived from the current Jig Plant) and a new WHIMS Plant to rework the existing slimes from the Slimes Dam. This project can be regarded as an ongoing rehabilitation project in terms of the National Waste Management Strategy of the reduction of waste production and the reuse of waste (note that this is an approved activities – refer to the preceding section). This project will have numerous economic and environmental benefits.

The following is a summary of the project specific impacts:

- Geology
  - The impact of dolomite related instability on infrastructure is likely to be the highest risk where dolomite bedrock is shallow or underlies a blanketing layer or layers of unconsolidated soils and deposits. This is particularly relevant where water-bearing services are involved, and the risk of leakage is always possible. Concentrations of surface water such as from stormwater or from unlined impoundments such as tailings storge facilities that are unlined pose a risk.
  - Infrastructure such as roads, bridges and pipelines will be a risk due to the presence of a blanketing layer of recent soils which overlie buried karst ground at depth. Leaking services

and other concertation of water in the vicinity of infrastructure such as stormwater ponding result in water ingress into the ground causing subsurface erosion into receiving cavities in the dolomite bedrock.

- Soils
  - No significant impact has been identified.
- Ecology
  - The activities associated with Project 4 are limited in extent and will mostly impact on habitat that is already degraded and transformed. There will be loss of some floral habitat within the Rupicolous Habitat (Beneficiation Optimisation infrastructure), which will result in small and localised impacts on floral diversity and habitat given that mitigation measures are sufficiently implemented.
  - With mitigation measures adhered to, the proposed activities associated with Projects 4 and 5 are not anticipated to have significant or residual impacts on the floral communities within the Beeshoek Mine.
  - Project 4 will minimally impact on floral SCC.
  - The activities associated with Projects 4 and 5 are limited in extent and will mostly impact on faunal habitat and species that have already been subjected to mining related impacts and habitat degradation. Projects 4 and 5 will lead to the loss of portions of faunal habitat within the Calcrete Shrubland, rupicolous habitat and preferential flow path, which will result in small and localised impacts on faunal diversity and habitat provided mitigation measures are sufficiently implemented.
- Freshwater
  - The project will therefore not pose a risk to the various watercourses and freshwater features identified.
- Hydrology
  - No significant impacts have been identified.
- Hydrogeology
  - No significant impact has been identified.
- Air Quality
  - The predicted annual PM10 concentrations from Project 4, are low and below the NAAQS. The highest concentrations occur in the immediately vicinity of these individual sources.
  - The predicted annual PM2.5 concentrations from Project 4 are low and below the NAAQS. The highest concentrations occur in the immediately vicinity of these individual sources.
  - The predicted dust fallout resulting from Project 4 is low relative to standards and highest fallout rates occur in the immediately vicinity of these individual sources.
  - The impact significance for Project 4 is considered low.
- Noise
  - The activities are undertaken within the existing mining area and an environment characterised by heavy machinery and earth moving equipment. No significant impact has been identified.
- Cultural and Heritage (including Palaeontology)
  - No impact has been identified.
- Visual and Topography
  - No significant impact has been identified.
- Socio Economic
  - In view of the fact that mining activities are already undertaken in the area and that the Beeshoek Optimisation Project would be situated within the mining rights area, the proposed mining activities do not constitute a separate activity. It would rather be perceived as development associated with an existing activity.
  - The mining activities and associated infrastructure by itself will thus not introduce new social risks and hazards, but only increase the probability and scale of those already associated with the existing mining activities.
  - Limited direct negative impacts on the social environment are, at this stage, anticipated.
  - The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region. As the Beeshoek mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

2.i.i.3.e Project 5

The project will result in the minor changes to the location of borehole positions to optimise dewatering for safe mining conditions.

The intent of this project is not to increase water abstraction from the groundwater resources, but to rather improve water management on site. This is specifically relating to utilising available water allocations and agreements. In terms of the WUL, 2018, the mine has a total of 5 655 371m^3/a approved as Section 21(a) – groundwater abstraction and use. This will be reduced in the amended WULA, 2021 to 5 652 724m^3/a. A large portion (70%) of this allocation is to allow dewatering for safe mining practices. Due to the reduction in groundwater levels to south of the mine, dewatering volumes have been reduced for Village Pit. However an increase volume has been included for the remining of the HF Pit. Note that overall water abstraction is still in line with the WUL, 2018.

In addition to this the project allows for the storage and distribution of water within the mine area to protect water losses and improve storage capacity. The mine will therefore establish additional water storage tanks on site which will include:

- A new storage tank near the exiting BN Tank of 500m^3. The purpose is to provide sufficient storage space for water from the approved in-pit dewatering activities. This will likely be a concrete type of facility;
- 4 x 10m^3 plastic tanks at the current Beneficiation Plant, to assist with day to day operational water transfer and use;
- 1 x 2 000m^3 process water steel fabricated tank adjacent to the existing Clarifier connected with a “balancing pipe”. To allow for the storage of water in the water balance system of the mine to capacitate the plant process to start up without delay;
- Existing Dam: Steel Dam - 250m^3 capacity to store process water and allow for the storage of top-up water;
- Existing Dam: Zinc Dam - 90m^3 capacity to store input water where required; and
- A new dewatering tank at the Village Opencast Pit.

The following is a summary of the project specific impacts:

- Geology
  - The impact of dolomite related instability on infrastructure is likely to be the highest risk where dolomite bedrock is shallow or underlies a blanketing layer or layers of unconsolidated soils and deposits. This is particularly relevant where water-bearing services are involved, and the risk of leakage is always possible. Concentrations of surface water such as from stormwater or from unlined impoundments such as tailings storge facilities that are unlined pose a risk.
  - Infrastructure such as roads, bridges and pipelines will be a risk due to the presence of a blanketing layer of recent soils which overlie buried karst ground at depth. Leaking services and other concertation of water in the vicinity of infrastructure such as stormwater ponding result in water ingress into the ground causing subsurface erosion into receiving cavities in the dolomite bedrock.
- Soils
  - No significant impact has been identified.
- Ecology
  - The activities associated with Project 5 are limited in extent and will mostly impact on habitat that is already degraded and transformed. There will be loss of some floral habitat within the Rupicolous Habitat (Beneficiation Optimisation infrastructure), which will result in small and localised impacts on floral diversity and habitat given that mitigation measures are sufficiently implemented.
  - With mitigation measures adhered to, the proposed activities associated with Projects 4 and 5 are not anticipated to have significant or residual impacts on the floral communities within the Beeshoek Mine.
  - Project 5 will minimally impact on floral SCC.
  - The activities associated with Projects 4 and 5 are limited in extent and will mostly impact on faunal habitat and species that have already been subjected to mining related impacts and habitat degradation. Projects 4 and 5 will lead to the loss of portions of faunal habitat within the Calcrete Shrubland, rupicolous habitat and preferential flow path, which will result in small

and localised impacts on faunal diversity and habitat provided mitigation measures are sufficiently implemented.

- Freshwater
  - The project will therefore not pose a risk to the various watercourses
- Hydrology
  - No significant impacts have been identified.
- Hydrogeology
  - No significant impact has been identified.
- Air Quality
  - No significant impact has been identified.
- Noise
  - The activities are undertaken within the existing mining area and an environment characterised by heavy machinery and earth moving equipment. No significant impact has been identified.
- Cultural and Heritage (including Palaeontology)
  - No impact has been identified.
- Visual and Topography
  - No significant impact has been identified.
- Socio Economic
  - In view of the fact that mining activities are already undertaken in the area and that the Beeshoek Optimisation Project would be situated within the mining rights area, the proposed mining activities do not constitute a separate activity. It would rather be perceived as development associated with an existing activity.
  - The mining activities and associated infrastructure by itself will thus not introduce new social risks and hazards, but only increase the probability and scale of those already associated with the existing mining activities.
  - Limited direct negative impacts on the social environment are, at this stage, anticipated.
  - The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region. As the Beeshoek mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

2.i.i.3.f Project 6

The Beeshoek Link Line Feasibility Study aims to realise the above option and therefore the mine has investigated the options of linking Beeshoek to the TFR Ore line, via the existing Kolomela Direct Link. This in turn would allow Beeshoek Mie greater flexibility to also export ore through Saldanha port.

Negotiations with Transnet have not as of yet been concluded in terms of allocations, and for this reason the project is presented in this application as the best practical outcome. It is important to note that various discussions are being undertaken between Transnet and the Applicant. These discussions would define the direction the project moves in, i.e. immediate commissioning upon authorisation, potential delay in commissioning, or not commissioning the project. However, for the purposes of this EIA report, the assumption is made that this project will proceed, and for this reason should the project proceed the following is considered:

The line (main western line) will comprise a 2.8km main link line of approximately 5.5m in width with a 5m bulk fill (varies along the alignment). The line will tie from the existing Sishen/Postmasburg line at the Beeshoek Iron Ore Mine, crossing over the road accessing Tommys Field Airport and the R385 to link to the existing TFR Yard that services Kolomela Mine. The existing R385 road will be lifted such that the road passes over the railway line in a grade separated crossing. Considering that one 4m access road will be constructed along the alignment with an 8m buffer on either side of the railway line, the approximate extent of the development is 9ha (85 400m2). In addition, construction of the northern link is considered to allow train movement from the Sishen/Postmasburg rail way line directly onto the abovementioned link line. This line is approximately 1.3km in length with similar dimensions as the main western line. This latter line is about 2ha is extent.

The following is a summary of the project specific impacts:

- Geology

- The impact of dolomite related instability on infrastructure is likely to be the highest risk where dolomite bedrock is shallow or underlies a blanketing layer or layers of unconsolidated soils and deposits. This is particularly relevant where water-bearing services are involved, and the risk of leakage is always possible. Concentrations of surface water such as from stormwater or from unlined impoundments such as tailings storge facilities that are unlined pose a risk.
- Infrastructure such as roads, bridges and pipelines will be a risk due to the presence of a blanketing layer of recent soils which overlie buried karst ground at depth. Leaking services and other concertation of water in the vicinity of infrastructure such as stormwater ponding result in water ingress into the ground causing subsurface erosion into receiving cavities in the dolomite bedrock.

- Soils
  - Shallow soils of Coega/Knersvlakte (Cg), Prieska/Addo and Mispah/Glenrosa (Ms/Gs) formations collectively cover approximately 51.9% of the total investigated study area and can be considered as having poor physical characteristics ideal in supporting cultivation agricultural practices. This is attributed to the occurrence of Hardrock/Lithic and Hard Carbonate material near and/or at the surface which restricts root growth and development. This creates conditions that are not conducive to the cultivation of most cultivated crops. Some portions of the study area are comprised of extensively disturbed soils classified as Witbank formation (41.8%).
  - From a land capability point of view, the proposed railway line link project footprint is largely dominated by shallow soils with low agricultural potential soils with only minor areas comprising of High agricultural potential. At best, the Coega/Knersvlakte, Mispah/Glenrosa soil forms are suitable for marginal grazing. Although arable soils occur with the railway line link project footprint (Plooysburg), given the climatic constraints of the area (Rainfall less than 400 mm) and lack of irrigation options, these soils are not likely to contribute substantially to national food production.
- Ecology
  - The proposed Railway Line Link Project will result in the clearance of vegetation that is of intermediate sensitivity (Natural Habitat Areas) and moderately low sensitivity (non-watercourse habitat, encroached sections in the Natural Habitat Areas, Degraded Thornveld), with some sections of low sensitivity (Modified habitat unit). The proposed Railway Line Link Project is associated with floral SCC which will directly be impacted by the proposed activities (SCC within the proposed footprint) – although with mitigation measures implemented, and due to the small extent of the footprint, the impacts can remain localised in extent and is unlikely to impact significantly on SCC population dynamics.
  - From a fauna perspective, the proposed Railway Line Link Project will result in the clearance of faunal habitat (vegetation) that predominantly ranges from intermediate to low sensitivity. The preferential flow path is deemed to be of moderately high sensitivity for fauna, and will be impacted upon at the various road and railway crossing point. This preferential flow path provides niche habitat and surface water for fauna in the local area and as such, is considered to be of increased importance, even though artificial.
- Freshwater
  - The project will therefore not pose a risk to the various watercourses and freshwater features identified.
- Hydrology
  - The proposed railway link is located in a flat area that has a semi-arid to arid climate. Quaternary catchment D73A, in which the railway link is proposed to be located, is endoreic, and therefore, very little surface water is expected to be generated.
  - The desktop assessment of contours and site investigation findings revealed that there are no natural watercourses near the proposed railway link.
- Hydrogeology
  - No significant impact has been identified.
- Air Quality
  - The activities will be undertaken within existing authorised sidings (at TFR and Beeshoek). Limited increase in air quality is foreseen.
- Noise
  - The activities are undertaken within the existing mining area and an environment characterised by heavy machinery and earth moving equipment. No significant impact has been identified.

- Cultural and Heritage (including Palaeontology)
    - No impact has been identified.
- Visual and Topography
    - No significant impact has been identified, the area is characterised by mining and mining related activities. The bridge over the R385 will result in changes to the current topography.
- Socio Economic
    - In view of the fact that mining activities are already undertaken in the area and that the Beeshoek Optimisation Project would be situated within the mining rights area, the proposed mining activities do not constitute a separate activity. It would rather be perceived as development associated with an existing activity.
    - The mining activities and associated infrastructure by itself will thus not introduce new social risks and hazards, but only increase the probability and scale of those already associated with the existing mining activities.
    - Limited direct negative impacts on the social environment are, at this stage, anticipated.
    - The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region. As the Beeshoek mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

2.i.i.4 General Impact Statements

The following is a summary of the various concluding statements by the specialists appointed for this project impact assessment:

- Soils
    - The surrounding areas within which the proposed project is to occur are dominated by Iron Ore mines, and no cultivated agricultural activities occur in the immediate vicinity. This is largely attributable to the dominance of rocky outcrops and shallow soils which are not ideal for cultivated agricultural production. In addition, lack of rainfall as well as limited irrigation options further disqualifies the area from being ideal for agricultural production. Therefore, based on the above-mentioned limiting factors, the proposed project is anticipated to lead to a relatively low cumulative loss of arable land and medium low cumulative loss of natural grasslands for grazing. Therefore, from a soil and land capability point of view, the addition to the cumulative impact footprint of the region is considered relatively minor.
- Ecology
    - It is the opinion of the ecologists that this study provides the relevant information required to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the project area will be made in support of the principle of sustainable development.
- Freshwater
    - Due to the outright loss of two Cryptic Wetlands, it is the specialist's opinion that the proposed mining expansion has the potential to result in impacts of very high significance on the receiving freshwater environment, particularly of a wetland type which is under-researched and of scientific interest. It is however noted that, based on the layout provided at the time of preparing this report, the extent of direct impact will be contained to the local area and will equate to less than 3 ha of wetland habitat. Thus, consideration of the value of this landscape must be considered from a freshwater and terrestrial biodiversity resource management point of view and juxtaposed with the responsibility to comply with Regulation 23 of the Mining and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) MPRDA pertaining to the optimisation of the Mining Right as well as the socio-economic and socio-cultural impact the project will have and the decision should be made and aligned with the principles of sustainable development and Integrated Environmental Management.
    - The expansion of the existing WRDs and detrital area, proposed exploration drilling and proposed activities within already disturbed areas are anticipated to have a 'low' or even negligible risk significance, provided that strict enforcement of mitigation measures takes place. Therefore, those activities may be considered acceptable from a freshwater ecology management perspective.

- Hydrology
    - Based on the findings and outcomes of this study, it is the opinion of the specialist that from a surface water perspective, the proposed projects and activities can commence, provided that the recommendations and mitigation measures provided in this report are adhered to. It is important that future prospecting activities in the southern and western extent of the MRA should avoid the wetlands, depressions, recharge zone and drainage lines.
- Hydrogeology
    - Beeshoek is currently operating in a dynamic mining environment. Water levels are also impacted by various external sources, which directly impacts the water levels at Beeshoek. Currently, no additional groundwater is to be abstracted from the catchment as part of this project expansion. However, due to the nature of the environment in which the mine is operating, regular numerical model updates must be undertaken to determine whether the volumes for dewatering will still be sufficient to also supply the mine with the required volumes as approved in the Section 21(a) water uses.
- Air Quality
    - From an air quality perspective, it is the reasonable opinion that the Beeshoek Mine optimisation project should be authorised considering the findings of this assessment.
- Cultural and Heritage (including Palaeontology)
    - The project is in line with surrounding land use and the impact to heritage resources can be mitigated to an acceptable level. The project can commence provided that the recommendations in this report are adhered to and based on SAHRA's approval.
- Visual
    - The natural landscape of the area has already been altered by mining activities. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed infrastructure. It is therefore the opinion of the specialist that the project can commence, provided that the recommendations and mitigation measures.
- Socio Economic
    - Should the proposed project not proceed, the status quo in terms of the existing social impacts in the area would therefore remain. The life of mine would then not be extended and the mine would cease to operate over a shorter period of time.
    - The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region.
    - As the Beeshoek mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.
    - The 'no-go alternative' should thus not be considered from a social point of view as the negative social impacts anticipated with the Beeshoek optimisation project are deemed low. The negative impacts would further respond to mitigation as proposed. The proposed activities further fall within the mining rights area and the area is already characterised by and surrounded by various mining infrastructure.
    - From a social perspective it can be concluded that the socio-economic benefits associated with the project outweigh the negative social impacts. The Beeshoek Optimisation project is anticipated to facilitate the continuation of economic benefits to the local area, currently faced with high rates of unemployment and poverty.

According to the assessment carried out by the EAP the majority of the impacts can be reduced to a medium to low significance with the appropriate mitigation measures in place. This is specifically due to the fact that the mine has committed to the incorporation of the specialist recommendations into their mining optimisation project.

The following mitigation measures are crucial and should form part of the Environmental Authorisation to ensure that the applicant manages impacts adequately:

- Note that laydown areas will only be placed in areas which are demarcated for permanent activity or existing disturbed areas, or where specifically indicated in this report, to ensure that no additional areas are disturbed;
- Ensure that the no-go zones are clearly defined and indicated on the surface layouts and design plans;
- Ensure that all design drawings include effective erosion control measures;

- Adhere to the proposed conceptual Storm Water Management Plan contained in the Hydrological Report and also stipulated in Section 2.e.iv.3.i.4;
- Ensure that training on the EIA and EMPr and the final decision by the DMRE is given to all contractors and employees directly involved in the planning, construction and operation of the projects in question;
- Adhere to all management measures and actions presented in this report;
- Demarcate all floral SCC and/ or protected floral species prior to site clearance and apply for the necessary tree and vegetation removal permits;
- The required environmental permits and authorisations from Competent Authorities, in terms of SCC's and Water Uses must be obtained;
- Should invertebrate taxa be present, a detailed rescue and relocation plan should be developed by a suitably qualified specialist, to relocate egg banks, either to cryptic wetlands that will be undisturbed, or to recreated wetlands (refer to the figure overleaf for a concept diagram). Such a rescue and relocation plan could potentially form part of and offset initiative, which could be on site or also potentially be included at the Doornfontein property should it be required by the relevant authority.
- Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction and operational phases. AIPs should be cleared within the focus area before any vegetation clearing activities commence, thereby ensuring that no AIP propagules are spread with construction rubble, or soils contaminated with AIP seeds during the construction phase; and
- An AIP Management/Control Plan should be implemented by a qualified professional. No uncertified chemical control of AIPs to occur within the watercourses.

2.i.ii Final Site Map

The initial project plan allowed for two large mining areas on the Southern Portion of the Mine – around the current Village Opencast Pit and around the current East Pit. Key aspects of the specialist studies were considered in the finalisation of the final site map. Due to the outcomes of specifically the freshwater ecosystems study (please refer to Annexure 8), the extent of these future pit expansions was significantly reduced. The amendment in the site layout does not rule out future mining in these areas, but rather to conduct in depth exploration studies, to understand the geological resources better in order to target economic feasible resources strategically with the least impact on sensitive systems, such as the Cryptic Wetlands and the Recharge Zone.

2.i.ii.1.a.1 Freshwater Ecosystems Considerations

The delineations as presented are regarded as a best estimate of the riparian and temporary zone boundaries based on the site conditions present at the time of the assessment and considers the specialist study and legislative requirements. For this reason, a 100m zone of regulation in line with Regulation GN704 of the NWA is applicable to any drainage systems which may be affected by specific mining infrastructure, such as the drill pads, expansion of WRDs areas and so forth. In addition, in terms of Regulation 509 of the NWA, a 100m zone of regulation is applicable to any riparian area, in the absence of a determined 1:100 year flood line, and a 500m zone of regulation in line with Regulation 509 of the NWA is also applicable to any wetland identified within the Mining Right Area.

The respective zones of regulation in terms of Regulations GN509 and GN704 of the NWA, and the NEMA, are depicted in the figures below. Note the 100m and 500m buffer indicates where approval from the DWS is required in terms of the location of wetlands. This buffer will not restrict activities, but will require approval from the DWS.

The Zones of Regulation are conceptually depicted in the following figures.

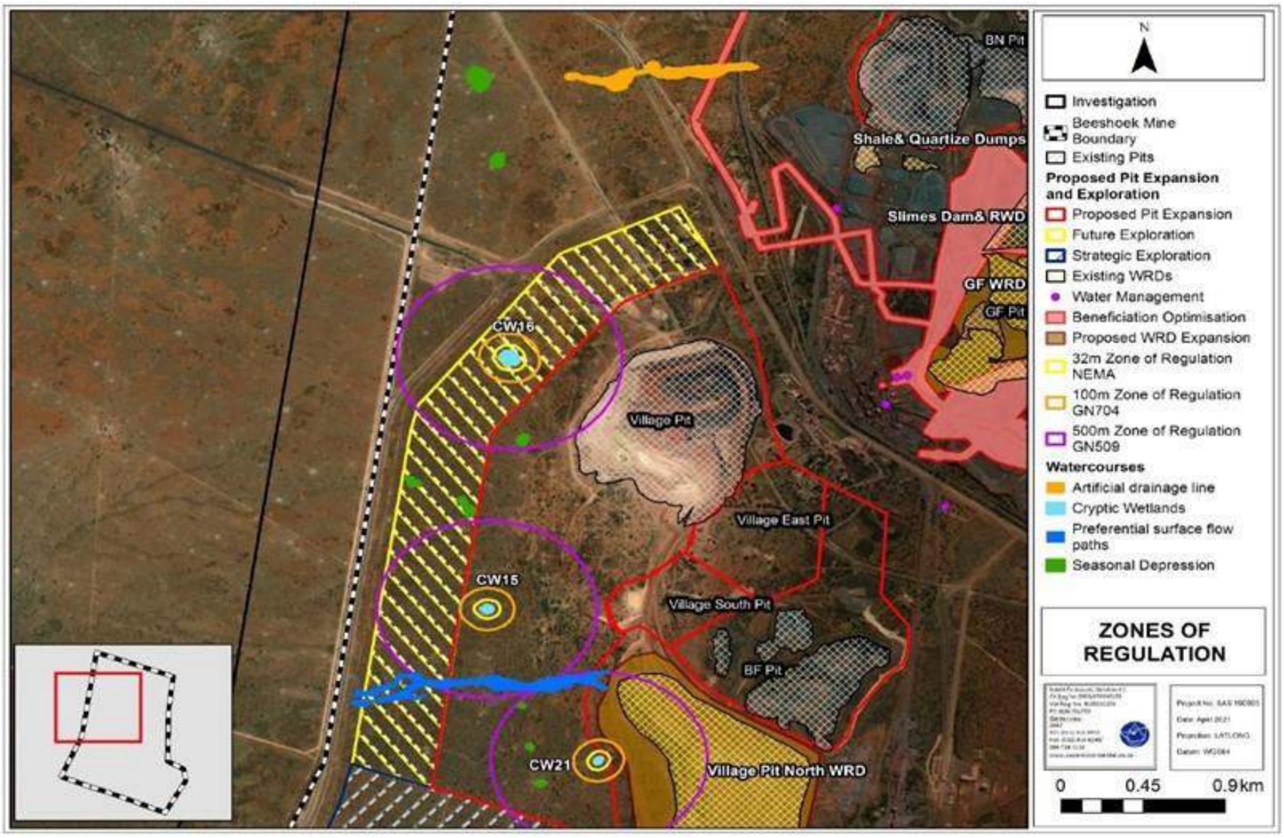

Figure 110: Conceptual presentation of the zones of regulation in terms of NEMA, GN704 and GN509 of 2016 as they relate to the NWA in relation to the Cryptic Wetlands located in the north-western portion of the Beeshoek Mine

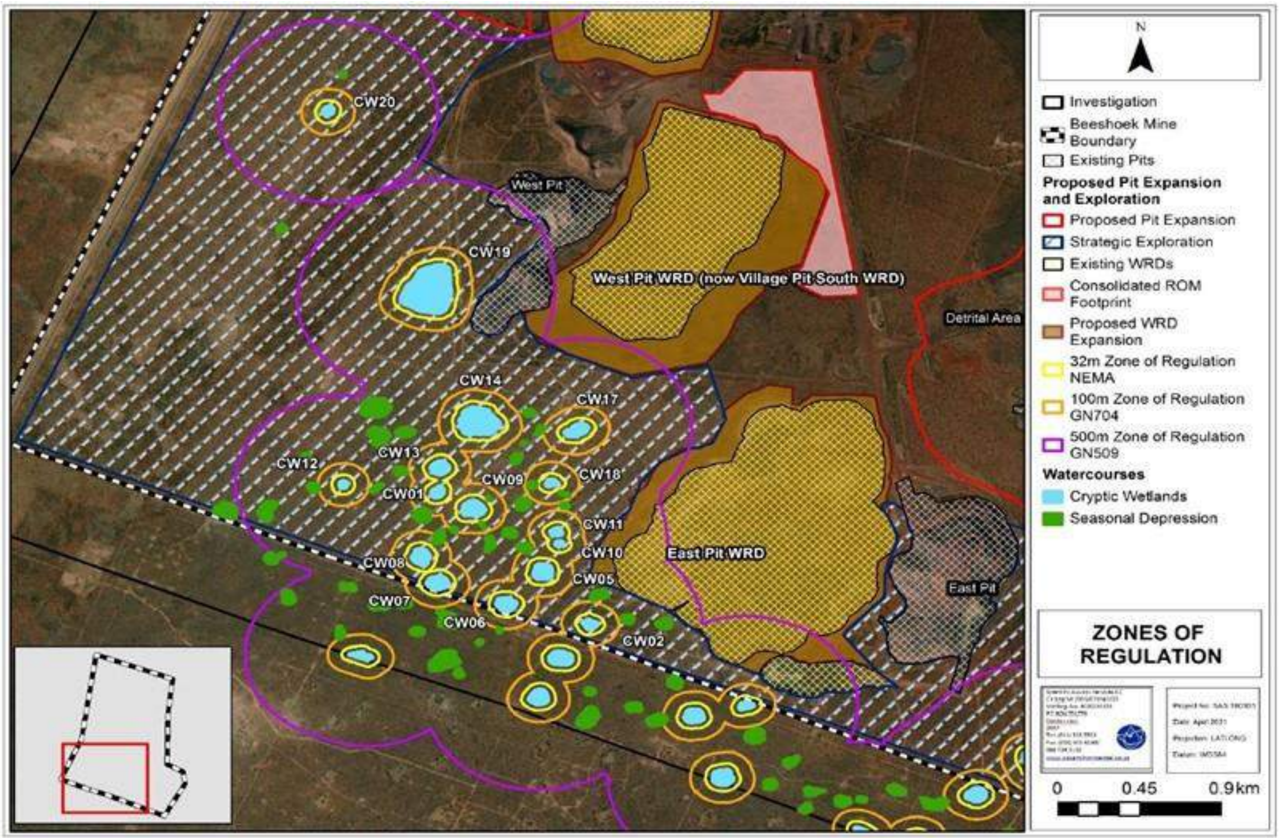

Figure 111: Conceptual presentation of the zones of regulation in terms of NEMA, GN704 and GN509 of 2016 as they relate to the NWA in relation to the cryptic wetlands located in the south-western portion of the Beeshoek Mine

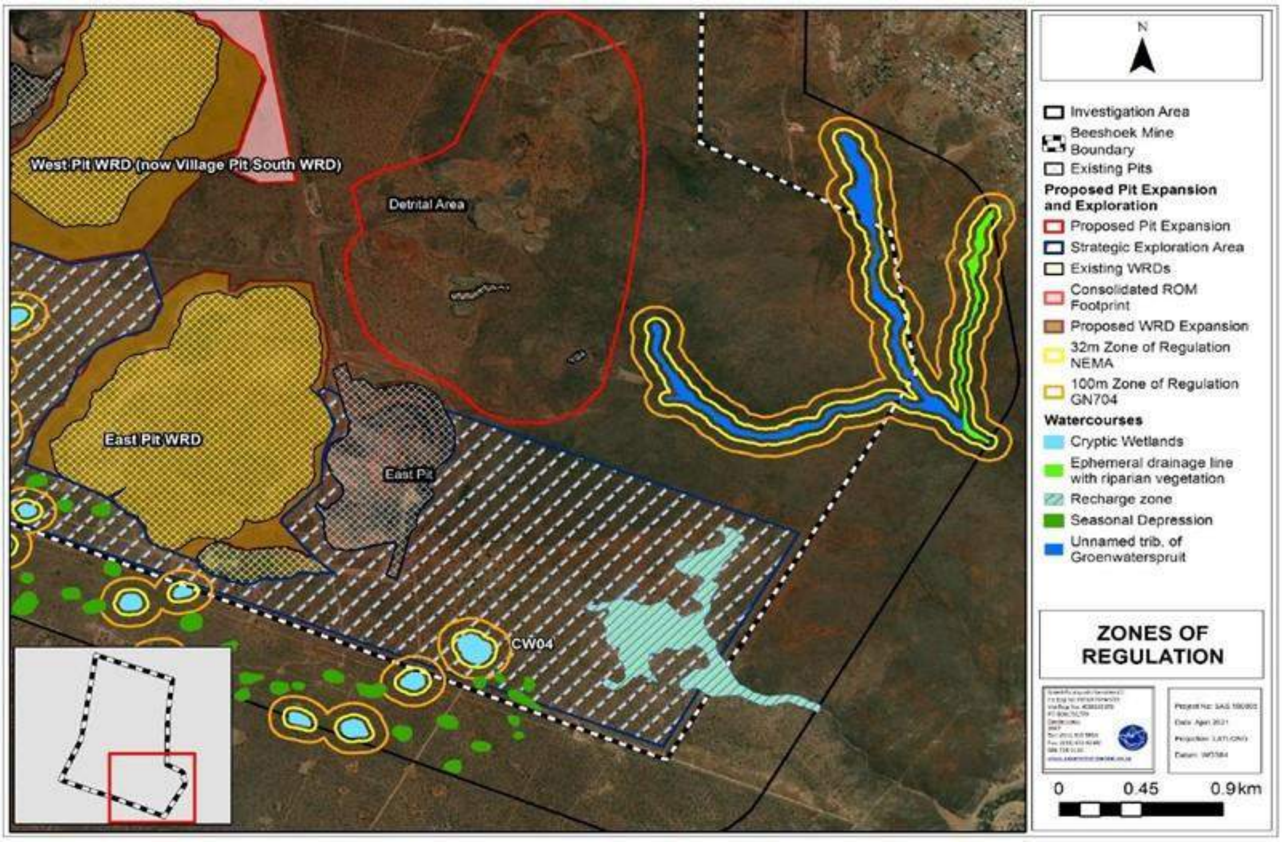

Figure 112: Conceptual presentation of the zones of regulation in terms of NEMA and GN704 as it relates to the NWA in relation to the cryptic wetlands and episodic drainage line located in the south-eastern portion of the Beeshoek Mine

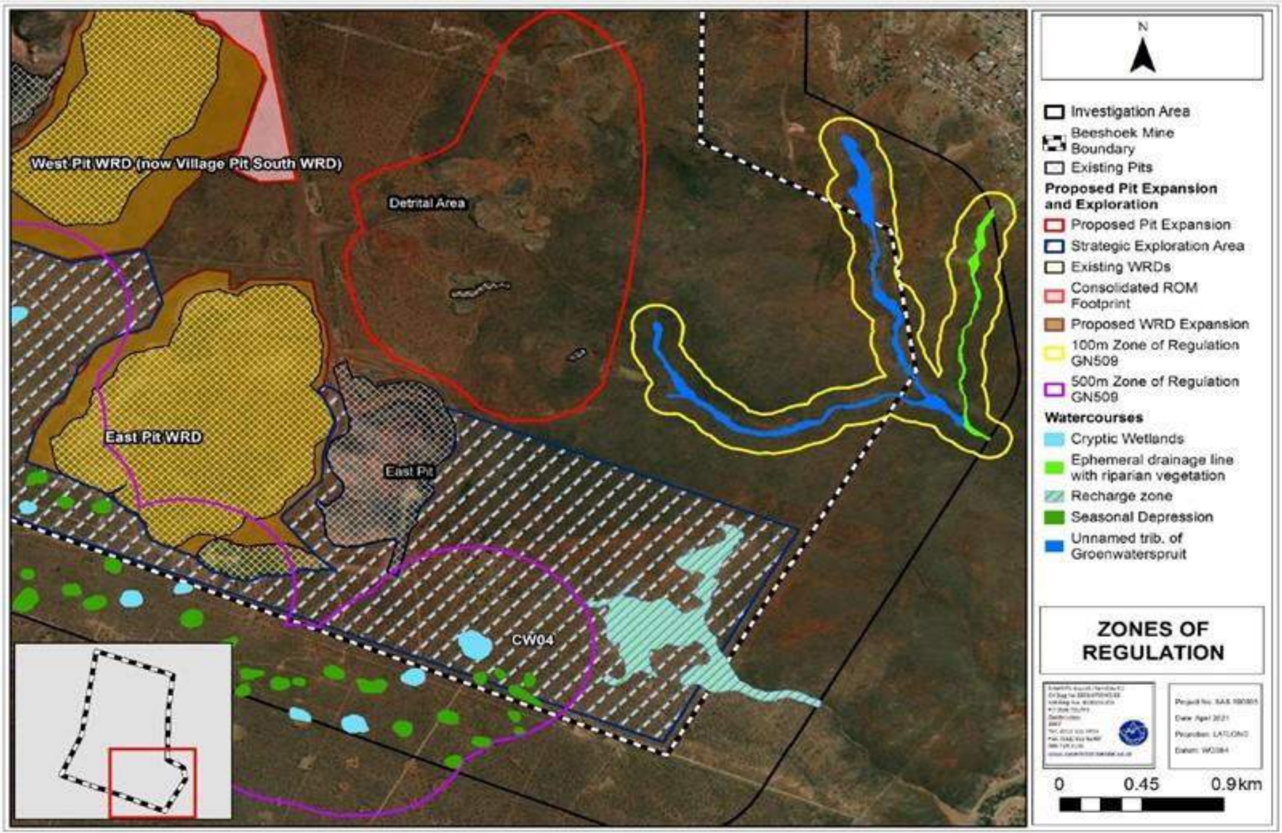

Figure 113: Conceptual presentation of the zones of regulation in terms of GN509 of 2016 as it relates to the NWA in relation to the Cryptic Wetlands and episodic drainage line located in the south eastern portion of the Beeshoek Mine

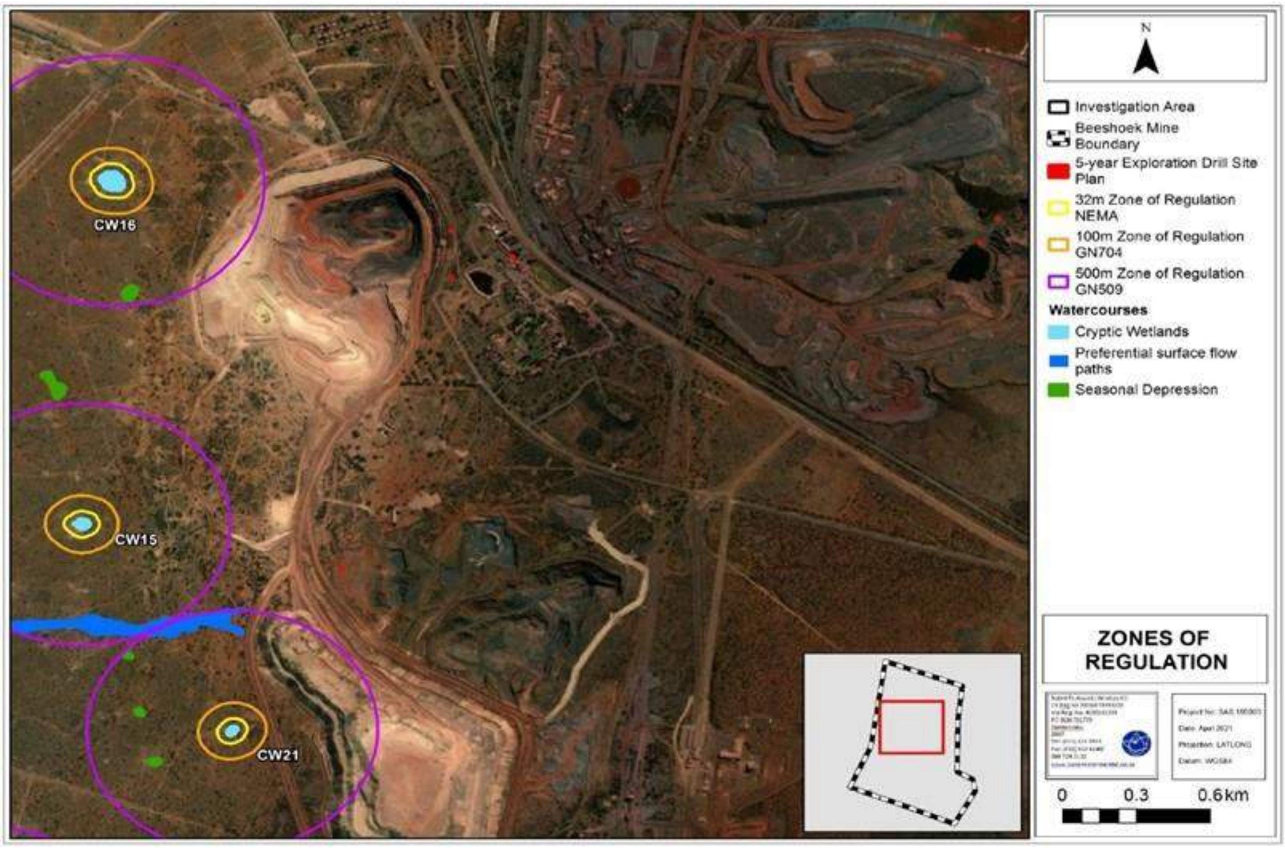

Figure 114:: Conceptual presentation of the zones of regulation in terms of NEMA, GN509 of 2016 and GN704 as it relates to the NWA in relation to the cryptic wetlands located in the central portion of the Beeshoek Mine.

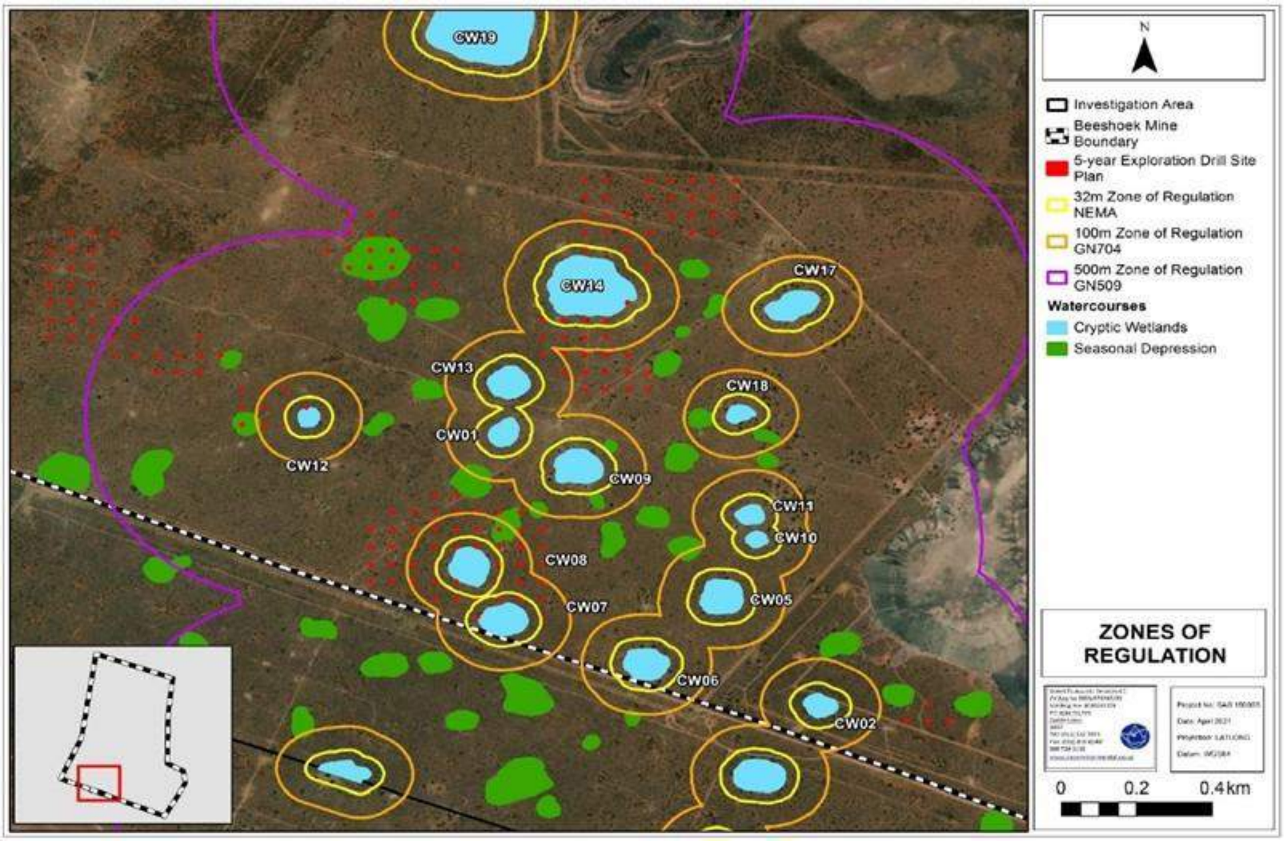

Figure 115: Conceptual presentation of the zones of regulation in terms of NEMA, GN509 of 2016 and GN704 as it relates to the NWA in relation to the cryptic wetlands located in the south-western portion of the Beeshoek Mine.

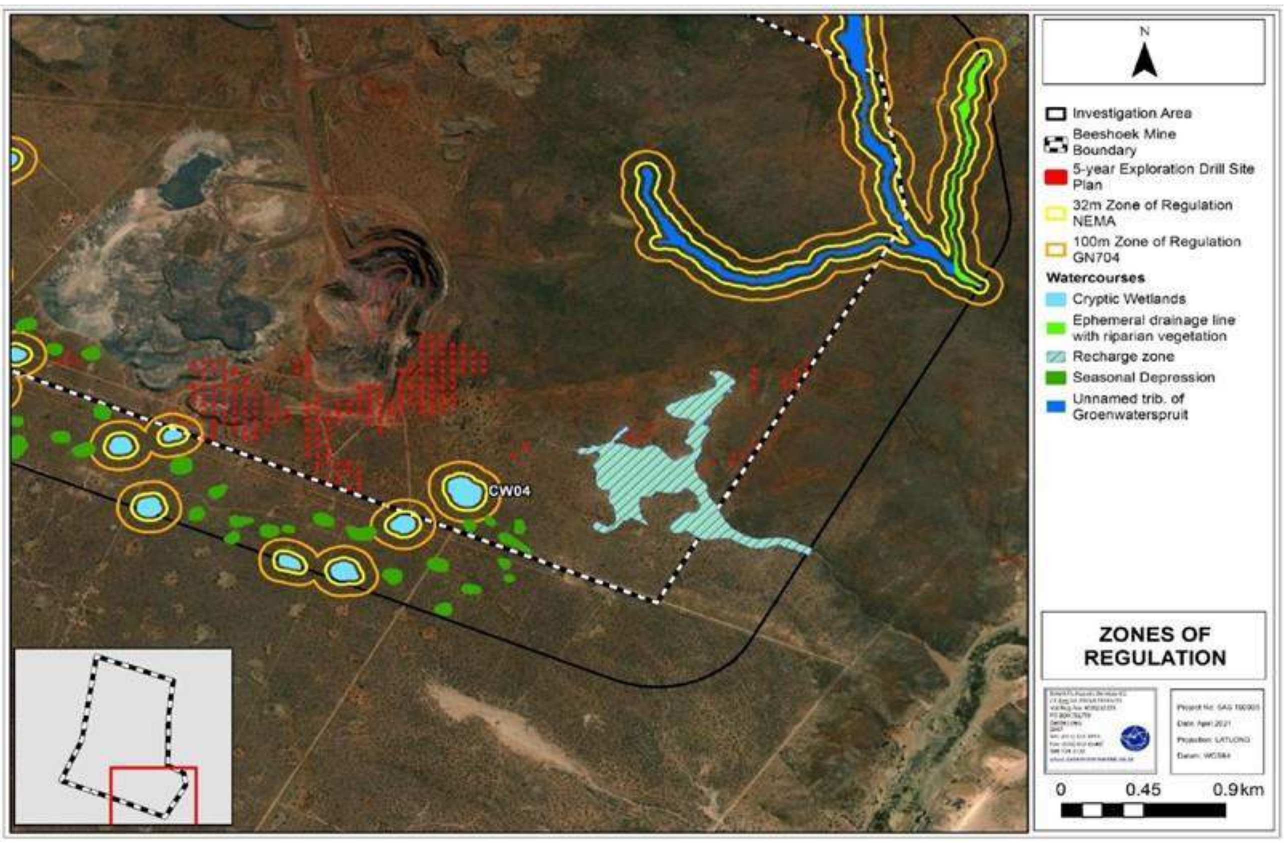

Figure 116: Conceptual presentation of the zones of regulation in terms of NEMA and GN704 as it relates to the NWA in relation to the Cryptic Wetlands and episodic drainage line located in the south-eastern portion of the Beeshoek Mine

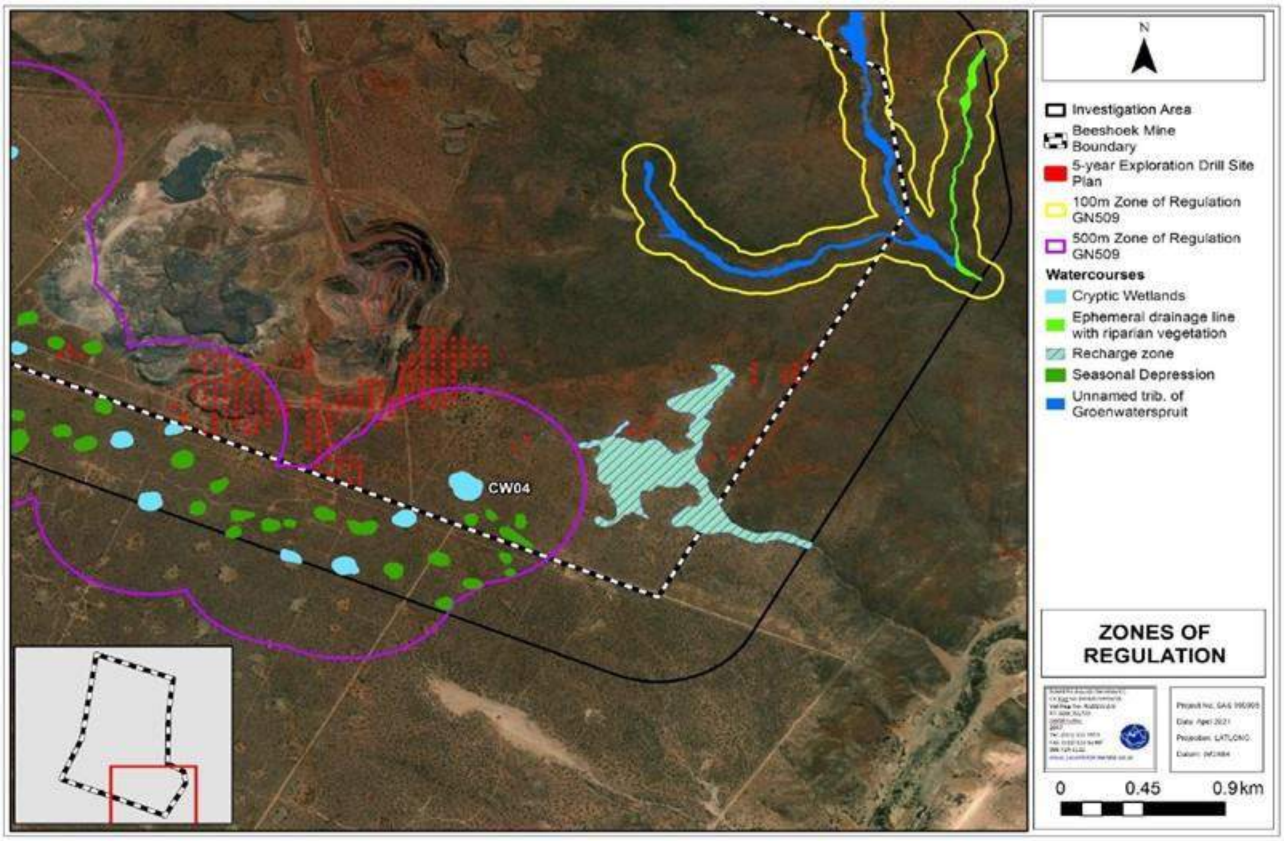

Figure 117: Conceptual presentation of the zones of regulation in terms of GN509 of 2016 as it relates to the NWA in relation to the cryptic wetlands and episodic drainage line located in the south-eastern portion of the Beeshoek Mine.

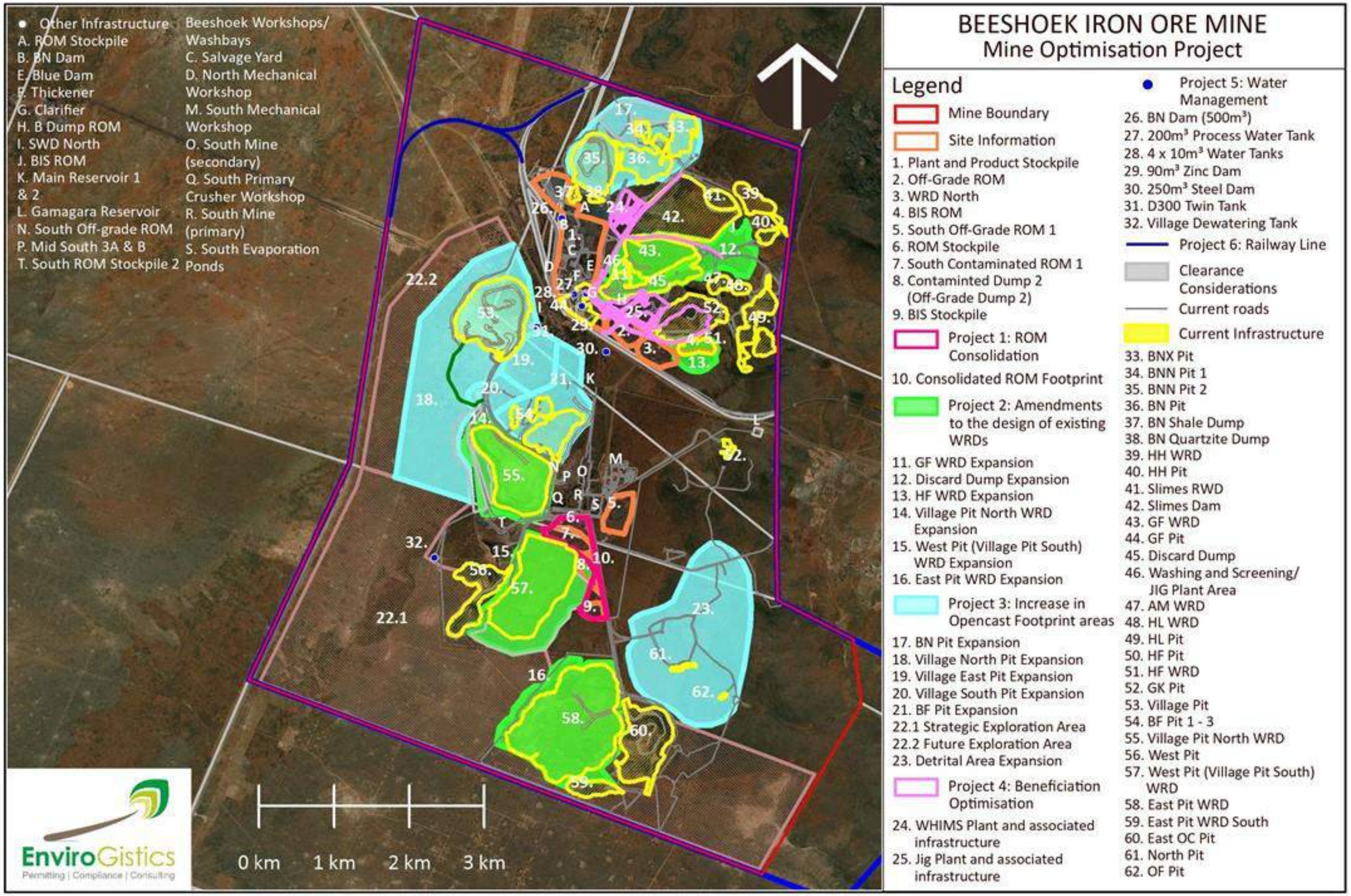

Figure 118: Final Site Layout

2.i.iii Summary of the Positive and Negative implication and risk of the proposed activity and identified alternatives

Please refer to Section 2.e.iv.3.h and 2.e.iv.3.i for the summary of the potential impacts and proposed management measures. Also refer to Table 75 for the summary of the various specialist studies.

2.j Proposed Impact Management Objectives and the Impact Management Outcomes for inclusion in the EMPr

As part of this Part A of the report various potential impacts, both positive and negative have been identified as a result of the proposed projects. The following objectives have been identified which should be guiding the management measures as presented in Part B of this report (the EMPr).

Planning Phase

The following aspects with its associated objectives have been considered during the planning phase:

- Legal Planning
    - To operate within the enviro-legal ambits of South Africa; and
    - To be aware of the latest environmental legal requirements.
- Integrated Mine Development Planning
    - Comply with the DWS Best Practice Guidelines;
    - Comply with the requirements of the approved EMPr, WUL and Environmental Authorisation;
    - Ensure that all relevant departments [Geology, Production, Engineering and Safety, Health, Environment and Quality (SHERQ)] are aware of the conditions and requirements of the EMP and Environmental Authorisation; and
    - Ensure that a communication forum and integrated meetings are in place between the above-mentioned departments, to ensure that environmental requirements are identified proactively to ensure optimal, timeous and lawful mining activities can be undertaken.
- Stakeholder Consultation and Economic Development:
    - Ensure that the activities of surrounding mines and landowners are not negatively impacted upon as a result of the proposed projects.

Construction Phase:

- Only commence with construction when all required environmental and WULs and/or plant/tree removal permits have been obtained.
- Remain within the ambits of the approved mining layout and activity description of the approved EMPr and Environmental Authorisation;
- Ensure that the areas defined as sensitive are protected and that the final site layout as proposed are adhered to;
- Remain with in the dust fall out limits of the NAAQS (NEM:AQA);
- Comply with the requirements of the approved EMPr and Environmental Authorisation;
- Ensure that all relevant departments (Geology, Production, Engineering and SHERQ) are aware of the conditions and requirements of the EMPr and Environmental Authorisation;
- Maintain and open and transparent relationship with the regulatory authorities;
- Prohibit unauthorised access to site and/or designated mining area without the necessary induction; and
- Induction to be updated and in line with all enviro-legal regulatory requirements.

Operational Phase

- Financial provision for post closure maintenance cost of rehabilitation activity area/sites will at all times be appropriate to provide for premature closure in terms of the NEMA;
- Plan and conduct the mining plan with closure in mine (i.e. planning with ongoing rehabilitation in mind);
- Remain within the ambits of the approved mining layout and activity description of the approved EMPr and Environmental Authorisation;
- Operate facilities towards and/or within a practical design with closure in mind; and
- Operate the water management circuit on site to increase efficiency and reduce the need for maintenance of these facilities.

- Soils and land capability:
  - Protect soil resources and surrounding land capability, where mining is not undertaken;
  - Protect soils in terms of hydrocarbon pollution; and
  - Protect soils to be used in terms of ongoing rehabilitation.
- Ecology:
  - Limit the presence of alien and invasive species on site;
  - Limit the impact of the facility on the ecological setting of the area;
  - Protect SCC species or obtain the necessary removal permits; and
  - Aim to achieve best practical rehabilitation practices.
- Aquatic Environment:
  - Protect the groundwater and surface water resources;
  - Protect the integrity of the Storm Water Management System;
  - Meet and operate within published environmental guidelines, such as ambient air quality guidelines, water quality guidelines and biodiversity plans; and
  - Aim to achieve best practical rehabilitation practices and investigate measures to ensure aquatic-ecological continuation after mining.
- Hydrology
  - Maintain clean and dirty water systems within the mining property;
  - Protect water resources, including Cryptic Wetlands;
  - Understand the strategic water setting in which the mine is located (south-eastern portion)
- Hydrogeology
  - Limit groundwater abstraction as far as practically possible, by ongoing optimisation of Water Demand and Conservation on site;
  - Maintain open channel of communication with the Local Municipality and other surrounding groundwater users; and
  - Ensure that the Mine does not negatively impact on the groundwater quality resources.
- Air Quality
  - Remain with in the dust fall out limits of the NAAQS (NEM:AQA).
- Visual and Topography
  - Not to negatively impact on surrounding landowners in terms of light pollution.
- Heritage and Paleontological Resources
  - Ensure that heritage and cultural resources, including paleontological resources are protected, should these be identified.
- Socio-Economic Condition
  - Invest in the utilisation of local labour and local business resources as far as practically possible;
  - Contribute to the socio-economic development of the Local Municipality to improve conditions as identified in the IDPs; and
  - Maintain an open channel of communication with the Local Municipality, Communities, surrounding mines and landowners.
- General
  - The hierarchy of waste management should be implemented on site, in line with the NEMWA and the National Waste Management Strategy;
  - The cradle to grave principle in terms of waste management must be implemented; and
  - Meet and operate within published environmental guidelines, such as ambient air quality guidelines, water quality guidelines and biodiversity plans.
- Ongoing Research
  - The NEMA Regulations promulgated to regulate the Financial Provision has resulted in mining operations having to reconsider the implementation of ongoing rehabilitation into the operational plans of the mine. Ongoing research into rehabilitation at the Beeshoek Mine will involve the following:
    - Ongoing research in terms of the practical rehabilitation practices to achieve the final land use commitments (wilderness) and investigate measures to ensure aquatic-ecological continuation after mining;
    - Strategic management and eradication of Alien Invasive Species;
    - Regular update of the numerical model in line with the WUL;
    - Strategic plan on how the mine can more efficiently mine resources optimally by ongoing exploration activities;

- Investigate and understand the strategic water setting in which the mine is located (south-eastern portion)
- Annually review the Mining Works Programme, to consider ongoing rehabilitation practices – for example backfilling of waste rock vs. stockpiling thereof of WRDs; and
- Development of a Water Conservation and Demand Management Plan and the annual update thereof.

The following relates to site specific objectives:

- Opencast Operations and exploration
  - Protect water resources, such as cryptic wetlands as far as practically possible;
  - Protect SCC species (flora and fauna) where possible;
  - Remain with in the dust fall out limits of the NAAQS (NEM:AQA);
  - Investigate means to offset or recreate Cryptic Wetlands where these are lost; and
  - Participate in ongoing research to better understand the strategic water setting and cryptic wetlands in this area.
- Redesign of WRDs
  - Groundwater monitoring in the existing monitoring boreholes must continue according to the conditions of the approved WULs;
  - WRDs must be operated and designs to ensure safety;
  - Design and operate in terms of closure; and
  - Where possible rather backfill than deposit of mine residue.
- Beneficiation Plants
  - Optimise the reworking of mine residue on site;
  - Optimise water conservation and demand principles on within the plant circuit; and
  - Meet the objectives of GN704 in terms of clean and dirty water management.
- Water Management
  - Optimise water conservation and demand principles.
- Railway line
  - Meet local and national iron ore demand and supply requirements; and
  - Operate and support a safe and effective transportation system.

Rehabilitation objectives:

- General
  - Return of land to its pre-mining state where possible (grazing and/or wilderness land);
  - Minimise the impact on the local community;
  - Minimise the impact on the surrounding economic environmental and other mining activities;
  - Maintenance requirements for rehabilitated activity areas/sites need to be established and documented within the capability of the subsequent land user; and
  - Final Detailed Closure Plan must be developed five (5) years prior to final closure.
- Opencast Pits
  - Backfill pits where possible; and
  - Where voids remain, ensure that these are safe – for example construction of enviro-berms.
- WRD
  - Achieve at least a 1:3 slope angle;
  - Implement erosion control measures on side slopes;
  - Ensure that water does not accumulate on surfaces;
  - Eradicate any invasive species;
  - Encourage plant growth and where required implement natural seeding in order to revegetate disturbed areas; and
  - Manually plant and re-vegetate with indigenous flora only when self-seeding is not successful.
- Demolish all haul and access roads;
  - Rip all roads that have been compacted;
  - Encourage plant growth and where required implement natural seeding in order to revegetate disturbed areas; and
  - Manually plant and re-vegetate with indigenous flora only when self-seeding is not successful.
- Surface Footprints
  - Loosen soil;

  - Encourage plant growth and where required implement natural seeding in order to revegetate disturbed areas; and
  - Manually plant and re-vegetate with indigenous flora only when self-seeding is not successful.
- Buildings and Infrastructure
  - Dismantle mine related infrastructure;
  - Demolish all concrete, brick and/or gravel foundations, slabs, pavements, roadways;
  - Dismantle all fencing for recycling or metal scrapping;
  - Remove all fuel storage facilities (tanks, reticulation et) and have them removed by an accredited fuel handling company; and
  - The foundations of all buildings that will be removed should be removed to a depth of 1m.
- Building on the closure vision, the objectives of the final rehabilitation plan are to:
  - Ensure all areas are closed in a manner that ensures they are geotechnical stable and safe;
  - Prevent erosion through sloping of remaining deposits to appropriate gradients;
  - Ensure that all areas are free-draining and non-polluting;
  - Establish vegetation cover allowing the area to be used for wilderness;
  - Establish a low maintenance system; and
  - Ensure the final landform blends into the surrounding topography as far as practically possible.

2.k Final Proposed Alternatives

As mentioned before, Section 23(1)(a) of the MPRDA states in Section 1(a), that subject to subsection (4), the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. This project specifically gives rise to this requirement, and results in the optimisation of mineral waste deposition, beneficiation, water management and the logistical requirements for product transportation.

Various optimisation activities are planned for the mine as previously discussed. By not allowing this project to proceed, the mine will lose the opportunity to rework current waste streams and thereby reducing the dirty water footprint.

In addition to this, this project plans to optimise the exploration of mineral resources to which the mine has the Mineral Rights to. By not allowing the expansion of opencast operations, the mine will not be in a position to optimally work within its allocated Mineral Resource boundaries.

The opportunity to effectively and efficiently export iron ore resources via the Saldanha port will further be lost should the allowance for the railway line link not realise.

The projects in question will have a substantial socio-economic benefit within the local area, but also regionally. No fatal flaws or environmental concerns, which cannot be addressed with sound and proper management have been identified. Should the proposed project not proceed, the status quo in terms of the existing social impacts in the area would therefore remain. The life of mine would then not be extended and the mine would cease to operate over a shorter period of time.

The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region.

As the Beeshoek mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

The ‘no-go alternative’ should thus not be considered from a social point of view as the negative social impacts anticipated with the Beeshoek optimisation project are deemed low. The negative impacts would further respond to mitigation as proposed. The proposed activities further fall within the mining rights area and the area is already characterised by and surrounded by various mining infrastructure.

The Beeshoek Optimisation project will extend the life of mine and will result in the continuation of the existing operations and by not allowing this project, the following opportunities will be lost:

- The continuation of job and income opportunities with subsequent positive economic spin-offs;
- Continuation of central tax revenues;
- Positive impact in terms of the socio-economic development of the area and reducing poverty levels through continued employment; and
- Socio-economic investments targeted at the local community through local economic development projects, as well as through capacity building and training.

Please refer to Section 2.d for the alternatives considered.

2.l Aspects for inclusion as conditions of the Environmental Authorisation

This EMPr has been complied to present all the required management measures, actions, monitoring requirements and closure objectives to ensure that the impact of this project be limited to meet the final objectives listed in this document.

The following mitigation measures are crucial and should form part of the environmental authorisation to ensure that the applicant manages impacts adequately:

- The management measures and actions as presented in the EMPr must be implemented and adhered to on site;
- An ECO should be appointed during the construction phases to monitor the implementation of the EMP;
- The Monitoring Programme and Reporting Programme (internal and external audits) should be adhered to;
- Ensure that training on the EIA and EMPr and the final decision by the DMR is given to all contractors and employees directly involved in the planning, construction and operation of the projects in question;
- Demarcate all sensitive and/or listed flora species prior to site clearance and apply for the necessary tree and vegetation removal permits with relevant Departments (NCDENC and DFFE);
- No activities which require WULs or approval from the DWS may commence without the necessary authorisations;
- Soil placement and revegetation trials should be implemented on WRD slopes, backfilled opencast footprint areas, as well as areas where infrastructure was previously demolished; and
- Sampling of the Cryptic Wetlands to determine the presence (or absence) of macroinvertebrates must be undertaken before disturbance (specifically CW15 and CW21, directly impacted by the proposed Village Pit expansion). Should invertebrate taxa be present, a detailed rescue and relocation plan should be developed by a suitably qualified specialist, to relocate egg banks, either to Cryptic Wetlands that will be undisturbed, or to recreated wetlands (as presented under Section 2.e.iv.3.i.2.5 of this report).

2.m Description of any Assumptions, Uncertainties and Gaps in Knowledge

In each of the specialist reports, the relevant assumptions and gaps have been listed. None of the assumptions listed resulted in uncertainty in terms of the outcomes of the specialist studies and therefore the EAP is confident that the management measures presented in this report will be suitable for achieving the environmental objectives.

2.n Reasoned opinion as to whether the proposed activity should or should not be authorised

2.n.i Reasons why the activity should be authorised or not

It is the opinion of the EAP that this EIA and EMPr provides the necessary and relevant information required in order to implement the principles of Integrated Environmental Management so as to ensure that the best long-term use of the soil, ecological and aquatic resources in the project area will be made in support of the principle of sustainable development.

No fatal flaws or residual impacts have been identified by the specialist or the EAP.

The project will <u>not</u> result in a new Greenfields mining activity, but rather utilising and optimising the infrastructure and resources available to prolong the life of mine. This in itself will have a significant benefit economically and socially within the Local Municipality.

When considering the no-go alternative option it is evident that this project could result in various positive impacts on the environment.

Recommendations of the EAP and specialists have been considered favourably by the applicant and the final project plan has incorporated these recommendations. If the proposed management and mitigation measures are not properly applied or if the applicant intentionally disregards any of these measures, it will negatively affect the environment and have potential consequences and for this reason it is important that the recommendations for conditions for inclusion as presented in Section 2.l be included should the Environmental Authorisation be considered favourably by the Competent Authority.

It is recommended that, the proposed development be considered **favourably** provided that the recommended management measures for the identified impacts, monitoring requirements and auditing protocols are adhered to, and that construction within the no-go zones is avoided. Where this is not possible, such as avoiding the 500m buffer around wetlands systems, such construction is to be kept to an absolute minimum and only undertaken with the necessary approval of the DMR and DWS.

2.o Period for which the Environmental Authorisation is required

The Environmental Authorisation is required for the life of mine, which will increase to 15 years.

2.p Undertaking

The undertaking by the Application to meet the requirements of this section is provided in Part B (EMPr) and is applicable to both the EIA report and EMPr.

2.q Financial Provision

The purpose of this section is to present the financial provision required to implement the Final Rehabilitation Plan for the proposed study. This cost is a best case preliminary cost based on current layout information, with strong focus on the 2021 Financial Provision Assessment undertaken by Globesight (Pty) Ltd.

This plan must be assessed annually, as the construction and operational phased progress to determine the status quo “bill of quantities” of clearance and infrastructure, as well as the update of the “Master Rates” (contractor rates) to determine the current financial provision requirements, as well as the mine’s compliance in terms of rehabilitation commitments set.

The final rehabilitation, decommissioning and mine closure plan must be measurable and auditable, must take into consideration the proposed post-mining end use of the affected area and must contain information that is necessary for the definition of the closure vision, objectives and design and relinquishment criteria, indicating what infrastructure and activities will ultimately be decommissioned, closed, removed and remediated and the risk drivers determining actions, indicating how the closure actions will be implemented to achieve closure relinquishment criteria and indicating monitoring, auditing and reporting requirements. For this reason this EMPr has made provision for the following:

- Provide an overview of the mine and its environmental context (Section 2.c and Section 2.e.iii of Part A);
- Presentation of identified risks based on an Environmental Risk Assessment conducted for the Mine (a Risk Assessment was conducted as part of the 2021 Financial Provision Assessment, as well as this report. (Section 2.e.iv.3 and Section 2.e.iv.3.f of Part A);
- Presentation of the approved closure design principles, and also identify where these require amendment (Section 2.d.i of Part B);
- Presentation of the final post-mining land use (Table 88 and Table 89 - Mining areas could be rehabilitated to a wilderness final state with a final land capability of about 60% of the original land capability according to the 2009 EMP);
- Presentation of the closure actions to achieve the final land use (Table 88 and Table 89);
- Identification of gaps in the plan;
- Closure Cost Estimation; and
- Monitoring requirements (please refer to Section 2.h.vii of Part B).

The amount that is required to both manage and rehabilitate the environment in respect of rehabilitation is **R 28 962 329,40** (including VAT).

2.q.i.1 Appointed Specialist

GlobeSight was subcontracted by EnviroGistics as the appointed consultant by Beeshoek to complete the 2021 Financial Provision Assessment for the rehabilitation and closure of the Mine and in the process also considered the projects being applied for.

The following sections presents the key considerations in how the Optimisation Projects' financial provision amount was derived:

2.q.i.2 Philosophy and Legal Considerations

According to the 2018 Financial Provision Report, successful closure depends on setting, continually reviewing and validating and finally meeting closure goals that align with company and stakeholder requirements. There should be minimal residual risk to the environment, and the community should realise benefits that will continue to exist without further involvement from the company. This philosophy was considered in the development of the financial provision for the current mine, life of mine and proposed projects.

The vision of mine closure should be to ensure that a process is established to guide all decisions and actions during a mine's life such that:

- Future public health and safety are not compromised;
- Environmental resources are not subject to physical and chemical deterioration;
- The post-mining use of the site is beneficial and sustainable in the long-term;
- Any adverse socio-economic impacts are minimised; and
- The opportunity is taken to maximize socio-economic benefits.

The above vision has been incorporated in the development of the management measures for the proposed projects.

In order to derive the financial provision, the following legislation was also considered:

Table 76: Financial Provision Legislation

Applicable legislation and guidelines	Details
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)	Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that – a) Prevent pollution and ecological degradation; b) Promote conservation; and c) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development
The Conservation of Agricultural Resources, 1983 (Act No. 43 of 1983)	The Conservation of Agricultural Resources Act, 43 of 1983 (CARA) states that the degradation of the agricultural potential of soil is illegal. The CARA requires that protection of land against soil erosion and the prevention of water logging and salinization of soils means of suitable soil conservation works to be constructed and maintained.
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002)	The MPRDA sets out the requirements relating to the development of the nation's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through exploration and mining related activities.
National Environmental Management Act, 1998 (Act No. 107 of 1998)	Section 41 (1) of the MPRDA has been repealed and in terms of Section 24P in the NEMA as amended which provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision must guarantee the availability of sufficient funds to undertake the- a) Rehabilitation of the adverse environmental impacts of the listed or specified activities; b) Rehabilitation of the impacts of the prospecting, exploration, mining or production activities, including the pumping and treatment of polluted or extraneous water; c) Decommissioning and closure of the operations; d) Remediation of latent or residual environmental impacts which become known in the future; e) Removal of building structures and other objects; and/or f) Remediation of any other negative environmental impacts. In addition to Section 24P, the Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations were promulgated on the 20 November 2015 (Government Notice No. 1147 published in GG 39425).

Applicable legislation and guidelines	Details
	Regulation 11 of the Financial Provision Regulations requires a holder of a Mining Right to determine the quantum of the financial provision through detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for: a) Annual rehabilitation, as reflected in Annual Rehabilitation Plans; b) Final rehabilitation, decommissioning and closure of the mining operations as per the Rehabilitation and Closure Plans (RCPs) which includes the findings of the Environmental Risk Assessment (ERA); and c) Remediation of latent or residual environmental impacts as identified in the ERA. The NEMA, as amended was set in place in accordance with section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.*
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	NEMBA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and also takes into account the management of alien and invasive species. This Act works in accordance to the framework set under NEMA. The following regulations which have been promulgated in terms of the NEMBA are also of relevance: ▪ Alien and Invasive Species Lists, 2020; ▪ National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations; and ▪ National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN R.1002, 9 December 2011).
National Water Act, 1998 (Act No. 36 of 1998)	The NWA provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)	According to the NEM:AQA the Department of Environmental Affairs (DEA; now DFFE), the provincial environmental departments and local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM: AQA. A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM: AQA is the establishment of National Ambient Air Quality Standards (NAAQS) (GN R 1210 of 2009). These standards provide the goals for air quality management plans and also provide the benchmark by which the effectiveness of these management plans is measured.

2.q.i.3 Methodology and Approach to the Financial Provision Calculation

This cost is a best case preliminary cost based on current layout information, with strong focus on the 2021 Financial Provision Assessment undertaken by Globesight (Pty) Ltd .

The following approach was adopted from the 2021 Financial Provision, Risk Assessment Report.

2.q.i.3.a Identification of Post-Closure Land Use

Another important consideration in the determination of the financial provision is the post-closure land use commitment. Post-closure land use is determined in consultation with stakeholders so that the post closure land use meets the requirements of the stakeholders, within the context of the closure plan. This activity is undertaken for the whole mine lease area affected by mining activities and integrates stakeholder requirements with risk mitigation.

The proposed final land use would be to return the area to wilderness area as committed to in the various EMPr's preceding this application. The 2009 EMPr as approved states: "The post-operational land use is aimed at returning the entire Beeshoek footprint area to wilderness at 60% pre-mining capability". This would include demolishing surface infrastructure that will not be handed over to a third party and promoting indigenous plant growth through either achieving self-succession, or where this is not possible, reintroduce species through a seeding programme. It is evident that the re-establishment of this vegetation biome on site will not be difficult as areas that have already undergone rehabilitation have seen a large success in terms of the revegetation. The key in this area will be the management of Alien Invasive Species.

The Tsantsabane Local Municipal area falls in the Gamagara Corridor. The Northern Cape Province Spatial Development Plan (NCPSDF (2012: 68)) defines the Gamagara Corridor as comprising the mining belt of the John Taolo Gaetsewe and ZF Mgcawu districts and runs from Lime Acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese. Economically, Tsantsabane Local Municipality is known for being rich in minerals, and for its mining, agriculture, manufacturing and farming sectors. The municipality has become one of the leading investment areas in the Northern Cape. Agriculture, mining, and tourism form the key economic drivers in this area. The spatial vision of the ZF Mgcawu District Municipality thus include:

- Tourism: Cultural, wilderness, floristic, river tourism ranging from the Kgalagadi international trans frontier park to the culture of the Riemvasmaak community to river tourism on the Orange River;
- Mining and mining beneficiation;
- Agriculture: riverbank vineyards and expansive stock and game farming in the Kalahari; and
- Renewable energy technology opportunities.

Wilderness setting, or the continuation of exploration to further develop opencast resources with in the approved Mining Rights Area falls within the spatial vision of the District Municipality.

It should be noted that the closure plan for the proposed projects will be revised as the implementation of the project progresses; this will ensure that the mine operation take advances in technology and rehabilitation methods into consideration.

2.q.i.3.b Risk Assessment

Risk assessment is the overall process of risk identification, risk analysis and risk evaluation. A baseline Hazard Identification and Risk Assessment (HIRA) was completed as part of the financial provision update. The baseline HIRA is based on a qualitative method. The following process steps were taken:

- A general discussion on hazards and “driving forces” was used to determine things that could “go wrong” during the mine closure;
- The boundaries of the project were defined; and
- Areas within the mining area were defined requiring rehabilitation.

For each of the areas in the process:

- Potential unwanted events were identified;
- Current controls for each unwanted event were identified and recorded;
- The most likely severity, should the event occur, and likelihood of the event occurring were then estimated;
- Based on this, the level of risk was estimated using the risk matrix; and
- For the Highly and Extremely Intolerable events, additional “controls” were recommended to reduce the level of risk.

Before preceding in the outcomes of the study it is important to define Residual vs Latent Risks.

A residual risk as per the Oxford Dictionary is: “Remaining after the greater part or quantity has gone.” The 2015 Financial Provision Regulations defines residual environmental impacts as “any environmental impact or risk that may result or manifest after actions for final rehabilitation, decommissioning and closure have been implemented.

A latent risk as per the Oxford Dictionary is “(of a quality or state) existing but not yet developed or manifest; hidden or concealed.”

Based on the specialist studies conducted as part of the past Environmental Authorisation Processes, which includes multi-disciplinary specialist studies, as well as subsequent reviews of these studies (such as the Numerical Groundwater Model updates), it is concluded that no quantitative residual risks have been identified. This pertains to the fact that no specific quantitative risk has been identified which can be costed for the purposes of long term management post mine closure -i.e. when all closure measures have been implemented and still specific impacts remain. For example, where decant has been identified as part of a mine’s operational layout and plan, the decant can be quantified, and the treatment options thereof stipulated or where a groundwater pollution plume has been identified as part of a numerical model a specific measures are determined to retract or manage the movement of this plume, such as scavenger boreholes. For the purposes of Beeshoek Mine, no residual risks have been identified.

Latent risks on the other hand are regarded as those risks which are unknown/hidden and for which further studies and/or investigations are required. These are typically associated with ineffective rehabilitation due to premature closure (the risk is present, however management measures are in place throughout the operational phase of the mine to address these), or the loss of employment due to premature closure, or instability due to the underlying strata/geology, such as dolomites (investigations are undertaken on a regular basis to determine where infrastructure must be place or where risk of subsidence are present and as a result these are incorporated within the mine planning and layout. However, in the event of poor stormwater management or dewatering from other sources, residual to the mine activities, subsidence may occur. This is however a latent risk and not a residual risk – this is a "what if", which must be investigated and understood and incorporated as part of the ongoing layout development of the mine.

Latent Environmental Impacts may be expected for the post-closure scenario, should the recommended operational, ongoing rehabilitation and rehabilitation as part of decommissioning and closure not be successful. This is however unlikely and managed through ongoing studies and investigations. These risks are therefore subjected to further studies as identified in the Beeshoek Residual Risk Report or as part of ongoing incorporation of measures as presented in the Social and Labour Plans. These relates specifically to:

- Stability (due to the presence of the dolomites in the area);
- Management of the impact on the loss of employment once the mine closes; and
- The impacts on premature closure.

Ongoing updates of the groundwater reports and reassessment of the deep dolomitic studies due to the incorporation of conditions listed in these reports may be suitable to better understand the environment and also manage specific areas of concern to manage and/or avoid any potential unknown residual risks.

As mentioned above, no residual risks were identified, but potential latent risks to proactively managed were identified. Ten unwanted events were identified for the mine. The risks are categorised as follows:

Table 77: Risk Levels

Colour	Descriptor	Action	Sign-Off
	Extremely Intolerable	Immediate Action	General Manager
	Highly Intolerable	Short term action required	Senior Management
	ALARP (As low as reasonably predictable)	Heightened Action	Section Manager
	Maintain	Ensure levels of control	Supervisor

These unwanted events were ranked for risk based on the maximum reasonable severity should they occur and the likelihood of that specific severity/consequence occurring (please refer to the following table presenting the risk matrix used). This analysis was firstly done assuming that no controls are in place (i.e. the raw latent risk) and secondly considering current controls were in place and effective (i.e. residual risk).

For the purpose of the risk assessment the following was assumed:

1. All infrastructure will be removed by the mine – i.e. no built infrastructure will remain;
2. The shaping, ripping and revegetation (self-succession) of the post mining area as costed will be successful and this will be monitored for a period of three (3) years post closure to ensure success and correct areas of concern;
3. Considering successful shaping, ripping and revegetation, no residual impacts are foreseen on any watercourses (i.e. cryptic wetlands or drainage systems);
4. Opencast pits will be backfilled and where backfilling is not possible, enviroberms will be placed to allow for the safety of the area;
5. The post mining land use will be wilderness, as the land capability studies indicate that successful farming such as livestock commercial farming is marginal due to the low grazing capacity for this area (14 hectares per animal);
6. After closure and cessation of dewatering/groundwater abstraction, the water table will rise in the mine to reinstate equilibrium with the surrounding groundwater systems. The rebound period also depends on regional activity as large-scale dewatering is occurring at the neighbouring mines as well. Following the closure of the opencasts and the cessation of the dewatering it is assumed to lead to groundwater rebound and potential decanting. However, due to naturally deep-lying groundwater levels, no decant is predicted;
7. In terms of a residual impact on groundwater quality, the 2017 and subsequent groundwater studies indicated that contamination to the aquifer from the identified sources (Slimes and Mine Residue Deposits) is unlikely; and

8. In terms of a potential failure of the Slimes Dam, no significant risk is likely at this time, as the facility is located within an old quarry. The 2020 Dolomitic study further indicated that the risk of subsidence at the Slimes Dam is based on seep from the facility. With the rehabilitation strategy in place, to cover and shape the facility no further residual risk associated with this facility is anticipated.

Based on the above the current management measures and closure plan proposed and approved in the existing EMPrs should address all potential impacts, with the exception of potential latent risks – i.e. risks which may occur in the future but cannot be reasonably quantified at this stage. These risks are presented below, and the necessary control measures are recommended to remediate such risks.

Ten unwanted events were identified as part of the 2021 Risk Assessment Report. With the implementation of management measures, one (1) of the unwanted events were ranked as highly intolerable, five (5) ranked as ALARP and four (4) as maintain (please refer to the table below).

The risks identified includes:

1. Mine potentially not rehabilitated and closed properly, which could lead to access and security concerns which could lead to establishment of informal settlements. This could also lead to injury or fatalities dur to unauthorised and unrestricted access to mining areas not properly rehabilitated.
2. Mine potentially not rehabilitated and closed properly, which could lead to the occurrence of sinkhole development due to lack of rehabilitation and storm water control around Mine Residue Stockpile slopes and the Slimes Dam.
3. Potential inadequate budget to adequately rehabilitated the environment. This could result in not achieving the final land use plan (rating considering ongoing rehabilitation is currently undertaken).
4. Potential negative effect of future closure on the employees and their future income, which could lead to employees and community income source lost.
5. Potential surface subsidence at opencast pit voids, which could have a negative impact on surface rehabilitation due to the collapse of Opencast Walls – impact on rehabilitation landscape and storm water management.
6. Potential surface subsidence around Mine Residue Slopes. This could have a negative impact no surface rehabilitation due to the collapse of surface infrastructure (MRD) and pooling of surface water – injury to humans and/or animals.
7. Potential surface subsidence on the general environment, resulting in a negative impact on surface rehabilitation due to the collapse of surface infrastructure due to pooling of surface water – injury to humans and/or animals, damage to local infrastructure.
8. Potential dissatisfaction of communities with future land use resulting in protests and disruption of the closure process.
9. Potential unforeseen waste disposal at closure, resulting in unforeseen economic and environmental cost – changes in legislation can also contribute.
10. Potential changes in future legislation. This could include more stringent closure requirements with an unforeseen cost implication.

Table 78: Potential Extremely and Highly Intolerable Risk

Hazard	Consequence(s)	Raw Risk Rank	Residual Risk
Mine potentially not rehabilitated and closed properly.	Access and security concerns which could lead to establishment of informal settlements. Injury or fatalities dur to unauthorised and unrestricted access to mining areas not properly rehabilitated.	Extremely Intolerable	Highly Intolerable.
Mine potentially not rehabilitated and closed properly.	Occurrence of sinkhole development due to lack of rehabilitation and storm water control around Mine Residue Stockpile slopes and the Slimes Dam.	Highly Intolerable	ALARP
Potential inadequate budget to adequately rehabilitated the environment.	Not achieving the final land use plan (rating considering ongoing rehabilitation is currently undertaken).	Extremely Intolerable	ALARP
Potential negative effect of future closure on the employees and their future income.	Employees and community income source lost.	Extremely Intolerable	Maintain
Potential surface subsidence at opencast pit voids.	Negative impact on surface rehabilitation due to the collapse of Opencast Walls – impact on rehabilitation landscape and storm water management	Highly Intolerable	ALARP
Potential surface subsidence around Mine Residue Slopes	Negative impact no surface rehabilitation due to the collapse of surface infrastructure (MRD) and pooling of surface water – injury to humans and/or animals.	Highly Intolerable	Maintain

Hazard	Consequence(s)	Raw Risk Rank	Residual Risk
Potential surface subsidence on the general environment.	Negative impact on surface rehabilitation due to the collapse of surface infrastructure due to pooling of surface water – injury to humans and/or animals, damage to local infrastructure.	Highly Intolerable	ALARP
Potential dissatisfaction of communities with future land use.	Protests and disruption of the closure process	Highly Intolerable	ALARP
Potential unforeseen waste disposal at closure	Unforeseen economic and environmental cost – changes in legislation can also contribute	Highly Intolerable	Maintain
Potential changes in future legislation.	Closure requirements more stringent with an unforeseen cost implication	Highly Intolerable	Maintain

For the highest ranked events (highly intolerable and ALARP), additional "controls" should be put in place to reduce the level of risk. Deadlines for ensuring that the additional controls are put in place as well as accountabilities for doing so, should be defined.

Proposed Control Measure Identification

The control measures are presented in Part B - Table 88 and Table 89.

2.q.i.3.c Methodology

A closure cost model has been compiled using Microsoft Excel. The closure cost model consists of an input sheet, containing measurements of the infrastructure, a standard rate sheet and a summary sheet, which summarises the costs for closure. The closure cost model calculates the cost of demolishing, removing and rehabilitating each component of the mining area infrastructure.

The infrastructure areas and other areas affected by mining activities for the 2021 overall Financial Provision Assessment, were measured from plans provided by the mine, and also verified during site investigations.

Based on the approved Closure Objectives contained in the approved EMPrs, a rehabilitation costing strategy and framework was developed to ultimately compile a detailed independent rehabilitation and closure solution for the purposes of the action plan and the cost estimate.

The same table has been utilised for the preliminary development of financial provision for the Optimisation Project. The bill of quantities for this assessment was based on current design specifications available (for example the Beneficiation Plants), or where this is not available from the available site layouts.

The Master Rates utilised for this assessment is based on the 2021 costing methodology as was sources from published contractor rates where available.

The master rates used is provided in the following table:

Table 79: Itemised actions and unit rates

ITEMISED RATES FOR DECOMISSIONING AND REHABILITATION (2021) - BEESHOEK IRON ORE MINE				
Ref Nr.	Cost Item	Rate	Unit	Notes
1	**Steel Infrastructure**			
1,1	Dismantle steel structure high with heavy internal steel	R 442,51	m²	Includes all structural steel, pipes, gantries, containers requiring 100T crane (I.e. large vehicle workshops)
1,2	Dismantle low to medium height steel buildings/structures to salvage yard	R 182,57	m²	Includes all structural steel, pipes, gantries, containers requiring 25T crane
1,3	Dismantle conveyors to salvage yard	R 441,19	m	Dismantle all conveyor lines to salvage stockpile. Assume 60 days for completion.
2	**Concrete Infrastructure**			
2,1	Demolish all reinforced concrete foundations/bases/slabs/floors	R 218,27	m²	Includes cut to fill on site.
4	**Brick Structures**			
4,1	Demolish brick structure, load and spoil (on site)	R 140,18	m²	Includes pre-stripping, demolishment and spoil to site. Foundations to 1m below surface.
6	**Waste Removal/Disposal**			
6,3	Cut hazardous material to hazardous disposal site	R 1 627,11	m³	Hydrocarbon contaminated materials, asbestos, medical waste.
7	**Piping, cables & lines**			
7,1	Dismantle and remove piping on surface to stockpile	R 57,60	m	Remove piping on surface, cut to stockpile. Assume 40 days for completion.
7,2	Dismantle and remove overhead powerlines to stockpile	R 32,83	m	Remove overhead powerlines, cut to stockpile. Assume 20 days for completion.
7,4	Dismantle and remove communication lines on surface to stockpile	R 32,83	m	Remove communication lines on surface, cut to stockpile. Assume 20 days for completion.

ITEMISED RATES FOR DECOMISSIONING AND REHABILITATION (2021) - BEESHOEK IRON ORE MINE				
Ref Nr.	**Cost Item**	**Rate**	**Unit**	**Notes**
8	**Roads**			
8,1	Demolish unsurfaced gravel roads, rip and shape	R 1,98	m^2	Normal two-way access road (avg. width 8-10m).
8,2	Demolish unsurfaced haul roads, rip and shape	R 3,96	m^2	Extended width haul roads (avg. width 18-20m).
8,3	Demolish surfaced (tarred) roads, rip and shape	R 9,42	m^2	Remove tar refaced to stockpile on-site. 10km free haul limit.
9	**Fences**			
9,1	Removal of fences, cut to stockpile	R 40,32	m	Remove fences to salvage stockpile
10	**Railway Lines**			
10,2	Remove rails, sleepers and ballast	R 155,63	m	8m lengths cut to salvage yard. Cut sleepers to spoil. Cut ballast to spoil.
11	**Water Management**			
11,1	Cut casing and cap borehole	R 3 455,82	Item	Cut casing to 500mm below surface and install concrete cap & plinth
14	**Earth Works**			
14,1	Profile dumps, spoils, slopes (General Spec)	R 19,90	m^2	Assumed 2.5m deep avg. bulldozing. Rip & shape to 1:3 slopes with soil containment berms.
14,2	Backfill 1	R 26,84	m^3	Cut to fill within maximum 2km free haul distance. SG = 2.2
14,3	Backfill 2	R 22,56	m^3	Cut to fill within maximum 600m free haul.
14,4	Enviro Berm	R 354,80	m	3.5m effective height, 2.6m width, with cut-off trench in front (1.5mx1.5m).
14,5	Rip and shape remaining disturbed surfaces	R 4,03	m^2	Rip & shape generally flat surfaces which have undergone footprint disturbance. Assume 50% of area requirement.
14,6	Slope stabilisation	R 29,59	m	Stabilisation of shaped slopes with water containment berms.
19	**Environmental Management**			
19,1	Surface Water Quality Monitoring	R 750 000,00	Annum	Based on current expenditure incurred by Beeshoek for this service.
19,2	Groundwater Quality Monitoring		Annum	Based on current expenditure incurred by Beeshoek for this service.
19,3	Air Quality Monitoring (PM2.5 & PM10)	R 240 000,00	Annum	Based on current expenditure incurred by Beeshoek for this service.
19,4	Vegetation establishment & Distribution Monitoring	R 120 000,00	Annum	Based on current expenditure incurred by Beeshoek for this service.
19,5	Land Stability Monitoring	R 1 400 000,00	Annum	Based on current expenditure incurred by Beeshoek for this service.
19,5	Land Stability Monitoring	R 2 500 000,00	Item	Annual cost commitment 2021/22
19,6	Dust suppression	R 345 581,89	Annum	Water tanker for dust dispersion reduction and management
19,9	Social & Labour Plan Commitments	R 610 528,01	Annum	Annual cost post closure
19,9	Social & Labour Plan 2021/22 Commitments	R 26 000 000,00	Item	Annual cost commitment 2021/22

2.q.i.3.d Financial Provision Costing

The following table presents the preliminary financial provision which the mine should allow for:

Table 80: Draft Financial Provision Calculation (grey highlights are project application specific)

# as 2021 Financial Provision Report, Globesight	Infrastructure	Quantity	Rate	Unit	Total	Key assumptions
1	**Steel Infrastructure**					
1,2	Dismantle low to medium height steel buildings/structures to salvage yard	40892	R 182,57	m^2	R 7 465 652,44	920 tons provided by design team - assumed similar steel infrastructure quantities (m3) than current plant area for each of the plants
1,3	Dismantle conveyors to salvage yard (WHIMS)	611	R 441,19	m	R 269 567,09	290 tons structural steel; 182 tons platework provided by design team - length obtained from drawings
1,4	Dismantle conveyors to salvage yard (Jig)	940	R 441,19	m	R 414 718,60	Obtained from drawings
2	**Concrete Infrastructure**					
2,1	Demolish all reinforced concrete foundations/bases/slabs/floors	5500	R 218,27	m^2	R 1 200 485,00	Provided by design team.
2,2	Railway line bridge	3897	R 218,27	m^2	R 850 598,19	Obtained from drawings
4	**Brick Structures**					
4,1	Demolish brick structure, load and spoil (on site)	1250	R 140,18	m^2	R 175 225,00	Provided by design team (including substations, MCC, Construction offices, ablutions, hydraulic power pack room and compressor/blower house)
7	**Piping, cables & lines**					
7,1	Dismantle and remove piping on surface to stockpile	15187	R 57,60	m	R 874 771,20	Provided by design team - 10 187m plant; 5 000m overland
7,2	Dismantle and remove overhead powerlines to stockpile	3500	R 32,83	m	R 114 905,00	Provided by design team - 3 500m cable rack
8	**Roads**					
8,1	WHIMS and JIG Plant - Demolish unsurfaced haul roads, rip and shape	16800	R 3,96	m^2	R 66 528,00	Obtained from drawings
8,2	Opencast Pit Haul Roads - Demolish unsurfaced haul roads, rip and shape	240000	R 3,96	m^2	R 950 400,00	Obtained from drawings
8,3	Demolish unsurfaced gravel roads, rip and shape	22400	R 3,96	m^2	R 88 704,00	Obtained from drawings
8,4	Railway line roads (tar), rip and shape	6811	R 9,42	m^2	R 64 159,62	Obtained from drawings - assumed 7m width
8,5	Railway line roads (temporary gravel), rip and shape	10200	R 1,98	m^2	R 20 196,00	Obtained from drawings, assumed 6m width
8,6	Railway line service road	24852	R 1,98	m^2	R 49 206,96	Along railway line - assume 6m width
9	**Fences**					
9,1	Removal of fences (post closure), cut to stockpile	5600	R 37,53	m	R 210 162,57	For the railway line area - the mine has existing provision for the rehabilitation of the fences.
10	**Railway Lines**					
10,2	Remove rails, sleepers and balast	4142	R 144,86	m	R 600 018,64	Obtained from the drawings
11	**Opencast Pits and Borrow Pits**					
11,1	Village O/C Pit (enviroberm)	10406	R 354,80	m	R 3 692 048,80	
11,2	Village East O/C Pit (enviroberm)	1525	R 354,80	m	R 541 070,00	
11,3	Village South O/C Pit (enviroberm)	1216	R 354,80	m	R 431 436,80	

# as 2021 Financial Provision Report, Globesight	Infrastructure	Quantity	Rate	Unit	Total	Key assumptions
11,4	BN O/C Pit	Already included in current financial provision				
11,5	EP O/C Pit	14599	R 354,80	m	R 5 179 725,20	
11,6	BF O/C Pit	Already included in current financial provision				
11,7	Backfill of borrow pit areas (railway line) - backfill	63504	R 26,84	m3		Bridge Laydown areas (N&S) - assumed depth of 3m
14A	WRDs are included in existing Closure Cost - will be adaped in annual assessments					Financial provision is in place for the rehabilitation of all the WRDs. The project will result in the ongoing sloping (i.e. implementation of rehabilitation measres; and phased increase - these costs will be updated annually as the mining activities progresses - however at this time, financial provision is in place for the rehabilittion of these facilities)
14B	**General Surface Rehabilitation**					
14,1	Rip and Shape remaining disturbed surfaces (Plant)	56000	4,03	m²	R 225 680,00	
14,2	Rip and Shape remaining disturbed surfaces (ROM)	350000	4,03	m²	R 1 410 500,00	
14,3	Rip and Shape laydown areas (Bridge laydown area)	17808	4,03	m²	R 71 766,24	
19	**Environmental Management, including Maintenance and Aftercare**					
19,1	Surface Water Quality Monitoring	No additional provision, part of overall closure plan.				
19,2	Groundwater Quality Monitoring	No additional provision, part of overall closure plan.				
19,3	Air Quality Monitoring (PM2.5 & MP10)	No additional provision, part of overall closure plan.				
19,4	Vegetation establishment & Distribution Monitoring	No additional provision, part of overall closure plan.				
19,5	Land Stability Monitoring	No additional provision, part of overall closure plan.				
19,6	Dust suppression	No additional provision, part of overall closure plan.				
19,9	Social & Labour Plan Committments	No additional provision, part of overall closure plan.				
				Total	**R 24 967 525,34**	
Management and Administration						
Preliminary & General (6%) (6% as this is part of the overall processing activities)				0,06	R1 498 051,52	
Contingency (10%)				0,1	R2 496 752,53	
				TOTAL (Excluding VAT)	**R 28 962 329,40**	

2.q.ii Confirm that this amount can be provided for from operating expenditure.

It is confirmed that the amount for outstanding rehabilitation can be provided from operating expenditure and in the form of either a Bank Guarantee or included in the mine's current Financial Rehabilitation Fund.

2.r Deviations from the approved Scoping Report (ESR) and Plan of Study

2.r.i Deviations from the methodology used in determining the significance of potential environmental impacts and risks

The methodology to rate the impacts and risks associated with the proposed project detailed in this EIA report have not deviated from those described in the ESR.

There has also been no change to the Plan of Study, with all specialist studies and methodologies for assessment completed. In addition to the recommended Stakeholder Consultation, an additional round of meetings will be held with key stakeholder groups during the review period of the draft EIA/EMPr, with specialist (Ecological Specialist, Aquatic Specialist, Air Quality Specialist, Hydrogeological Specialist and SIA Specialist) present.

The only deviation is the change in activity description for Project 2 – opencast pits; and the Project 6 – railway line.

2.r.ii Motivation of the deviation

As a result of the outcomes of various of the specialist studies, as well as the comments received from the stakeholders the following amendments have been made to the project layout.

1. Specific Demarcation of Run of Mine (ROM) Stockpiles on South Mine:
    - No change
2. Amendments to the design of existing WRDs in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints;
    - No change
3. Increase of Opencast Pit footprint areas, as well as the undertaking of detrital mining;
    - The size of the proposed expansion of the Village Pit to the west of the current pit has been reduced to allow a buffer of at least 500m from the Kolomela Mine access road. The area previously earmarked within the 500m buffer area will currently only be considered for exploration activities. Only upon the completion of exploration further considerations on pit expansions will be given into this area.
    - The proposed Future Pit to the south of the mine has been excluded due to the presence of various cryptic wetlands and a recharge system which requires further investigation. This has now been identified as a strategic exploration area to ensure that the applicant continues with strategic drilling activities to identify the most strategic resources in consideration of the sensitive ecosystems present.
4. Beneficiation Optimisation Project (WHIMS and Jig Plants):
    - No change
5. Development of supporting infrastructure such as power lines, roads, pipelines and improvements to storm water management systems where applicable;
    - No change
6. Development of a 2.8km railway line link between the existing Beeshoek Siding and the Transnet Freight Rail (TFR) siding.
    - It is important to note that various discussions are being undertaken between Transnet and the Applicant. These discussions would define the direction the project moves in, i.e. immediate commissioning upon authorisation, potential delay in commissioning, or not commissioning the project. However, for the purposes of this EIA report, the assumption is made that this project will proceed, and for this reason should the project proceed the following is considered:
        - Construction of a northern link line to tie the Beeshoek line with the OREX line which runs from the North, from Khumani Iron Ore Mine.

- The initial plan to cross under the current R385 has been revisited by the engineering team. The crossing of the R385 will be a design of a road bridge over the proposed railway link line.
- The project will further include a new access road to the Tommy's Field Airport. This access to Tommys Field Airport will either be through level crossings over the rail line or a bridge through the formation beneath the rail line.
- Borrow pits and laydown areas will be established temporarily for the purposes of the construction phase.

2.s Other information required by the Competent Authority

2.s.i Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the

2.s.i.1 Impact on the socio-economic conditions of any directly affected person

Various potential impacts have been considered in the Social Impact Assessment which includes the following and is addressed in detail in the impact assessment (Section 2.e.iv.3.a):

- Employment;
- Population Influx;
- Traffic Movement;
- Railway Line Construction;
- Dust Generation and Health Risk;
- Noise Generation;
- Continuation of employment;
- Impact on socio-economic development;
- Impact on Sense of Plance and resource use;
- Impact on community safety and security; and
- Blasting Radius.

The outcomes of the Socio Impact Assessment concluded that, should the project not proceed, the status quo in terms of the existing social impacts in the area would remain. The Life of Mine would then not be extended and the mine would cease to operate over a shorter period of time.

The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region.

As the Beeshoek is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

The 'no-go alternative' should thus not be considered from a social point of view as the negative social impacts anticipated with the Beeshoek optimisation project are deemed low. The negative impacts would further respond to mitigation as proposed. The proposed activities further fall within the mining rights area and the area is already characterised by and surrounded by various mining infrastructure.

2.s.i.2 Impact on any National Estate referred to in Section 3(2) of the National Heritage Resources Act

All impacts on heritage conditions are assessed in the Heritage Impact Assessment (Annexure 12). Based on the available information, no unmitigated/ permanent impact on the natural estate will take place as part of this project.

2.t Other Maters required in terms of sections 24(4)(a) and (b) of the Act

Information regarding the baseline and potential impacts for this project, is based on the existing information available, discussions with stakeholders (refer to Annexure 4), specialists (refer to Annexure 6 to Annexure 14), the applicant and discussions with authorities (refer to Annexure 4). The EAP has included all identified impacts, based on the current scope of the project, in this EIA and has assigned appropriate management measures to reduce and manage each identified impact, which are included in this EMPr.

Please refer to Section 2.e.i for the discussion on alternatives. The projects presented are all located within the existing Mining Area. The activities considered in this application are linked to approved and established sites and therefore no property alternatives or location alternatives are relevant.

With regards to the selection of the Option for the railway line project, various options were considered, these related mainly to the most effective tie in, into the TFR line. No environmental constraints were identified.

Changes have been made to the planned opencast footprints to allow for further strategic exploration due to the presence of various sensitive ecological and water systems (i.e. cryptic wetlands). Large portions of the planned opencast pit footprints on the South Mine have been reduced on the South Mine to allow for more strategic exploration to ensure that opencast operations target very specific areas for future mining opportunities. This does not project that mining will not be conducted in these areas, but that further test work must be completed in order to ensure that the most suitable mine plan is developed considering environmental, economic and social considerations.

The key alternative identified for the purposes of this project is whether the project will proceed or not. This is discussed in more detail in Section 2.e.i.1.e.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

2.a Contact Person and Correspondence Address

2.a.i Details of the Environmental Assessment Practitioner (EAP)

Table 81: Details of EAP

Name	Tanja Bekker
Designation	Environmental Assessment Practitioner
Postal Address	PO Box 22014, Helderkruin, 1733
Physical Address	21 Gladiolus Street, Roodekrans, 1724
Telephone Number	+27 (0) 82 412 1799
Cell Phone Number	+27 (0) 82 412 1799
Fax Number:	+ 27 (0) 86 551 5233
Email Address	tanja@envirogistics.co.za

2.a.ii Expertise of the EAP

The following table presents a summary of the EAP's experience:

Table 82: Experience of EAP

Name	Position	Qualification	Professional Registrations	Experience
Tanja Bekker	Environmental Assessment Practitioner	M.Sc. Environmental Management (RAU; now University of Johannesburg)	Registered with the Environmental Assessment Practitioners Association of South Africa (EAPASA; Reg No. 2019/306). Professional Natural Scientist (Pr.Sci.Nat) in the field of Environmental Science with the South African Council for Natural Scientific Professions (SACNASP; Reg No. 400198/09) Member of the South African branch of the International Impact Assessment Association (IAIAsa) Member of the South African branch of the Environmental Law Association (ELA)	19 Years

The EAP's Curriculum Vitae was submitted along with the application form. This can be provided upon request should it be required as part of the ESR.

<u>Education</u>
MSc. Environmental Management - RAU (University of Johannesburg)
BSc. Geography Honours (Cum Laude) - RAU (University of Johannesburg)
BSc. Earth Sciences (Geography & Geology) – RAU (University of Johannesburg)

<u>Career Enhancing Courses</u>
ISO 14000 Lead Auditors Course (WTH Management)
Certificate in Project Management (Pretoria University)
Management Advance Programme (MAP 81) (Wits Business School)

<u>Professional Affiliations</u>
Registered member of EAPASA
Certified ISO 14001 Environmental Management System Auditor
Registered as a Professional Natural Scientist with SACNASP
Member of the South African affiliate of the IAIA
Member of the ELA of South Africa

Ms. Bekker is registered as a Professional Natural Scientist in the field of Environmental Science with SACNASP and is also a Registered EAP with EAPASA, a legal requirement stipulated by NEMA. She is further certified as an ISO 14001 Lead Auditor. Her qualifications include BSc. Earth Sciences (Geology and Geography), BSc. Hons. Geography, and MSc. Environmental Management. In addition to these tertiary qualifications, she obtained a Certificate in Project Management, and completed the Management Advancement Programme at Wits Business School.

With more than 19 years' working experience in environmental management and the consulting industry and managing various Large Account Clients, she understands the South African Regulatory System, and can advise clients with due diligence on their environmental regulatory requirements and offer a solution driven service to their project life cycle. She is equipped with exceptional project management and coordination skills, which especially enhances the service she offers clients within the environmental permitting system.

Her key focus is environmental management and compliance with extensive experience in the mining industry. Project Management and Coordination of projects form a critical component of her duties, which include project planning, initiation of projects, client, authority and stakeholder consultation, specialist coordination, budget control, process control, quality control and timeframe management. Her interest lies in a client advisory capacity, being involved during due diligence investigations, pre-project development and assisting the client and engineering team in adding value to develop the project in an environmentally sustainable manner, considering client costs and liabilities, as well as considering the implication of environmental authorisation conditions and requirements on project deliverables. Her involvement in projects has spanned over the project life cycle from Due Diligence Investigations, Pre-Feasibility Investigations, Prospecting Right Applications, Mining Right Applications, Environmental Reporting and implementation and auditing of Environmental Management Plans and Authorisations.

2.a.iii Details of the Applicant

Beeshoek is situated in the Tsantsabane Local Municipality, with neighbouring towns being Postmasburg, located 7km east of the mine and Kathu located 70km north of the mine.

Mining at Beeshoek was established in 1964 with a basic hand sorting operation. In 1975 a full Washing and Screening Plant was installed. Because of increased production, Beeshoek South, a southern extension of the Beeshoek Mine, was commissioned during 1999 on the farms Beesthoek and Olynfontein.

Assmang (Pty) Ltd is the holder of the new order rights in terms of the Mineral and Petroleum Resources Development Act, 2002 (Assmang (Pty) Ltd is the holder of the new order rights in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) in respect of high-grade hematite iron ore deposits at Beeshoek on the farms Beesthoek and Olynfontein. The mining method currently entails an opencast mining operation, which consists of five (5) active opencast pits (Village Pit, HF Pit, BF Pit, East Pit, and BN Pit). Although other opencast pits are dormant at this time, these are continuously assessed in terms of their economic value. The current resources of the Mine are approximately 97.17 million tonnes with a reserve of about 26.18 million tonnes.

Beeshoek can be broadly categorised as follows:

- Northern mining area (North Mine): This area comprises active as well as historical mining areas. A number of small quarries and mine residue dumps of various categories are located within this area. The area also includes the existing iron ore beneficiation plant, tailings storage facility (slimes dam), as well as the North Opencast Pits;
- Main Offices, village (since demolished) and recreational area; and
- Southern mining area (South Mine): This area comprises large opencast pits and associated Waste Rock Dumps (WRDs). The Village Pit and associated WRD are the main activities in this area. This area also includes a crushing and screening area as pre-preparation of the Run of Mine (ROM) iron ore before being routed by overland conveyor to the Iron Ore Beneficiation Plant located at North Mine.

Table 83: Details of Applicant

Applicant	Beeshoek Iron Ore Mine
Postal Address	Private Bag X3002 Postmasburg 8420
Technical Manager (SHERQ)	Ms. Dorianne Odendaal Tel: +27 (0) 53 311 6666 E-mail: dorianne.odendaal@assmang.co.za
Environmental Superintendent	Mr. Msimelelo Silomntu Tel: +27 (0) 53 311 6666 Cell: +27 (0) 63 520 9191 E-mail: msimelelo.silomntu@assmang.co.za
Senior General Manager	Ms. Maryke Burger Telephone No: +27 (0) 53 311 6666 Email: Maryke.Burger@assmang.co.za
Mining Rights Holder	Assmang (Pty) Ltd

	Private Bag X3002 Northlands 2116 South Africa Contact: Andre Joubert Telephone: +27 (0) 11 770 6800 Facsimile: +27 (0) 11 268 6440 Email: andre.joubert@arm.co.za
Surface Holder	Assmang Limited Private Bag X3002 Northlands 2116 South Africa
Mining Right Ref. No.	(NC) 223MRC

2.a.iv Environmental Authorisations

In terms of the Minerals Act, 1991, an Old Order Mining Right was obtained for all mining activities on the farms Olynfontein, Portion 4, and Beesthoek, Portion RE and Portion 1, under reference number NC 5/2/2/150, dated 1 December 1993.

Because of increased production, the applicant applied for an addendum, for the "Mid-South" Section on the farm Olynfontein, which was approved by the Department of Mineral Resources (DMRE; now the Department of Mineral Resources and Energy (DMRE)) on 7 November 1997, with reference number NC 6/2/2/15. Beeshoek South (South Mine), a southern extension of the Beeshoek Mine, was commissioned during 1999 on the farms Beesthoek and Olynfontein. This mining right made provision for six opencast pits at estimated iron ore reserves of 160 million tonnes for export. The mining method currently entails an opencast mining operation, which consists of five (5) active opencast pits (Village Pit, HF Pit, BF Pit, East Pit, BN Pit). The current resources of the mine are 98 million tonnes with a reserve of 46 million tonnes.

A revision to the Environmental Management Plan (EMP) was submitted to the DMRE in August 2004. The purpose of the EMP Update was:

- To enhance the format and content of the EMP in order to be better aligned it to the current standard of EMPs;
- To reflect the latest environmental related monitoring and work conducted by the mine;
- To provide better focus on closure of the mine. This specifically addresses the rehabilitation of opencast pits and mine residue dumps; and
- To outline the process to be followed to contribute to the maintenance of quality of life during the post-closure period.

The key infrastructure associated with the 2004 EMP Update was:

- Six million tonnes per year opencast mining activity, producing iron ore for the local and export markets;
- The mine comprises a number of opencast pits located within distinct northern and southern mining areas (North and South Mines);
- The northern mining area comprised primarily the historical mining activity, with, at that time, the new BN Opencast Pit; and
- The southern mining area included the new and larger opencast pits and the dominant mining was conducted within this area.

The Old Order Mining Right was converted to a New Order Mining Right on 16 March 2012 (Ref: NC30/5/1/3/2/1/223EM) and an EMP Alignment Report, 2009 was approved by the DMRE on 7 June 2010. The EMP Alignment Report made provision for the current Village Pit Mining Operation and the demolition of the Beeshoek Village.

Subsequent to the EMP Alignment, various individual Environmental Authorisations were undertaken:

2010 EMP, for the R385 Regional Road Deviation (approved 3 May 2011). The Road Deviation was required as part of the Village Pit. The road realignment (associated with the proposed mine expansion) also required that:

- Inhabitants of Beeshoek Mine Village be moved to Postmasburg;
- Several Assmang power lines not exceeding a capacity of 22 kilovolts be relocated, one of which was located along the existing R385 Road;

- The relocation of the telephone lines along the R385 Road, which impacted on the sociable weaver nesting site on a telephone pole, take place (these have been safely relocated);
- Telephone lines and optic fiber lines will have to be relocated;
- The mine offices be moved to North Mine; and
- A communication tower alongside the current road in Beeshoek be relocated.

2013 Basic Assessment Application (approved 14 March 2014): This application was for the expansion of the BF WRD (now the Village WRD).

2014 Basic Assessment Application (approved 19 June 2015): The project entailed the development of a 35m wide and 1.45km long haul road from the Beeshoek Village Pit to the ROM Stockpile. The haul road also formed part of the associated infrastructure for the Village WRD and was depicted on plans submitted with the 2013 Basic Assessment Application.

2015 Basic Assessment Application (approved 10 March 2017): The project entails the construction of the Storm Water Dam North, which has been finalised with the Storm Water Dam North now operational.

In summary of the above, the mine is currently operational with all required environmental authorisations in terms of the following in place:

- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) [also the original approval in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989) (ECA)];
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA);
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA); and
- National Water Act, 1998 (Act No. 36 of 1998) (NWA).
    - The aforementioned Act makes provision for a Water Use Licence (WUL), which was obtained during 21 August 2018 and amended on 19 November 2019 to correct certain administrative errors.

Copies of the Environmental Authorisations are available from the mine.

Table 84: List of Environmental Authorisations

#	Legislation	Licence	Reference	Date
1	Minerals Act, 1991	EMPr Addendum, for the "Mid-South" Section	NC 6/2/2/15	7 November 1997
2	Environmental Conservation Act, 1989	Section 20 Permit for Domestic Landfill Site	12/9/11	30 October 2008
3	Minerals and Petroleum Resources Development Act, 2002	EIA and EMPr Alignment Report	IVU.07.160	July 2009, Approved 7 July 2010
4	Minerals and Petroleum Resources Development Act, 2002	Old Order Mining Right was converted to a New Order Mining Right	NC30/5/1/2/3/2/1/223EM	16 March 2012
5	National Environmental Management Act, 1998	EMPr for the R385 Regional Road Deviation	17/2011	3 May 2011
6	National Environmental Management Act, 1998	BF WRD (now the Village WRD) EMPr	12/2014	14 March 2014
7	National Water Act, 1998	Water Use Licence	10/D73A/ABGJ/2592	1 December 2014
8	National Environmental Management Act, 1998	BF WRD (now the Village WRD) Haul Road EMPr	20/2015	19 June 2015
9	National Environmental Management Act, 1998	Storm Water Dam North	NC30/5/1/2/3/2/1/223EM	10 March 2017
10	National Water Act, 1998	Water Use Licence	10/D73A/ABGJ/2592	21 August 2018; amendment 19 November 2019

2.b Description of the Aspects of the Activity

The activities associated with this EMP is presented in Section 2.c of Part A of this report. The specific aspects associated with the activities are presented in Section 2.c.vii. The listed activities applicable to this report is detailed in Section 2.d of Part A of this report.

2.c Composite Map

Please refer to the following figures presenting the key features considered:

- Figure 118: Final Site Layout & Figure 110: Conceptual presentation of the zones of regulation in terms of NEMA, GN704 and GN509 of 2016 as they relate to the NWA in relation to the Cryptic Wetlands located in the north-western portion of the Beeshoek Mine;
- Figure 111: Conceptual presentation of the zones of regulation in terms of NEMA, GN704 and GN509 of 2016 as they relate to the NWA in relation to the cryptic wetlands located in the south-western portion of the Beeshoek Mine;
- Figure 112: Conceptual presentation of the zones of regulation in terms of NEMA and GN704 as it relates to the NWA in relation to the cryptic wetlands and episodic drainage line located in the south-eastern portion of the Beeshoek Mine;
- Figure 113: Conceptual presentation of the zones of regulation in terms of GN509 of 2016 as it relates to the NWA in relation to the Cryptic Wetlands and episodic drainage line located in the south eastern portion of the Beeshoek Mine;
- Figure 114:: Conceptual presentation of the zones of regulation in terms of NEMA, GN509 of 2016 and GN704 as it relates to the NWA in relation to the cryptic wetlands located in the central portion of the Beeshoek Mine.;
- Figure 115: Conceptual presentation of the zones of regulation in terms of NEMA, GN509 of 2016 and GN704 as it relates to the NWA in relation to the cryptic wetlands located in the south-western portion of the Beeshoek Mine.;
- Figure 116: Conceptual presentation of the zones of regulation in terms of NEMA and GN704 as it relates to the NWA in relation to the Cryptic Wetlands and episodic drainage line located in the south-eastern portion of the Beeshoek Mine;
- Figure 117: Conceptual presentation of the zones of regulation in terms of GN509 of 2016 as it relates to the NWA in relation to the cryptic wetlands and episodic drainage line located in the south-eastern portion of the Beeshoek Mine.;
- Figure 118: Final Site Layout

2.d Description of Impact Management Objectives including management statement

2.d.i Determination of closure objectives

The proposed final land use would be to return the area to wilderness area as committed to in the various EMPr's preceding this application. The 2009 EMPr as approved states: "The post-operational land use is aimed at returning the entire Beeshoek footprint area to wilderness at 60% pre-mining capability". This would include demolishing surface infrastructure that will not be handed over to a third party and promoting indigenous plant growth through either achieving self-succession, or where this is not possible, reintroduce species through a seeding programme. It is evident that the re-establishment of this vegetation biome on site will not be difficult as areas that have already undergone rehabilitation have seen a large success in terms of the revegetation. The key in this area will be the management of Alien Invasive Species.

The Tsantsabane Local municipal area falls in the Gamagara Corridor. The Northern Cape Province Spatial Development Plan (NCPSDF (2012: 68)) defines the Gamagara Corridor as comprising the mining belt of the John Taolo Gaetsewe and ZF Mgcawu districts and runs from Lime Acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese. Economically, Tsantsabane Local Municipality is known for being rich in minerals, and for its mining, agriculture, manufacturing and farming sectors. The municipality has become one of the leading investment areas in the Northern Cape. Agriculture, mining, and tourism form the key economic drivers in this area. The spatial vision of the ZF Mgcawu District Municipality thus include:

- Tourism: Cultural, wilderness, floristic, river tourism ranging from the Kgalagadi international trans frontier park to the culture of the Riemvasmaak community to river tourism on the Orange River;
- Mining and mining beneficiation;
- Agriculture: riverbank vineyards and expansive stock and game farming in the Kalahari; and
- Renewable energy technology opportunities.

Wilderness setting, or the continuation of exploration to further develop opencast resources with in the approved Mining Rights Area falls within the spatial vision of the District Municipality.

It should be noted that the closure plan for the proposed projects will be revised as the implementation of the project progresses; this will ensure that the mine operation take advances in technology and rehabilitation methods into consideration.

The specific closure objectives for the mine are:

- To operate within the enviro-legal ambits of South Africa;
- To be aware of the latest environmental legal requirements;
- To prevent the sterilisation of any future potential ore reserves;
- Limit the impact of the activities on the Ecological Setting of the area;
- Understand the water resource setting in which the mining operations are taking place, by undertaking ongoing research and improvement activities;
- Operate the water management circuit on site to increase mining efficiency and reduce the need for maintenance of these facilities;
- Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation;
- Protect the soil resources within the area in which the mine operates;
- Remain within the designated area demarcated for activities;
- Remain within the National Environmental Management: Air Quality Act (Act No. 9 of 2004) (NEM:AQA) Dust Regulation guidelines for rural communities;
- Protect heritage resources for future generations;
- Protect Fauna and Flora, specifically SCC species;
- Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations;
- Follow the waste hierarchy approach;
- Protect the integrity of the Storm Water Management System;
- Restore the area to its intended final land use; and
- This ensure that the surface rights belonging to third parties (exploration area) is returned to its pre-exploration environmental conditions.

The key aim of decommissioning and closure is to ensure that all the significant impacts are ameliorated. Please also refer to Table 89 which provides the summary of the relevant closure actions.

All objectives are also presented in Section 2.j of Part A of this report and Table 85 to Table 88 of Part B of this report.

2.d.ii The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity

Please refer to Table 71 to Table 74 of Part A of this report for a detailed list of all impacts and management measures. Table 85 to Table 88 of Part B provides the specific action plans, responsibilities and timeframes. The following section describes general rehabilitation strategies to assist with site wide rehabilitation.

Table 89 which provides the summary of the relevant closure actions which is recommended in for the mine.

Section 2.h of Part B of this report provides the detailed monitoring programme recommended for the mine throughout the various phases of operation.

2.d.iii Potential risk of Acid Mine Drainage

The project has no risk of Acid Mine Drainage (please refer to Annexure 10).

2.d.iv Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

Please refer to the section above.

2.d.v Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

Please refer to the sections above. Based on the specialist studies there are no acid mine drainage expected from activities taking place on site.

2.d.vi Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

Please refer to the sections above. Based on the specialist studies there are no acid mine drainage expected from activities taking place on site.

2.d.vii Volumes and rate of water use required for the mining, trenching or bulk sampling operation.

No additional water requirements are associated with this Environmental Authorisation.

The project allows for the storage and distribution of water within the mine area to protect water losses and improve storage capacity. The intent of this project is not to increase water abstraction from the groundwater resources, but to rather improve water management on site. This is specifically relating to utilising available water allocations and agreements. In terms of the WUL, 2018, the Mine has a total of 5 655 371m^3/a approved as Section 21(a) – groundwater abstraction and use. This will be reduced in the amended Water Use Licence Application (WULA), 2021 to 5 652 724m^3/a. A large portion (70%) of this allocation is to allow dewatering for safe mining practices. Due to the reduction in groundwater levels to south of the mine, dewatering volumes have been reduced for Village Pit. However, an increase volume has been included for the remining of the HF Pit. Note that overall water abstraction is still in line with the WUL, 2018. The Mine is dependent on water supply from external sources to ensure sustainable supply.

A bulk water supply scheme from the Vaal River to the arid areas of the Gamagara valley near Postmasburg and north thereof was implemented by the then Department of Water Affairs (DWA; now Department of Water and Sanitation (DWS)) to supply potable water to these areas and thus to enable the development of the large scale mining operations in areas such as Beeshoek, Lime Acres, Sishen, Mamatwane, Hotazel and Black Rock. Beeshoek is not currently using potable water from the Vaal Gamagara Water Supply Scheme, but rather sourced from Kolomela Mine directly. All potable water is sourced from boreholes drilled on the mine property. Beeshoek receives extraneous mine water from the Sedibeng Pipeline that originates from Kolomela Mine. This water is made available to Beeshoek according to an agreement reached with Anglo American dated 28 November 2012 in lieu of groundwater loss at Beeshoek due to the impact of dewatering at Kolomela Mine. The agreement allows the use of 320m^3/hr, of water from the pipeline which is equivalent to a maximum rate of 2,8 million m^3/a. Kolomela Mine is responsible for the cost of abstracting this water from the Sedibeng pipeline. The Sedibeng Pipeline agreement contributes 32% of the available water resources.

2.d.viii Has a water use licence has been applied for?

A Water Use Licence Application (WULA) has not yet been submitted. The pre-consultation meeting with the DWS was conducted on 12 May at the DWS offices in Kimberley.

The DWS also commented on the Environmental Scoping Report (ESR) in a letter dated 16 June 2021 (please refer to Annexure 4 for the minutes of the meetings, as well as a copy of this response letter.

A WULA will be submitted prior to the commencement of the proposed project. It is planned to submit the WULA on the EWULAAS online system, as per the DWS requirements during the submission of the final EIA report. This will allow the process to take into consideration all comments that may be provided by the DWS during the review period.

No activities will be undertaken without the necessary approvals.

The WUL will not only cater for this project, but will also replace the current 2018 WUL. For this project, the following activities may trigger water uses:

- Section 21(a) water uses – for the amendment to the location of boreholes, as well as the redistribution of dewatering or abstraction volumes in the system;

- Section 21(b) for the storage of water;
- Section 21(c)&(i) applications for activities in proximity to Cryptic Wetlands;
- Section 21(g) for the amendment to the WRD designs, construction of water containment facilities for the purposes of storing dirty water, conservancy tanks, and backfilling; and
- GN704 exemption for the location of infrastructure within the 100m buffer from watercourses, this may be for the Truck Parking, Product Stockpile and Exploration Activities;

2.d.ix *Impacts to be mitigated in their respective phases*

Please refer to Table 8**Error! Reference source not found.** for the discussion on the sizes of disturbance.

Table 85: Impacts to be mitigated in their respective phases (Planning Phase)

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
Legal Requirements (Environmental Permits)	2, 3, 4, 5	South Africa Enviro-Legal Compliance	Unlawful water and waste (mine residue) activities, which could lead to NWA Directives and Section 24G Rectification fines. Project delays due to outstanding Enviro-Legal requirements not adhered to.	-14	CbA	A legal assessment of all Water Uses must be undertaken every second year to ensure that all Water Uses are licensed.	17	To operate within the enviro-legal ambits of South Africa.	Ensure that all activities undertaken by the mine are lawful with the required environmental licences in place.	x			x	Compliance in terms of Regulatory Requirements and the implementation of the EMP.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP.	Independent ECO	Monthly for the construction phase. Thereafter biennial external audits can be undertaken.
						The mine must familiarise themselves with the NEM:WA Regulations for the management of Mine Residue Deposits. Those included in previous approved EMPs are considered lawful under the NEM:WA, however where reworking, rehabilitation, stockpiling is taking place, not included into the previous EMP, these activities are unlawful and may require a Waste Management Licence.		To ensure that the project can be implemented within the required timeframes according to the Mine Works Programme.	Ensure that all environmental authorisations on site is implemented on site and ongoing monitoring of compliance are undertaken to reach 100% compliance.	x			x	Compliance in terms of Regulatory Requirements and the implementation of the EMP.	Quarterly internal audits must be undertaken to ensure compliance with the Environmental Authorisation and EMP. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.	SHERQ Department	Quarterly
						All legally appointed personnel responsible or involved in water use activities on site must receive training on the			All Departments responsible for development of the mine, must understand the requirements	x			x	Compliance in terms of Regulatory Requirements and the implementation of the EMP.	Monthly environmental meetings must be implemented to discuss the mining plan, implementation thereof,	SHERQ, Engineering and Mining/Geology Department.	Monthly

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						requirements of the WUL and the EMPr.			of the environmental legislation and must involve this into their planning processes.						implication on current Environmental Regulations and potential constraints and liabilities. Minutes must be kept of these meetings and action plans with responsibilities must be drafted.		
						No clearance of activities may be initiated without the necessary tree removal permits.											
						A detailed ongoing rehabilitation plan must be developed for the mine. This plan must include the following: Continuous backfilling of opencast pit opportunities; Rehabilitation trials to determine the most practical and suitable manner to rehabilitate waste rock dumps, unused haul roads, historically mined areas; Offsetting and/or recreation of disturbed Cryptic Wetlands.											
						A Heritage and Paleontological Chance Finds Procedure must be available on site and provided to all contractors and parties available for site clearance.											
						Regular internal audits must be undertaken on the lawful implementation of the WUL.											
						Ensure that all parties are aware of the conditions of the Environmental											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						Authorisation and approved EMPr.											
						Agreements between the TFR and the Mine for the tie into the TFR line must be obtained prior to construction.											
						Agreements must be in place between the Mine and the roads agency prior to the construction of the rail under road system.											
						Geotechnical studies must be completed and final designs approved by the various role players (such as the mine, roads agency, TFR) prior to the construction of the railway line.											
						Water Use Licence, EMPr an all other required Environmental Permits must be available on site at all times.											
						Floral SCC recorded within the proposed mining footprint included species protected under the NFA and the NEMBA TOPS regulations, as well as species protected under Schedule 1 and 2 of the NCNCA. A walkdown of the footprint area is required before											

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						construction activities commence, where all anticipated floral SCC/protected species are searched and marked for relocation and/or destruction so that all necessary permits can be obtained from the DENC and DFFE.											
						For NFA protected tree species, attempting to relocate mature individuals are often too expensive and/or result in unsuccessful re-establishment due to unavoidable damage to their root systems during their excavation. Where possible, seedlings of affected tree species should be targeted for relocation, and seeds must be harvested prior to vegetation clearance to use in rehabilitation activities. It is important that seedlings and seeds be harvested within a close proximity of an area to be impacted, so as to prevent alteration											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						of population genetics.											
						Geophytes and succulents are good candidates for rescue and relocation, and these should be targeted for such initiatives. Where possible, propagules of such species must also be harvested and propagated in a plant nursery to use in rehabilitation activities during the closure and rehabilitation phase of the project.											
						A rescue and relocation plan must be drafted and approved by the relevant authorities for all floral SCC that will potentially be impacted by the proposed mining activities. The Rescue and Relocation Plan must be used in conjunction with an approved Rehabilitation Plan for the Beeshoek Mine to ensure successful translocation and/or reinstatement of floral SCC and habitat for such species.											

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						The legal register must be updated to indicate all updated water uses.											
Planning infrastructure placement to avoid resource sterilisation	2, 4 and 6	Geological Resources	Loss of potential iron ore resources due to the placement of infrastructure.	-13	CbA	Implementation of strategic exploration programmes and ongoing development of the Mine Works Programme.	-9	Well developed Mine Works Programme with strategic future planning.	Optimise extraction of iron ore resources in line with the Mining Works Programme, without negative impact on mine layout.	x			x	Compliance with the Mine Works Pogramme	Monthly environmental meetings must be implemented to discuss the mining plan, implementation thereof, implication on current Environmental Regulations and potential constraints and liabilities. Minutes must be kept of these meetings and action plans with responsibilities must be drafted.	SHERQ, Engineering and Mining/Geology Department.	Quarterly, throughout life of mine
															Mine planning and Engineering Department annual involvement in the development of the NEMA Financial Rehabilitation planning.	SHERQ, Engineering and Mining/Geology Department.	Annually through the life of mine
Planning infrastructure placement to avoid natural resource sterilisation	2, 3, 4, 5 and 6	Soil Resources	Soil Compaction and loss of soil resources due to potential poor planning leading to excessive or unnecessary placement of infrastructure in soils highly prone to compaction.	-13	CbA	Implementation of decisive mine layout development.	-5	Well developed Mine Works Programme with strategic future planning.	Protect soils resources as far as practically possible.	x			x	Compliance with the Mine Work Pogramme and mine layout	Monthly environmental meetings must be implemented to discuss the mining plan, implementation thereof, implication on current Environmental Regulations and potential constraints and liabilities. Minutes	SHERQ, Engineering and Mining/Geology Department.	Quarterly, throughout life of mine

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
															must be kept of these meetings and action plans with responsibilities must be drafted.		
															Mine planning and Engineering Department annual involvement in the development of the NEMA Financial Rehabilitation planning.	SHERQ, Engineering and Mining/Geology Department.	Annually through the life of mine
Planning towards construction of the railway line	6	Legal Compliance, Project Planning timeframes	Project delays due to outstanding Enviro-Legal requirements not adhered to	-14	CbA	No clearance of activities may be initiated without the necessary tree removal permits.	17	To ensure that the project can be implemented within the required timeframes according to the Mine Works Programme.	Ensure that all activities undertaken by the mine are lawful with the required environmental licences in place.	x				Compliance in terms of Regulatory Requirements and the implementation of the EMP.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP.	Independent ECO	Monthly for the construction phase. Thereafter biennial external audits can be undertaken.
						A Heritage and Paleontological Chance Finds Procedure must be available on site and provided to all contractors and parties available for site clearance.			All Departments responsible for development of the mine, must understand the requirements of the environmental legislation and must involve this into their planning processes.	x				Compliance in terms of Regulatory Requirements and the implementation of the EMP.	Monthly environmental meetings must be implemented to discuss the mining plan, implementation thereof, implication on current Environmental Regulations and potential constraints and liabilities. Minutes must be kept of these meetings and action plans with responsibilities must be drafted.	SHERQ, Engineering and Mining/Geology Department.	Monthly
						The necessary traffic management plan must be developed and approval must be obtained from relevant Authorities, as well as the Airport's authority prior to the commencement of construction.											
						Agreements between the TFR and the Mine for		To ensure that agreement	Optimise and utilise the available	x				Successful implementation	Sign off of agreements and the	SHERQ	Monthly

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						the tie into the TFR line must be obtained prior to construction.		between the mine and the TFR can be adhered to.	allocation for the export and supply of iron ore resources.					of the railway line link.	implementation of this, through regular monitoring.		
						Agreements must be in place between the Mine and the roads agency prior to the construction of the rail under road system.											
						Geotechnical studies must be completed and final designs approved by the various role players (such as the mine, roads agency, TFR) prior to the construction of the railway line.											
Relocation of Mine owned and State (Eskom) Owned (where possible) Powerline	6	Socio-Economic	The relocation of the powerlines (applicant owned and/or Eskom owned) could temporarily disrupt Economic Activities in the area which the powerline supplies.	-12	CBA	The mine should obtain approval from the relevant parties regarding the relocation of the powerlines should this be required.	-5	Maintain good relationship with surrounding mines.	Approved operating procedures, safety files and communication structure and compliance thereto.	x	x			Continuation of economic activities. Compliance with Health and Safety Requirements. Compliance with Environmental Authorisations.	Initiate discussions with Eskom regarding the procedures for the relocation process.	Engineering Manager.	Immediately
															Initiate discussions with the impacted parties.	Engineering Manager.	Immediately
						The mine should enter into discussions with affected parties to develop an operating procedure and timeline for the removal of the powerlines.		No impact on economic activities in the area.	Good relationship with surrounding landowners.						Monitor the implementation of the Operating procedure during the relocation of the powerline (powerline relocation will be undertaken under Eskom environmental procedures).	Environmental Department.	During planning phase
						The powerlines may not be removed without the required approvals by the relevant authorities (if applicable).											During planning phase

Table 86: Impacts to be mitigated in their respective phases (Construction Phase)

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
Land and Footprint Clearance	2, 3, 4, 5 and 6	Geology	No additional impacts from planning phase.	-	-		-	-	-	-	-	-	-	-	-	-	-
Topsoil Stripping and Stockpiling and Vegetation Removal	1, 2, 3, 4, 5 and 6	Topography	Direct impact: Alteration of topography. Removal of vegetation and the associated shaping of the area will lead to change in topographical characteristics of the area. The impact is not considered significant due to the fairly flat nature of the topography and the location of the activities in the immediate vicinity of the existing plant area.	-9	R	The footprint areas of all surface infrastructure must remain as small as possible within the parameters of operational and engineering requirements. Construction areas must be clearly demarcated to control movement of personnel and vehicles, providing clear boundaries for construction sites in order to limit the spread of impacts. Markers and pegs will be erected and maintained along the boundaries of the working areas, access roads, haul roads and paths before commencing any work. If proved insufficient for control, these shall be replaced by fencing. Designs of the facilities (Soil Stockpiles, Dirty water infrastructure and landscaping) must be undertaken by a registered Engineer.	-5	Remain within demarcated areas. Design facilities to blend into the existing site character as far as practically possible.	No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas.	x				Soil Erosion and Loss of planning opportunities with closure in mind.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						Draw up a procedure clearly reflecting the method and phases of clearance of vegetation only in areas where construction will take place. Removal of vegetation must be undertaken in a phased approach to limit surface exposure. Temporary erosion control measures may be used to protect the disturbed soils during the construction phase until adequate vegetation has established. Clean and dirty water separation must be implemented early in the construction phase, especially down-gradient of construction areas to ensure that the natural runoff patterns are impacted as little as possible. Clearance and activities around identified pan areas must be limited and must be approved in terms of a WUL. Linear infrastructure											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						must follow as far as practically possible the natural contours of the area.											
	2, 3, 4, 5 & 6	Soil, Land Use and Land Capability	Direct impact: The removal and stockpiling of “topsoil” (a mixture of soil and small rock material)may lead to a loss of soil resource and land capability through erosion of the stockpiles and chemical and physical degradation. This impact is considered important due to the fact that the mine may be operating on a negative topsoil balance and therefore the retaining of suitable topsoil is important for successful rehabilitation.	-13	R	Excavation and long-term stockpiling of soil should be limited within the demarcated areas Ensure all stockpiles (place for future rehabilitation) are clearly and permanently demarcated and located in defined no-go areas Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the ‘cut and cover’ technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used Use of heavy machinery such as bulldozers should be avoided as far as possible. Soil stripping should be done in conjunction with a soil specialist and	-5	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation. No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas.	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept. Induction should be reviewed and updated biannually.	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring. Induction Updates: Every 18 months

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						careful consultation of the pre-mining soil survey is essential. This will ensure optimal soil availability and avoid excessive mixing of soil due to over-stripping, as well as loss of available cover soil due to under-stripping. Such consultation is recommended for the whole soil handling process, from stripping through stockpiling to final rehabilitation.											
						Separate stockpiling of different soil to obtain the highest post-mining land capability.											
						According to the Soils 2001 Layer the focus area is largely situated within an area where the soils are classified as red-yellow apedal freely drained soils with a high base status and less than 300mm depth, for this reason in general 300mm of soils should be removed. However, for deep soils such Vaalbos and Nkonkoni, separate stripping, stockpiling and											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						replacing of soil horizons [A (0-30 cm) and B (30-60 cm)] in the original natural sequence to combat hard setting and compaction, and maintain soil fertility											
						Stockpile height should be restricted to that which can deposited without equipment being located on the stockpile.											
						The stockpile should be treated with temporary soil stabilisation methods such as the application of organic matter to promote soil aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion											
						Soil erosion should be controlled on stockpiles by having control measures to reduce erosion risk such as erosion control blankets, soil binders, revegetation, contours, diversion banks and spillways											
						Stockpiled soils should be stored for a maximum of 5 years. Concurrent											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						rehabilitation should strongly be considered to reduce the duration of stockpile storage to ensure that the quality of stored soil material does not deteriorate excessively; especially with regard to leaching and acidification											
						The topsoil stockpile should be vegetated, or sufficient erosion control measures should be implemented to contain erosion of the stockpile during rain events. Temporary berms can be installed, around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion											
						Stockpiles should be managed to encourage self-succession of vegetation as an erosion control measure.											
						These stockpiles should also be kept alien vegetation free at all times to prevent loss of soil quality											
						During ongoing rehabilitation activities replace											

Name of Activity	**Project**	**Impact Area**	**Potential Impacts**	**Rating**		**Mitigation Type**	**Rating**	**Objectives**	**Goals**	**Timeframes**				**Monitoring Requirements**			
Activities			**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**			**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						soil to appropriate soil depths in the correct order, and cover areas to achieve an appropriate topographic aspect and attitude so as to achieve a free draining landscape that is as close as possible the pre-mining land capability rating as possible											
	2, 3, 4, 5 and 6		Soil compaction due to the potential movement of construction equipment/machinery, and the unnecessary placement of construction material in soils which are prone to compaction. Heavy equipment traffic during construction activities is anticipated to cause significant soil compaction. The severity of this impact is anticipated to be moderate for soils such as the Vaalbos/Nkonkoni soil due to loamy sand texture. Whereas soils with a relatively shallow bedrock and lithocutanic character (partly weathered rock material) such as	-11	R	The contractor will ensure that all activities, material and equipment storage and personnel movement take place within the designated area. As far as possible construction areas should be accessed through the existing road network. A site plan must be developed, indicating the following: Location of all approved activities; Buffers around pans; 1:100 year buffer around all watercourses, where applicable; Location of the buffer zones and other no-go zone's. Laydown areas should be located	-5										

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			the Coega/Knersvlakte and Glenrosa/Mispah soil forms are anticipated to be less impaired due to the resistance offered by the underlying bedrock. Soil compaction will potentially lead to: ➢ Increased bulk density and soil strength, reduced aeration and lower infiltration rate; ➢ Consequently, it lowers crop performance via stunted aboveground growth coupled with reduced root growth; ➢ Destroyed soil structure, leading to large with fewer natural voids with a high possibility of soil crusting. This situation may lead to stunted, drought-stressed plants due restricted water and nutrient uptake, which results in reduced crop yields; and ➢ Soil biodiversity is also influenced by reduced soil aeration. Severe soil compaction may cause reduced microbial biomass. Soil compaction may not influence the quantity, but the distribution of			within disturbed soils or where projects are demarcated to avoid compaction of natural soils. All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence heritage artefacts and the meeting of management measures. A system must be implemented on site to address all significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation. As part of ongoing rehabilitation, compacted soils adjacent to the mining and associated infrastructure footprint should be lightly ripped to											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			macro fauna that is vital for soil structure including earthworms due to reduction in large pores.			at least 25 cm below ground surface to alleviate compaction prior to re-vegetation											
	2, 3, 4, 5 & 6		Soil Erosion Shallow, and sandy textured soils have a low water retention capacity and are typically more susceptible to erosion in comparison to clay textured soils, which in contrast are less susceptible to erosion. However, the parameters determining the extent and severity of soil erosion are highly complex, with water and wind as the main geomorphic agents, and soil erosion is largely dependent on land use and soil management and is generally accelerated by human activities such as tillage practices. Most of the proposed activities are located on a relatively flat and gently sloping terrain, consisting of rocky Coega/Knersvlakte and Mispah/Glenrosa soils with very shallow to no soils. The identified soils	-11	R	Ensure that all design drawings include effective erosion control measures. Ensure the required erosion protection measures are monitored and corrected where necessary. Ensure the required erosion protection measures are monitored and corrected where necessary. Clearing of vegetation should take place in a phased manner as to keep bare soil areas as small as possible to limit the erosion potential. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, trails must be initiated to	-5	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation .	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent Environmental Control Officer (ECO) to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. This will most likely lead to: ➢ Loss of soil; ➢ Reduced soil fertility status of soils and subsequently loss of valuable arable land; and ➢ Possible pollution and sedimentation of nearby watercourses consequently affecting the water quality for livestock. The significance of this impact the various projects is presented in the tables below. The impacts can be reduced if mitigation measure outlined in this document are adhered to, as illustrated on the impact rating table below.			determine the best rehabilitation procedure for the establishment of vegetation on these disturbed areas.											
						The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites.											
						If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low.											
						The footprint of the proposed opencast pits, WRD expansions and infrastructure areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible.											
						No construction or project related activities may be undertaken			Maintaining soil integrity,	x			x	Soil Erosion and incorrect	Appointment of an Independent		ECO: Monthly for the

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						outside of the demarcated areas.		Retaining soil integrity for rehabilitation.	with successful vegetation establishment.					stockpiling of topsoil.	ECO to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHERQ Department.	construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring
	2, 3, 4, 5 & 6		Soil Contamination due to potential leakages in construction equipment/machinery leading to contamination. All the identified soils are considered equally predisposed to potential contamination, as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The impact significance of soil contamination is largely dependent on the nature, volume and/or concentration of the contaminant of concern. If the management protocols are not	-11	R	Regular monitoring of site activities and machinery must be undertaken to identify spills or leaks Spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans must be developed and be implemented Withdraw equipment for maintenance if change in emission characteristics is noticeable Spill kits (such as spill-sorb or a similar type of product) must be kept on site and used to clean up hydrocarbon spills in the event that they should occur Burying of any waste including	-5	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation.	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			well managed this will more likely lead to: ➢ Contaminants leaching into the soil and thus potentially rendering the soil sterile. reducing the yield potential of soils; and ➢ Potential reduction of water quality used for irrigation and for livestock use.			rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site											
								Retaining soil integrity for rehabilitation.	Maintaining soil integrity, with successful vegetation establishmen t.	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent ECO to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring
	2, 3, 4, 5 & 6		Loss of Agricultural Land Capability due to site clearing, the removal of vegetation, and associated disturbances to soils, as well as the potential indiscriminate disposal of hazardous and non-hazardous waste material spills and disposal. The proposed expansion projects will impact the soil resources in varying	-12	R	No construction or project related activities may be undertaken outside of the demarcated areas. Clean and dirty water systems must be established prior to construction. Due to the extent of the proposed expansion projects, mining (i.e., opencast pits excavation) should done in a phased	-5	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation .	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent ECO to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring

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Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			severities, with project 3 posing the highest impact significance due to its extent in size as well as the encroachment on high agricultural potential soils. Project 2 is anticipated to have the second highest impact while the remaining projects are anticipated to a limited impact since majority of the development will occur on previously disturbed soils. Although there is occurrence of arable soils, low crop yields are foreseen for this area due to climatic constraints (i.e., limited rainfall) and lack of irrigation options. Nevertheless, protection of high agricultural resources (where feasible) is deemed imperative in efforts to conserve the limited agricultural resources in line with the CARA.			manner and concurrent rehabilitation should occur as far as practically possible. This will allow the post closure land uses to potentially commence on the rehabilitated portions.									be implemented and monitored on areas identified. Photographic records of assessments must be kept.		
						Direct surface disturbance of the identified arable soils can be avoided where possible to minimise loss of arable soils.		Retaining soil integrity for rehabilitation.	Maintaining soil integrity, with successful vegetation establishmen t.	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent ECO to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring
	6		Loss of Agricultural Land Capability (Exploration Activities specifically) The majority of the soils that will be subjected to exploration activities are	-11	R	No construction or project related activities may be undertaken outside of the demarcated areas. Clean and dirty water systems must be established prior to construction.	-5	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation .	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent ECO to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			shallow (i.e., Coega/Knersvlakte. Mispah/Glenrosa) and not suitable for cultivation. Even though grazing can still occur in the soils, the grazing capacity is low (14ha/LSU) and as such it is not considered sufficient for viable commercial farming unless intensive management practices are implemented. From a soil, land use and land capability point of view, the overall impact significance of the proposed exploration activities is anticipated to be low after mitigation measures have been implemented during all phases of development.			Due to the extent of the proposed expansion projects, mining (i.e., opencast pits excavation) should done in a phased manner and concurrent rehabilitation should occur as far as practically possible. This will allow the post closure land uses to potentially commence on the rehabilitated portions.		rehabilitation. Protect the soil resources within the area in which the mine operates.							whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.		
						Direct surface disturbance of the identified arable soils can be avoided where possible to minimise loss of arable soils		Retaining soil integrity for rehabilitation.	Maintaining soil integrity, with successful vegetation establishment.	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent ECO to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring
		Flora Habitat	Loss of Habitat and Ecosystem Characteristics	-8	CbA	Adhere to the measures presented under soil impacts.	-5	Limit the impact of the mining operation on	No unlawful removal of flora of conservation	x			x	Limit the impact of the construction on the Ecological	Appointment of an Independent ECO to assess compliance with	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase.

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Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			Specialist impact rating: Calcrete Shrubland (low significance impact) Open Thornveld (low significance impact) Rupicolous Habitat (low significance impact) Transformed Habitat (very low significance impact)			Adhere to the measures presented under hydrological impacts (especially by implementing storm water management measures). Adhere to the management measures presented for air quality management. The construction camp and laydown areas must be included in the final layout plan and placed outside of sensitive habitat as identified in the biodiversity assessments Vegetation clearance and commencement of construction activities should either be scheduled to coincide with low rainfall conditions when erosive stormwater is anticipated to be limited or alternatively stormwater controls must be established at the start of construction and dust suppression implemented. As far as construction areas should be accessed through		the Ecological Setting of the area.	importance should take place. Initiate rehabilitation of disturbed areas once the construction phase has been completed. Successful self succession to be achieved. Eradication of invasive species within the mining area footprint.					Setting of the area.	the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Develop a site layout indicating all No-Go Zones (in terms of the aquatic assessment, ecological assessment, wetland assessment and hydrological assessment). Environmental Awareness training must be provided to employees. A suitable floral rescue and relocation plan should be developed and overseen by a suitably qualified specialist or nominated mine personnel in order to ensure that species loss during construction activities is kept to a minimum		Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring Map development: Immediately. Training; Annually Floral Rescue and Relocation Plan: Planning Phase

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						the existing road network											
						Minimise loss of indigenous vegetation where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as other specialist studies. Therefore, during the surveying and site-pegging phase of the proposed mining activities, all floral SCC that will be affected must be marked and where possible, relocated to suitable habitat surrounding the disturbance footprint. The relevant permits must be applied for within the relevant province as indicated in the baseline floral assessment, prior to the construction phase											
						Clearing of vegetation should take place in a phased manner as to keep bare soil areas as small as possible to limit the erosion potential.											
	1, 2					It must be ensured that, as far as possible, all proposed											

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						infrastructure, including temporary infrastructure, is placed outside of sensitive habitat units											
						Should any protected floral species be encountered within the proposed development footprint areas, permits should be obtained from NCDENC and DAFF to remove, cut or destroy any protected tree species before construction of infrastructure takes place											
						Access roads should be kept to existing roads, as far as possible, so as to reduce fragmentation of natural habitat outside of the authorised footprint											
						Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site											
						No dumping of litter, rubble or cleared vegetation on site should be allowed. Infrastructure and											

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						rubble removed because of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility.											
						If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be											

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Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						practised, preventing the ingress of hydrocarbons into the topsoil.											
						Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation: Removal of Alien Invasive Plant (AIP) species should preferably commence during the pre-construction phase and continue throughout the construction and operational phases. AIPs should be cleared within the focus area before any vegetation clearing activities commence, thereby ensuring that no AIP propagules are spread with construction rubble, or soils contaminated with AIP seeds during the construction phase; and An AIP Management/Control Plan should be implemented by a qualified professional. No uncertified chemical control of AIPs to occur											

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Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						within the watercourses. Ongoing alien and invasive plant monitoring and clearing/control should take place throughout all phases of the project activities and within a 20m buffer of all activities. The project perimeters should regularly be checked for AIP proliferation to prevent spread into surrounding natural areas; and Management of AIPs during the construction-phase and operational-phase activities must be focused on limiting their introduction and preventing their spread. For example, roadsides should be monitored, as they serve as common corridors along which AIP species are introduced and dispersed, and disturbed areas should regularly be monitored for AIP recruitment until successfully rehabilitated											
	3		Loss of Habitat and Ecosystem Characteristics Specialist impact	-10		A fine system/disciplinary system must be implemented on site for all	-5										

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			rating: Natural Habitat (Calcrete Shrubland, Open Thornveld, Rupicolous Habitat) (medium-low significance) Watercourse Habitat (Cryptic Wetlands) (medium-low significance) Non-watercourse Habitat (Preferential flow paths, recharge zone and Seasonal Depressions) (low significance) Modified Habitat (Transformed Areas and Degraded Thornveld) (very low significance)			significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation.											
	4&5		Loss of Habitat and Ecosystem Characteristics Specialist impact rating: Natural Habitat (Calcrete Shrubland, Rupicolous Habitat) (low significance) Non-watercourse Habitat (Preferential flow paths, recharge zone and Seasonal Depressions) (low significance) Modified Habitat (Transformed Areas and Degraded Thornveld) (very low significance)	-8		Any department wishes to clear new areas or construction new infrastructure should supply new endemic tree species or plants to the Environmental Department to be planted in areas earmarked for rehabilitation. In terms of ongoing rehabilitation: Rehabilitation of natural vegetation should proceed in accordance with the rehabilitation plan – concurrent rehabilitation is recommended. This rehabilitation plan should consider all phases	-5										

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						of the project indicating rehabilitation actions to be undertaken during and once construction has been completed, ongoing rehabilitation during the operational phase of the project as well as rehabilitation actions to be undertaken after operations have ceased. Appropriate shaping of disturbed areas is essential. To promote successful establishment of vegetation, the slopes must not be steeper than 1(V):5(H) or 1(V):3(H) (depending on engineering input and recommendations) . New slopes should resemble/mimic the natural topography of the surrounding area. Where slopes are left steeper than what is recommended for whatever reason, additional measures will be required to prevent soil											

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						erosion and to appropriately manage stormwater; Any natural areas beyond the direct footprint, which have been affected by the construction or operational activities, must be rehabilitated using indigenous species; Floral monitoring should be done annually during operational activities. Please also refer to the monitoring guidelines in section 5.5; Rehabilitation must be implemented concurrently as per the rehabilitation plan, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and costs associated with it; and All soils compacted because of construction activities falling outside of the											

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						project area should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas.											
						No illicit fires must be allowed during the operational phases of the proposed Borrow Pit project											
						Fire breaks should be maintained during the construction and operational phases											
						An effective dust management plan must be designed and implemented to mitigate the impact of dust on flora throughout the construction phase											
						Dust pollution have been associated with poor photosynthetic functionality in plants5. There is evidence of dust pollution leading to a reduction in chlorophyll, including chlorophyll degradation and reduced photosynthetic activity6 7, resulting from dust deposition on leaf surfaces. Dust deposition also result in stomata											

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						clogging, which causes a decreased rate of carbon dioxide exchange, carbon assimilation, transpiration, and therefore decreased net photosynthesis.											
	6		Loss of Habitat and Ecosystem Characteristics Specialist impact rating: Calcrete Shrubland (low significance impact) Open Thornveld (low significance impact) Rupicolous Habitat (low significance impact) Transformed Habitat (very low significance impact)	-8		To limit edge effect impacts to the surrounding natural habitat, the below guidelines must be followed: • Demarcating all footprint areas during construction activities; • No construction rubble to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility; • All soils compacted as a result of construction activities should be ripped, profiled and reseeded; • Suppress dust to mitigate the impact of dust on flora within a close proximity of construction activities; • Minimise the risk of erosion by limiting the extent of disturbed vegetation and	-5										

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						exposed soil; and • Manage the spread of AIP species and bush encroachers, which may affect remaining natural habitat within surrounding areas.											
	1, 2	Flora SCC	Loss of Species of Conservation Concern Specialist impact rating: Calcrete Shrubland (Boscia albitrunca and Vachellia erioloba) (medium-low significance impact) Open Thornveld (Boophone disticha, Boscia albitrunca, Orbea sp., Vachellia erioloba, Potentially Euphorbia cf. duseimata and Harpagophytum procumbens) (medium-low significance impact) Rupicolous Habitat (Potentially Boscia albitrunca) (low significance impact) Transformed Habitat (very low significance impact)	-8	CbA	A list and photographic illustration of all identified and probable SCCs should be visually placed on site. The rescue and relocation plan must be implemented on site. The disturbance footprint must be kept as small as possible in order to minimise impact on the surrounding environment (edge effect management) All areas of increased ecological sensitivity beyond the approved footprint must be designated as No-Go areas and be off-limits to all unauthorised construction vehicles and personnel. Removal of vegetation must be restricted to what is absolutely necessary and should remain	-5	Limit the impact of the mining operation on the Ecological Setting of the area.	No unlawful removal of flora of conservation importance should take place. Initiate rehabilitation of disturbed areas once the construction phase has been completed. Successful self succession to be achieved. Eradication of invasive species within the mining area footprint.	x			x	Limit the impact of the construction on the Ecological Setting of the area.	Appointment of an Independent ECO to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Develop a site layout indicating all No-Go Zones (in terms of the aquatic assessment, ecological assessment, wetland assessment and hydrological assessment). Environmental Awareness training must be provided to employees. A suitable flora and fauna rescue and relocation	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring Map development: Immediately. Training; Annually Floral Rescue and Relocation Plan: Planning Phase

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						within the approved footprint.									plan should be developed and overseen by a suitably qualified specialist or nominated mine personnel in order to ensure that species loss during construction activities is kept to a minimum		
						No additional habitat is to be disturbed during the operational phase of the project outside of the demarcated approved footprints (being applied for). Biweekly (recommended) to monthly (minimum requirement) monitoring and recording of the footprint areas must be done by the ECO and photographic records kept – special attention should also be paid to potential increase and spread of alien vegetation and bush encroachment.											
						Prior to the removal of plant species, the mine should appoint an ecologist to monitor and oversee the removal of all identified protected species, which should be removed under tree removal permits. All such species should be											

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						demarcated by signage or tape.											
						Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal											
						No collection of indigenous floral species must be allowed by construction personnel, especially with regard to floral SCC.											
						No dumping of litter, rubble or cleared vegetation on site must be allowed. Infrastructure and rubble removed as a result of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. Waste disposal											

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						containers and bins should be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility.											
						any spills occur, they should be cleaned up immediately to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil.											
						Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area.											

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles.											
						If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.											
						A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation.											
						A fine system/disciplinary system must be implemented on site for all											

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation.											
	3		Loss of Species of Conservation Concern Specialist impact rating: Calcrete Shrubland (Boscia albitrunca, Olea europaea subsp. africana, Ruschia calcarea, Vachellia erioloba) (Medium-high significance impact) Open Thornveld (Boophone disticha, Boscia albitrunca, Oxalis sp., Vachellia erioloba (potentially Orbea and Euphorbea species) (Medium-high significance impact) Rupicolous Habitat (Anacampseros filamentosa, Aloe hereroense, Aizoaceae, Ammocharis cf. coranica, Boscia albitrunca, Babiana bainesii, Euphorbia cf. rhombifolia, Gladiolus permeabilis subsp. edulis, Nymania capensis, Olea	-12		Any department wishes to clear new areas or construction new infrastructure should supply new endemic tree species or plants to the Environmental Department to be planted in areas earmarked for rehabilitation.	-6										

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			europaea subsp. africana, Vachellia erioloba) (medium-high significance) Watercourse Habitat (Cryptic Wetlands) (Nerine laticoma, Vachellia erioloba, Olea europaea subsp. africana) (medium-high significance) Non-watercourse Habitat (Preferential flow paths, recharge zone and Seasonal Depressions) (Vachellia erioloba and Nerine sp.))(medium-low significance) Modified Habitat (Transformed Areas and Degraded Thornveld) Vachellia erioloba and Aloe grandicornuta (medium-low significance)														
	4&5		Loss of Species of Conservation Concern Specialist impact rating: Calcrete Shrubland (Aizoaceae, Boscia albitrunca, Vachellia erioloba) (low significance) Rupicolous Habitat) (Boscia albitrunca) (low significance) Non-watercourse Habitat (Preferential flow paths, recharge zone and Seasonal Depressions) (low significance) Modified Habitat	-8		Monitoring of any rescued and relocated floral SCC should commence during the construction phase and continue unit it is evident that relocated species have successfully established.	-5										

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			(Transformed Areas and Degraded Thornveld) (low significance)														
	6		Loss of Habitat and Ecosystem Characteristics Specialist impact rating: Calcrete Shrubland (low significance impact) Open Thornveld (low significance impact) Rupicolous Habitat (low significance impact) Transformed Habitat (very low significance impact)	-8		Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed development footprint area.	-5										
	1, 2	Fauna Habitat	Loss of Habitat for Faunal Species Specialist impact rating: Calcrete Shrubland and Open Thornveld Habitats (medium-high significance) Transformed Habitat (low significance) Rupicolous Habitat (medium-high)	-12		Prior to vegetation clearing activities in the natural vegetation units the site should be inspected for the presence of mammal and scorpion burrows, reptiles and baboon spiders. If located, these species should be carefully flushed out or excavated ensuring no harm to the specimens, and relocated to similar surrounding habitat outside of the disturbance footprint area. Clearing of vegetation should take place in a phased manner. This will allow for	-7										

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						faunal species within the Railway Line Link Project to flee and avoid h A suitable rescue and relocation plan should be developed and overseen by a suitably qualified specialist should SCC be identified within the focus area in order to ensure that species loss during construction activities is kept to a minimum Faunal habitat beyond the demarcated area should not be cleared or altered Smaller species such as scorpions and reptiles will be less mobile during rainfall events and cold days (winter) and as such will not readily able to move out of an area ahead of ground clearing activities. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to											
	3		Los of Habitat for Faunal Species Specialist impact rating: Calcrete Shrubland, Open Thornveld, Rupicolous Habitat (High significance) Cryptic Wetland (high significance) Non-watercourse Habitat (high) Degraded Habitat (medium low) Transformed Habitat (low)	-12			-8										

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own											
	4, 5		Loss of Habitat for Faunal Species Specialist impact rating: Calcrete Shrubland Habitat (medium-low) Preferential flow path (low) Degraded Habitat (low) Transformed habitat (very low) Rupicolous Habitat (low)	-9		Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal	-5										
	6		Loss of Habitat for Faunal Species Specialist impact rating: Modified Habitat Unit (very low) Non-watercourse habitat (low) Natural habitats (calcrete shrubland	-9		All future prospecting activities should remain outside if the cryptic wetlands and the seasonal depressions, including their regulated zones, unless duly	-5										

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			and open thornveld) (medium-low)			authorised to do so. No hunting or trapping of faunal species is to be allowed by construction personnel											
	1, 2	Fauna SCC	Impact on Faunal SCC is considered medium-low	-9		Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed Whilst few to no faunal species were observed within the assessed in the CWs during the site visit, as noted in Section 2.e.iii.6.e, features such as those identified in the study area are noted to be important habitat for various Branchiopod species in the region, which are able to withstand extended periods of desiccation. Confirmation of the presence of these invertebrates by means of hatching out eggs under laboratory conditions did not form part of the scope of work thus their presence or absence in this group of CWs cannot be ruled	-5										

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Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						out without further investigation; however, Branchiopods and tadpoles were found in CW 14, inferring that they may be present in the other CWs assessed. It is therefore strongly recommended that: 1. Sampling of the cryptic wetlands to determine the presence (or absence) of macroinvertebrates be undertaken. 2. Sampling under dry conditions can be achieved by obtaining soil samples from the top layer (0-50 mm) of soil within each CW, which would hold the egg banks of any invertebrates present. 3. These soils samples are then processed under laboratory conditions to hatch out and enumerate the invertebrate taxa present. 4. Should invertebrate taxa be present, a detailed rescue and relocation plan should be developed by a suitably qualified											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						specialist, to relocate egg banks, either to cryptic wetlands that will be undisturbed, or to recreated wetlands (refer to the figure overleaf for a concept diagram). Such a rescue and relocation plan could potentially form part of and offset initiative, which could be on site or also potentially be included at the Doornfontein property should it be required by the relevant authority											
	3		Impact on Faunal SCC is considered medium-low	-5		No trapping or hunting of fauna whatsoever must be allowed;	-5										
	4, 5		Impact on Faunal SCC is considered low	-5		Should the presence of any faunal SCC be noted, or their breeding sites be located, notably ground dwelling or nesting species, within the development footprint a suitably qualified specialist should be consulted on the best way to proceed	-5										
	6		Impact on Faunal SCC is considered medium-low	-5		At a minimum a short herbaceous layer must be maintained around the Railway Line Link Project so that	-5										

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						a semblance of faunal habitat is reinstated in these areas All infrastructure and footprint areas should be rehabilitated in accordance with a rehabilitation plan compiled by a suitable specialist Faunal and floral monitoring should be done annually Ensure habitat connectivity is not compromised by maintaining movement corridors between the various habitat units as far as possible All areas of increased ecological sensitivity beyond the approved footprint must be designated as No-Go areas and be off-limits to all unauthorised construction vehicles and personnel Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities. Additional road construction should be limited to what is											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						absolutely necessary, and the footprint thereof kept to a minimal No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line and faunal recolonization. In the event of a breakdown, maintenance of vehicles must take place with care, and the collection of spillages should be practised preventing the ingress of hydrocarbons into the topsoil											
						It is recommended that a monitoring program be developed during the operational phase to detect any changes to species compositions in											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						the area, and where appropriate initiate mitigation / management measures to minimise impacts to these species Should any other faunal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) be encountered, construction should be halted and authorisation to relocate such species must be obtained from relevant authorities No collection of faunal SCCs may be allowed by construction or operational personnel.											
	2, 3	Riparian Habitat & Wetlands (Pans)	Expansion of Village Pit WRD, West Pit WRD and East Pit WRD Construction of clean and dirty water separation systems around the downgradient boundaries of the respective WRDs to direct clean stormwater run-off	-13	ID	Soil must not be exposed for longer than is necessary. Ongoing research in terms of the practical rehabilitation practices to achieve the final land use commitments (wilderness) and investigate measures to	-10	Remain within or approve upon the current Aquatic Health and Water Quality baseline conditions.	Improve upon the current aquatic health and water quality baseline conditions.	x			x	Compliance in terms of GN704 and the aquatic monitoring requirements.	Remain within demarcated areas. Construction and maintenance of the infrastructure and erosion controls. Assess Aquatic Habitat Characteristics.	Engineering department & Environmental Department. Specialist Aquatic Ecologist	Monitoring of the conditions of the Wetland Systems biannually (winter and summary monitoring). Annual vegetation monitoring of rehabilitated areas.

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			around and away from the WRD, and the clearing and levelling of land for the expansion of the Village Pit WRD within 100 m of CW 21, for expansion of West Pit WRD within 380 m of CW17 and for expansion of East Pit WRD within 150 m - 225 m of CWs 2, 10 and 11 and the removal of topsoil from WRD expansion areas, and stockpiling thereof for rehabilitation, could result in the following: *Exposure of soil, leading to increased runoff, erosion and wind-borne sediment, and thus potential increased sedimentation of the CWs; *Increased sedimentation of CW habitat, leading to smothering of flora and benthic biota and potentially altering surface water quality when water is present; *Decreased ecoservice provision; and *Proliferation of alien vegetation or encroacher species as a result of disturbances.			ensure aquatic-ecological continuation after mining, including participate in ongoing research to better understand the strategic water setting and cryptic wetlands in this area.									Research in best rehabilitation practices and the reinstatement of Cryptic Wetlands for future rehabilitation practices.		
						An action plan for the construction or offsetting of cryptic wetland should be developed during this phase. This may necessitate the recreation of these systems, as is discussed in further detail below – an opportunity to undertake this task on the Doornfontein property could be considered.											
						Construction-related waste must not be stored on site, and must be removed and disposed of in accordance with existing approved Beeshoek waste management policies.											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			Expansion of Village Pit may result in the following: *Direct loss of CW habitat, specifically CWs 15 and 21; *Damage to or direct loss of vegetation, leading to exposure and compaction of soil, in turn leading to increased risk of wind erosion and wind-borne sediment reaching surrounding CWs; *Increased sedimentation of the surrounding CWs may lead to changes to habitat, potentially altered surface water quality, smothering of vegetation and/or altered vegetation composition and altered macroinvertebrate assemblages (if present in the affected CWs); *Decreased ecoservice provision; *Decreased ability to support biodiversity; and *Proliferation of alien vegetation as a result of disturbances	-13	ID	The catchments of all identified watercourses must be determined by a suitably qualified specialist, and as far as feasible, no activities must be permitted within the delineated catchments.	-10										
						Contractor laydown areas, and material storage facilities to remain outside of the CWs located beyond the extent of the planned Pit expansion											
						All vehicle re-fuelling is to take place outside of the outside of the CWs located beyond the extent of the planned Opencast Pit expansion.											
						All clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation.											
						All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential.											
						Retain as much indigenous vegetation as possible.											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						An action plan for the construction or offsetting of cryptic wetland should be developed during this phase. This may necessitate the recreation of these systems, as is discussed in further detail below – an opportunity to undertake this task on the Doornfontein property could be considered.											
						The watercourse areas and their associated catchments beyond the proposed footprint of expansion should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas.											
			Expansion of Village Pit and the associated blasting may result in the following: *Altered water quality of adjacent CWs (to the south) as a result of wind-borne sediments, nitrates from blasting and so forth. *Increased sedimentation and erosion resulting from altered run-off	-11	CbA	During construction, the topsoil should be removed up to the depth determined by the specialist soil and land capability assessment (ZRC, 2021) and be carefully stockpiled, for use during rehabilitation, away from any CWs beyond the	-7										

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Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			patterns or wind-borne transportation to adjacent CWs may have a negative impact on geomorphological processes, habitat and/or biota.			footprint of the expansion and their catchments.											
						Excavated materials should not be contaminated and it should be ensured that the minimum surface area is taken up.											
						Soil should be stockpiled in line with the Soil Management Measures presented before.											
						All exposed topsoil must be protected for the duration of the construction phase in order to prevent erosion and further sedimentation of the reach of the watercourses proximal to these stockpiles.											
			Future Strategic Exploration Block (Exploration Drilling) could lead to the altered drainage patterns due to reduced vegetation cover and increased impermeable surfaces; risk of contaminated storm water runoff (e.g. hydrocarbons, sediment, originating from impermeable surfaces) entering the cryptic wetlands. This may lead to: *Potential direct	-8	CbA	Ensure that drill rig and laydown area footprint does not encroach on cryptic wetland habitats and that vegetation clearing is limited to essential areas only.	-5										
						Ensure soil management programme is implemented and maintained to minimise erosion and sedimentation.											
						Active re-vegetation of disturbed areas											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			loss of cryptic wetland habitat (where drill sites encroach on delineated boundary thereof); *Increased hardened surfaces within the catchment of various cryptic wetlands and compacted soils thus reducing integrity of interflow. *Localised landscape alterations within the catchment of affected cryptic wetlands, potentially leading to loss of recharge as surface water is directed away from CWs, and/or formation of preferential surface flow paths leading to erosion; *Increased surface water runoff, leading to erosion, and sedimentation of freshwater resource habitat. *Loss of foraging and breeding habitat within the catchment of cryptic wetlands for wetland-dependent fauna. *Proliferation of alien vegetation as a result of disturbances.			immediately after drilling is completed. Vegetation covers on all topsoil stockpiles. Develop, implement and maintain AIP management programme.											
			Stockpiling of topsoil, earthworks,	-10	CbA	Limit clearing of vegetation to what	-5										

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
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			movement of vehicles within delineated cryptic wetlands and their catchments as a result of the Future Exploration drill sites may lead to: *Increased water inputs to cryptic wetlands in the vicinity of drill pad;. *Possible contamination of surface water runoff from drill pads; *Possible erosion/incision of the cryptic wetlands adjacent to drill pads due to concentration of storm water runoff.			is absolutely essential in order to retain as much vegetation cover as possible. Implement and maintain soil management programme to minimise risk of erosion.											
			Future Strategic Exploration Block (Exploration Drilling) could lead to potential disposal of hazardous and non-hazardous materials in cryptic wetlands (although highly unlikely). This could result in: *Altered water quality, possible changes to flow patterns as a result of blockages caused by solid waste/rubble; *Possible damage to or smothering of macroinvertebrate egg banks, leading to impacts on macroinvertebrate and faunal assemblages.	-10	CbA	No waste materials are permitted to be disposed of within any cryptic wetland habitat, and all waste materials must be disposed of at an appropriate disposal facility. All cryptic wetland habitats in the vicinity of the drill rig footprint are to be designated "No Go" areas and off-limits to all personnel and vehicles.	-5										

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			Removal of topsoil from drill sites, and stockpiling thereof for rehabilitation may result in the increased risk of transportation of sediment from exposed soils in wind or storm water runoff, leading to increased turbidity of surface water, sedimentation of cryptic wetlands, smothering of vegetation and/or altered vegetation composition and smothering of macroinvertebrate egg banks.	-10	CbA	No stockpiles may be placed within the Cryptic Wetlands. Temporary stockpiles must be protected by means of suitable geotextiles such as hessian sheeting, silt curtains, sandbags etc. to prevent contamination of runoff and sedimentation of cryptic wetlands in the vicinity of the drill rigs. All stockpiles which are to remain on site post-construction are to be suitably managed to prevent erosion, either through managing the height and slope ratios, or through establishing indigenous vegetation. The recommendations of the specialist soil and land capability study (ZRC, 2021) must be followed in this regard.	-5										
			Expansion of existing detrital area to the south and east of the current location may result in: *Sediment-laden runoff or wind-borne sediment entering riparian	-6	CbA	See management measures for drill sites and opencast pit expansions above.	-5										

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Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
			habitat leading to altered water quality, and changes to aquatic habitat; and *Altered drainage/flow regimes, leading to altered runoff patterns and formation of preferential flow paths, leading to further erosion.														
	2, 3, 4, 5, 6	Hydrology	Removal of vegetation for the pits, WRDs and associated infrastructure. Stripping and stockpiling of topsoils, may result in erosion of exposed soils leading to siltation and sedimentation of downslope drainage channels.	-7	CbA	Vegetation clearance should be kept to an absolute minimum. Temporary erosion measures should be employed at exposed areas. Exposed areas should be vegetated as soon as possible. The topsoil stockpiles must be managed according to a topsoil management plan and should be vegetated.	-4	Operate the water management circuit on site to increase mining efficiency and reduce the need for maintenance of these facilities. Protect the surrounding demarcated watercourses.	Implement the SWMP on site and comply with GN704 requirements.	x			x	Compliance in terms of the WUL and the SWMP.	Annual compliance in terms of the designs of the facility and compliance in terms of the WUL must be undertaken. The integrity of the demarcated watercourses must be maintained.	SHERQ Department and Hydrologist	Surface Water Monitoring in line with the current monitoring programme. Monitoring of the conditions of the Wetland Systems biannually (winter and summary monitoring). Annual vegetation monitoring of rehabilitated areas.
	1, 2, 3, 4, 5, 6		Use of heavy machinery, trucks and vehicles for construction purposes, could lead to potential hydrocarbon spillages washed into downslope drainage channels.	-8	CbA	Machinery, trucks and vehicles must be well maintained and serviced regularly as per a recommended service guide. Refuelling must be undertaken over hard park bunded areas that adequately sized to capture and contain spillages. Machinery and vehicles should be	-4										

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						parked on appropriately lined areas. Drip trays must be employed under stationary machinery. Spillages should be reported immediately, and spill kits should be readily available at all times.											
	2, 3		Alteration in the natural topography through the development of the pits and WRDs.	-11	CbA	Opencast Pits and WRDs should be kept to minimum footprint areas. The creation of steep slopes should be avoided as far as possible. Culverts should be placed at topographically low positions to allow for suitable drainage.	-5										
	-	Geohydrology	No direct impact during the construction phase.	-	-		-	-	-	-	-	-	-	-	-	-	-
	2, 3, 6	Heritage	The study area is known for the presence of graves and heritage artefacts. The Screening assessment also indicated the importance of paleontological themes. During the Phase 1 Site investigation no areas of concern were identified.	-13	CbA	In the event that any other heritage artefacts or graves are encountered during the excavation activities, all activities must cease and the SAHRA should be contacted to determine the way forward before construction may continue. The possibility of the occurrence of subsurface finds cannot be	-5	Protect heritage resources for future generations.	Ensure that there is a 100% non-occurrence of impacts to heritage resources.	x			x	Presence of archaeological artefacts.	Development of a Heritage management plan . Implementation of a Chance find procedure during construction. Known graves should be indicated on development plans and avoided. Training of all contractors and responsible	Engineering Department.	Daily

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
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						excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP. This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.									parties must be undertaken to ensure that all parties are aware of the need to protect these resources and what to observe for. Daily inspections must be undertaken during the site clearance and excavation phases.		

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						• If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. • It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area. • The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for											

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						an assessment of the finds who will notify the SAHRA The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP.											
						It is recommended that the Strategic exploration area should be subjected to a heritage walk through prior to development.											
						Graves and cemeteries (BH26 and BH27) should be retained in situ with access for family members and a sufficient buffer zone.											
						Although unlikely, the recorded stone cairns (BH12 and BH24) could represent graves and should be											

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						confirmed during the social consultation process.											
	2, 3, 4, 6	Visual	Removal of vegetation for the pits, WRDs and associated infrastructure. Stripping and stockpiling of topsoils, which will create dust.	-7	CbA	Vegetation clearance should be kept to an absolute minimum. Exposed areas should be vegetated as soon as possible. Dust suppression measures should be implemented to limit the generation of dust.	-5	Retain the aesthetics of the area as far as practically possible.	Design and construction infrastructure to blend in with the general topography as far as practically possible. No encroachment outside of demarcated areas.	x			x	Retain activities in demarcated areas.	The Project Manager should implement the necessary design concepts to limit the impact on the soil resources and ecological connectivity and functioning of the ecosystem.	Project Manager	As part of the project design. Prior to construction.
			The movement of vehicles and heavy machinery during the construction phase will create a visual presence and will generate dust.	-7	CbA	Machinery, trucks and vehicles are already present on the Mine site and are unlikely create any additional significant presence. Dust suppression measures should be implemented to limit the generation of dust.	-4										
	1, 2, 3, 4, 5, 6	Air Quality	Direct impact: Dust-fallout	-9	CbA	Utilised the existing monitoring network to monitor dust fall out in and around the construction area, or adjust the monitoring network in line with the recommendations by the Air Quality Specialist. Strictly enforced speed limits on all roads - not to exceed 40km/ hr.	-5	Recording of dust fall out to determine trends.	Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.				x	National Dust Regulation Compliance.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHERQ Department.	Dust monitoring to be done in line with the current monitoring programme

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						All areas, especially with the exploration activities, should be rehabilitated once construction has been compiled, and in the case with the drilling pads, once the drilling activities at that pad had been concluded. Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast Limit site clearance to designated areas.											
	1, 2, 3, 4, 5, 6	Noise	The area is located within the mining area. Noise impacts are not considered to be significant but can occur during excavation and construction activities.	-5	CbA	Equipment will be well maintained to reduce excessive noise creation. ·Maintenance of vehicles and machinery should be done regularly. Activities will be restricted to the day time.	-4	Remain with the required health and safety standards.	Remain within the regulated guidelines and limits as required by the Mine Health and Safety Act.	x			x	Ambient noise monitoring.	Adjacent landowners will be informed of the planned dates of the significant land clearance activities where applicable. Daily noise monitoring will be undertaken in the areas where high levels of noise take place.	SHERQ Department.	Ongoing consultation with surrounding landowners. Conduct annual noise monitoring on the boundaries of the site. Regulator noise monitoring in terms of Mine Health and Safety Standards.
	1, 2, 3, 4, 5, 6	Social	A temporary increase in the	-10	CbA	Contractors are expected to house	10	Positive contribution	Continuation of traffic		x				The HR department	HR and SHERQ	Annual review and update of

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			concentration of workers will thus occur e.g., during the construction of the haul roads and decommissioning of the existing sections of haul roads, construction of the railway link line as well as the service relocations. New opportunities for short-term contract work could thus be generated for some periods of time as there would be around 20-70 unskilled personnel required at certain stages for the new mining infrastructure. This figure could increase with the construction of the railway link line and bridge at the R385. Locals could be part of the specialist contractor teams involved in the short-term contracts.			their employees in existing housing facilities in Postmasburg and surrounds. Due to the number of individuals that would be involved on a temporary basis, no new accommodation facilities would be required. Prioritise any possible new local labour in the recruitment process as part of the company's own recruitment policy or as part of the contractor management plan and stipulate the procurement of new employees, especially in the unskilled category, from the local communities Provide up-skilling opportunities for unskilled and semi-skilled local workers during the construction phase to allow them to become more employable for operational activities. Explore possible placement of local construction workers in mining operations.		to the Socio-Economic Setting of the Local Municipality. Maintenance of logistical characteristics and requirements of the local area.	logistics on the R385. Maintenance of relationships with surrounding landowners, mines and road users. Meeting the approved objectives and goals of the SLP.					Monitoring of the Social and Labour Plan.	should remain in ongoing consultation with the Local Municipality. Regular stakeholder focus meetings should be scheduled to discuss any perceived impacts or concerns.		the SLP. Monthly dust monitoring. At least annual stakeholder focus meetings. Weekly inspections of the railway line construction activities and implementation of the temporary diversion activities.
			the inflow of temporary workers, the inflow of individuals to the	-8	CbA	Maximise the use of local labour and contractors where possible by	-7										

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			study area in search of employment, as well as the potential conflict between locals and individuals from outside the study area during the construction/start-up phase. Over time, the ECO has experienced high development backlogs as a result of the increasing population and socio-economic growth driven by the inflow of outsiders to the area in search of employment in the solar and mining sectors. This has resulted in massive pressure on the delivery of basic services within the municipal area. The proposed Beeshoek Optimisation project, however, has as purpose the continuation of the mining activities within the existing mining rights boundary and to sustain the existing production capacity over time. No new areas will be opened up for mining, no new significant open cast pits will be developed and mining activities will			developing a strategy to involve local labour in the construction process. The development, publication and widespread dissemination of a recruitment policy could serve to encourage local employment and reduce the potential influx of jobseekers to the area. The communication strategy should ensure that unrealistic employment expectations are not created A representative of Beeshoek Mine could liaise with the local leaders and local councillors to either attend key community meetings arranged within the affected wards to discuss the possible employment and recruitment process; or liaise with the local leaders and local councillors to ensure that the correct information regarding this issue is portrayed to the communities											

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			be undertaken within the existing mine boundary. As indicated under Section 7.1, there will be limited new employment opportunities during the construction period with subsequent limited direct and controlled inflow of people to the area. The informal population influx is difficult to mitigate and cannot be attributed to the Beeshoek Optimisation project, as it is an existing impact in the region. However, construction related projects and mining focused areas usually attract jobseekers from within the study area or even from other provinces even prior to construction commencing. This situation is usually worsened by exaggerated rumours of possible employment opportunities. It is thus likely that the area continues to have an informal inflow of some jobseekers to the Postmasburg and surrounding area, due to the various			Beeshoek Mine should, where possible, support efforts by TLM to limit squatting and sub-letting in the area, e.g., no informal settlements should be allowed within the mining rights area. As per the Beeshoek SLP, the Beeshoek Mine has through the Khumani Housing Development Company, built 357 homes in the main residential areas of Postmasburg, namely Boichoko (51), Postdene (163) and Airfield (143). Beeshoek Mine plans to continue with this strategy and has stipulated the plans in the SLP. Beeshoek Mine must continue with their assistance in the provision of housing infrastructure as discussed in the Assmang Iron Ore Social and Labour Plan for Beeshoek Iron Ore Mine: 2019-2024. Review and updates of the SLP after 2024 must specify efforts by Beeshoek Mine to											

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			mining activities within the area, but no significant additional formal and informal inflow of jobseekers is expected as a direct result of this project.			continue to seek sustainable and collective solutions to the issue of housing for employees and other housing challenges in the area. There should be ongoing engagements between Beeshoek Mine, the relevant housing forums and working groups, as well as the TLM with regards to housing policies, models and challenges.											
	6		Traffic Movement Impacts - Traffic movement will be disturbed and possibly be delayed during the construction of the temporary road deviation when construction of the road bridge associated with the railway link line on the R385 commences. The R385 is used to access Beeshoek Mine, as well as Postmasburg. It further serves as link road to the access road to Kolomela Mine. The R385 thus serves public users, as well as mine related traffic volumes. The negative impact on the road users,	-10	CbA	Unauthorised entry onto the mining area must not be allowed. Access control should continue to be implemented. Mining areas must be secured and fenced. All construction vehicles should be in a good condition and adhere to road worthy standards. Construction vehicles must keep to speed limits. Limit construction hours to daylight hours e.g., 6am to 6 pm. Road users must be notified if delays would be experienced due to the road bridge construction.	-7										

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			however, will be of a short duration.			Warning signs with regard to the construction activities need to be erected at strategic places along the R385 and must be clearly visible at night. Road deviations must be clearly indicated by road signs and must be clearly visible at night. Access to the R385 and Olifantshoek Road to Kolomela Mine must be ensured at all times. Access to the Tommy's Field Airport must be ensured at all times. Temporary closure of the Tommy's Field Airport and the impact on flight patterns should be communicated to all parties involved and alternative available airport options must be finalised. Speed limits around the construction sites should be lowered for the duration of the construction period. The construction schedule of the railway link line and bridge on the											

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						R385 must be discussed and finalised in consultation with directly affected landowners and Kolomela Mine.											
	1, 2, 3, 4, 5, 6		Dust nuisance - please refer to air quality section.	-	-	-	-			-	-	-	-	-	-	-	-
	1, 2, 3, 4, 5, 6		Noise impacts - please refer to noise section.	-	-	-	-			-	-	-	-	-	-	-	-
Establishment of Infrastructure	-	Geology	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4, 5, 6	Topography	During the site clearance activity, the required storm water management systems and shaping of land would have been completed. Therefore no further impact on the topography is expected	-9	R	Activities should be constructed and developed within the approved design concepts. Note that laydown areas will only be constructed in areas which are demarcated for permanent activity construction to ensure that no additional areas are disturbed.	-5	Remain within demarcated areas. Design facilities to blend into the existing site character as far as practically possible.	No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas	**x**			**x**	Soil Erosion and aesthetics of the environment.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring
	4, 6		Alteration in the natural topography through the construction of infrastructure associated with the two additional Plants, as well as the railway line.	-11	CbA	Infrastructure should follow that natural topography where possible. The creation of steep slopes should be avoided as far as possible. Culverts should be placed at topographically low positions to	-5										

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						allow for suitable drainage.											
	-	Soil, Land Use and Land Capability	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Terrestrial Ecology (Fauna & Flora)	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Riparian Habitat & Wetlands (Pans)	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Hydrology	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4, 5, 6	Geohydrology	Direct impact. The use of waste rock in the compaction of the roads and surface footprints should not lead to an impact on the groundwater resources as the material is not considered a pollutant.	-7	CbA	Groundwater monitoring should be undertaken to ensure that the facilities are operated in manner as not to result in pollution plumes.	-5	Remain within or approve upon the current groundwater quality.	Improve upon the current groundwater quality.	x			x	Groundwater Pollution and potential trends.	Cost benefit analysis should be undertaken to ensure that the best road surfaces and compaction material are being used. Groundwater monitoring will be undertaken as per the current groundwater monitoring network on site. Application for GN704 Regulation 5 should be obtained prior to construction.	SHERQ Department & Engineering Department	Cost benefit analysis, prior to construction. Groundwater monitoring: As per current monitoring network. Application for GN704: To be undertaken as part of WUL Amendment, 2017

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	4		Seepage from Dirty Water Dams and the Staging stockpile at the WHIMS Plant resulting in groundwater contamination.	-7	CbA	Groundwater monitoring should be undertaken to ensure that the facilities are operated in manner as not to result in pollution plumes. The Staging Stockpile and the Central Process Water Dam should be designed and constructed with a Class C liner.	-5	Remain within or approve upon the current groundwater quality.	Improve upon the current groundwater quality.	x			x	Groundwater Pollution and potential trends.	Regular inspection of liners in terms of the Quality Assurance Standards. Groundwater monitoring will be undertaken as per the current groundwater monitoring network on site.	SHERQ Department & Engineering Department	Groundwater monitoring: As per current monitoring network. Regular inspection of liners in terms of the Quality Assurance Standards - at least every 5 years.
	-	Heritage	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-		-	-	-	-	-	-	-	-	-	-
	-	Visual	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-		-	-	-	-	-	-	-	-	-	-
	-	Air Quality	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-		-	-	-	-	-	-	-	-	-	-
	-	Noise	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-		-	-	-	-	-	-	-	-	-	-
	-	Social	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-		-	-	-	-	-	-	-	-	-	-
Placement of Enviroberms and Safety	-	Geology	No further impacts other than those addressed during	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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berms and preparation of WRD footprints			the planning and site clearance phase.														
	2	Topography	During the site clearance activity, the required storm water management systems and shaping of land would have been completed. The placement of the enviroberms will have a low impact on the environment in terms of topographic impacts.	-6	R	Enviroberms should be implemented along the perimeter of the Opencast Pits.	-5	Remain within demarcated areas. Design facilities to blend into the existing site character as far as practically possible.	No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas	-	-	-	x	Soil Erosion and aesthetics of the environment.	Regular inspections of the integrity of the Enviroberms	SHERQ Department & Engineering Department	Weekly inspections
		Soil and Land Use	No impact, berms are implemented within haul road boundaries, or along the opencast perimeter. No additional soils are removed other than that for the roads and opencast pits.	-	R	Management measures for the establishment of roads and opencast pits should be adhered to (this should include erosion management of berms).	-										
			Erosion on the side walls of enviro-berms.	-9	CbA	Enviro-berms should only be placed in demarcated areas around the opencast pits.	-4	Retaining soil integrity for rehabilitation.	Maintaining soil integrity, with successful vegetation establishmen t.				x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent ECO to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHERQ Department.	ECO: biennial external audits can be undertaken. SHERQ: Weekly monitoring
						Berm heights will be restricted to 5m.											
						Erosion control measures will be implemented on all stockpiles and self-succession will								Soil integrity analysis.	Assessment of the fertility of Soils	Soil Scientist.	Prior to placement of soils.

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						be encouraged (latter required on enviroberms).											
		Ecology	No impact is foreseen, berms are implemented within haul road boundaries, or along the opencast perimeter. No vegetation clearance will take place as part of these activities.	-9	R	Management measures for the establishment of roads and opencast pits should be adhered to. No activities may take place within 100m of any watercourse or pans unless authorised in the WUL.	-4	Remain within demarcated areas with no impact on demarcated NFEPA sites.	No expansions beyond approved footprints.	x	x		x	Loss of potentially sensitive areas.	Remain within authorised footprints.	Geological Department	Daily
			Presence of invader species could impact on the natural succession of vegetation on backfilled opencast pits.	-13	CbA	An AIP must be implemented on site and enforced (this should include all berms as well). This programme must stipulate the monitoring plan, which should include capturing of areas where invader species are present; action plan to remove these; % successful removal).	-7	Limit the impact of the mining operation on the Ecological Setting of the area.	Reduce the presence of invader species by 90% on site.		x		x	Invasion of Weeds and Alien Vegetation.	An AIP control plan must be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHERQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study (annually)
		Surface Water	Contamination and or siltation of water resources.	-6	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or as amended and approved. Maintenance of all Storm Water Management systems must be	-5	Ensure the integrity of enviroberms.	No erosion on enviroberms.				x	Water resource siltation and loss of soil resources	Annual compliance in terms of the designs of the facility and compliance in terms of the WUL must be undertaken. The integrity of the demarcated watercourses	SHERQ Department	Surface Water Monitoring in line with the current monitoring programme. Monitoring of the conditions of the Wetland Systems biannually (winter and

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						undertaken regularly on site.									must be maintained.		summary monitoring). Annual vegetation monitoring of rehabilitated areas.
		Groundwater	Contamination of groundwater due to the seepage of water from Mine Residue Deposits used in the construction of berms. The 2017 Groundwater Risk Assessment conducted by GPT, states that: "Based on the groundwater quality analyses, solid waste analyses and liquid waste analyses, as well as the statistical analysis of the data, it can be deduced that the chemical signatures of the 3 mediums (groundwater, solid waste and liquid waste) are quite similar. It was found that the constituents found to exceed the relevant screening levels for each of the three mediums are also similar. Also, most of the sources are located within the dewatered area, directing any contaminants towards the active mining areas." It	-5	CbA	The current groundwater chemistry monitoring must be maintained with annual additional analyses of sewage and hydrocarbon related contamination.	-4	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.	x	x			Groundwater Pollution and potential trends.	The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory	SHERQ Department	Quarterly
						Vehicles must be well maintained.			The monitoring network should be adhered to.				x				
						All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site			The occurrence of hydrocarbon spills must be reduced based on those captured in the incident report.	x			x				
						Any spills occurring during the collection process must be cleaned up immediately.											
						Any significant spills must be captured in the incident reports and must be reported to the relevant											

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Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			should also be noted that according to the GPT Monitoring Network Evaluation, 2016 the Nitrates are elevated in the groundwater naturally, based on background monitoring data. The nitrate concentrations found exceeded the SANS 241:2015 limits. However, it is proposed that this constituent be added to the monitored parameters in the WUL. The source of the naturally elevated nitrate in the groundwater is currently unknown and is presumed to be a by-product of the vegetation in the area.			department (NCDENC, WUA, CMA, DWS).											
						A clean up procedure (i.e. Works Instruction) must be in place.			Efficiency of implementin g action plans (i.e. how quick a spill is captured and rehabilitated) must improve.								
		Heritage	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No further impacts other than those	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			addressed during the planning and site clearance phase.														
		Social	No further impacts other than those addressed during the planning and site clearance phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waste Management and Handling Hydrocarbon spills within the Mining Area and the management of Domestic and Hazardous Waste	1, 2, 3, 4, 5, 6	Soils	Contamination of soil resources due to hydrocarbon spills.	-11	CbA	Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas. Regular monitoring of site activities and machinery must be undertaken to identify spills or leaks Spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans must be developed and be implemented Withdraw equipment for maintenance if change in emission characteristics is noticeable. All contaminated material at the Exploration Activities, where	-5	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.				x	Soil Pollution Prevention	The SHERQ Department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non-conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.	SHERQ Department	ECO: biennial external audits can be undertaken. SHERQ: Weekly monitoring.

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						applicable, must be contained in mobile sumps. The mobile sumps must maintain a suitable freeboard, to ensure when these are moved/transported, that no spillage will occur.											
						All fuels and soils must be stored in appropriate containers.											
						Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements.											
						Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages.											
						Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained.									Ensure that a Hydrocarbon Management Procedure and Spill Prevention and Emergency Spill Response Plan is available on site and updated regularly.		Regular update in terms of procedure requirements.
						Spill kits (such as spill-sorb or a similar type of product) must be kept on site and used to clean up		Awareness creation on site regarding duty of care and waste management.							Induction with the view on creating environmental awareness.		Annually for permanent staff. Start of each visit for contractors.

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						hydrocarbon spills in the event that they should occur											
						If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility.											
						Safety signage must be used at designated storage areas.											
						All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.											
			Contamination of soils as a result of a lack of sanitary services	-11	CbA	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	-5	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.				x	Soil Integrity	Contracts must be in place for the provision of chemical toilets where required. Removal companies must have the necessary contracts and permits in place.	SHERQ Department	Daily internal inspections Annual review of supply and removal companies contracts and permits.

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			Handling of building rubble	-7	CbA	Building rubble must be disposed of in line with the requirements of the NEM:WA. Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. All waste must be removed by licensed contractors and disposed of at a licensed landfill site or be disposed of at a licensed landfill site. As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented.	-5		Maintain a 100% accurate recording of waste and submission of such recording to the Department.				x				

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						Recycling practices must be investigated and implemented on site where practical.											
									Maintain daily covering of the landfill site.				x				
		Ecology	The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	-12	CbA	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste. The landfill site at Beeshoek must be operated in line with the ECA license requirements and conditions. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	-5	Proper waste management practices on site.	No unlawful disposal of waste. Registration of all waste handling and/or storage areas on site.				x	Ongoing Rehabilitation	Ongoing waste classification and management processes to be implemented. Updated waste inventory to be available on site. Waste Management and Handling Procedure to be available on site and updated regularly.	SHERQ Department	SHERQ: Weekly inspections. Regular update in terms of procedure requirements. Waste Classification of Waste Rock every five (5) years.
		Surface Water	Handling of Hazardous Waste within workshops, water containment facilities and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.	-11	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter. A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams.	-6	Protect the integrity of the Storm Water Management System.	Aim to achieve a zero-spill record.		x			Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHERQ Department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The water quality (constituents	SHERQ Department	Assessments: Weekly. Monitoring: As per approved WUL Reporting of incidents in terms of Environmental Authorisations, but generally within 24 hours of occurrence. Update of the Incident Reporting

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						Waste management training must be implemented on site.									listed in the WUL) must be monitored and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. An incident reporting procedures should be available on site and definitions must be developed to determine when an incident is reportable. Reportable incidents should be reported to the Regulatory Authority as per the regulatory requirements, as well as stipulations as part of the WUL and Environmental Authorisations.		Procedure in terms of the procedure requirements.
						Clear signs informing staff of waste management practices must be implemented on site.											
						All contaminated material at the Exploration Activities must be contained in mobile sumps. The mobile sumps must maintain a suitable freeboard, to ensure when these are moved/transported, that no spillage will occur.											
						Hazardous waste handling should only take place within bunded and/or lined areas.			Maintain a 100% safe disposal record on the disposal of hazardous waste.								
						Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.			Provide training to all staff on best practices regarding waste management every year.								
						Clean spills, if occur within 24 hours.											
						Documentation of removal and safe disposal must be available on site.											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						The Mine will adopt a cradle-to grave approach to ensure that the waste is removed and disposed of in a legally compliant manner.											
						Notify the relevant regulatory authorities in the event of the occurrence of a reportable incident.											
						Weekly inspections of Storm Water Management systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.											
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	-9	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter.	-5	Protect the integrity of the Storm Water Management System.	Maintain a 100% compliance with the conditions of the NEMWA Permit on site for the Domestic Landfill Sites.								
						Waste management training must be implemented on site.											
						Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Access control must be strictly enforced. The landfill site at Beeshoek must be operated in line with the ECA license requirements and conditions. Recycling practices must be investigated and implemented on site.											
		Groundwater	Large scale hydrocarbon spills could be present at the mining area	-12	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter. No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site.	-6	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.		x		x	Groundwater Pollution and potential trends & Soil Assessments.	To ensure a proactive approach, the SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these	SHERQ Department	Assessments: Weekly. Monitoring: Asper approved WUL

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						Any spills occurring during the collection process must be cleaned up immediately.									result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.		
						Any significant spills must be captured in the incident reports and must be reported to the relevant department (NCDENC, Catchment Management Agency/DWS).											
						All equipment and machinery should be kept in good working order.											
						A clean up procedure (i.e. Works Instruction) must be in place. Clean spills, if occur within 24 hours.											
			Handling or Hazardous Waste within workshops and general mine area.	-10	CbA	Clean and dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	-6										
						The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators).			Maintain a 100% safe disposal record on the disposal of hazardous waste.								
						Waste management training must be implemented on site.											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						Clear signs informing staff of waste management practices must be implemented on site.											
						Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored.											
						Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.											
						Documentation of removal and safe disposal must be available on site.											
			Handling and Storing of Domestic Waste	-7	CbA	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	-5		Maintain a 100% accurate recording of waste and submission of such recording to the Department.				x				
						Waste management training must be implemented on site.											
						Clear signs informing staff of waste management practices must be implemented on site.											
						All waste must be removed by licensed											

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						contractors and disposed of at a licensed landfill site.											
						As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented.											
						Recycling practices must be investigated and implemented on site where practical.											
						Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the landfill site can be detected.			Maintain daily covering of the landfill site.				x				
	-	Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4, 5, 6	Visual	Littering around the mining area could result in a reduction in the aesthetic nature of the environment.	-10	CbA	Regular inspections must be undertaken to ensure that littering along the mine fence area is managed.	-6	Proper waste management practices on site.	No unlawful disposal of waste.	-	-	-	x	-	Inspections and removal of unlawful littering.	SHERQ Department	Weekly inspections
	-	Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 87: Impacts to be mitigated in their respective phases (Operational Phase)

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
Removal of Resources (opencast pit mining)	3	Geology	The removal of iron ore via the opencast pits is a permanent impact on the geology as the mineral resource will not be able to be replaced.	-14	I	To ensure that the Mining Works Programme is continuously optimised to mine the minerals optimally.	15	Optimal use of mineral resources approved of in the Mining Right. Ongoing Exploration to ensure the optimal use of resources present in the Mining Rights area.	Profitable mining operations.				x	Optimal mining of mineral resources	The Mine Work Programme should be updated annually with all potential changes or amendments required.	Geological Department	Annually
						Ongoing research and exploration should be undertaken to ensure the optimal mining practices. These activities should take place within the stipulations of the EMP. Environmental Gap Assessments should be undertaken prior to the initiation of exploration activities or amendment to infrastructure design to ensure that such activities are undertaken in an environmentally lawful manner.		Optimising mining opportunities within the ambit of the EMP and Environmental Legislation.	Profitable mining operations, within environmental legal compliance.				x		Meetings must be held between the Environmental, Engineering and Geological departments to ensure that all activities can be planned and scheduled in line with Environmental Legislation.	SHERQ, Engineering and Mining/Geology Department.	At least Quarterly.
Removal of Resources (opencast pit mining)	3	Topography	Excavations in the landscape to the mining activities.	-11	R	Ongoing rehabilitation during opencast mining of the opencast pits, as well as detrital	-7	Backfilling of opencast pits before the establishment of new waste disposal areas.	Meeting final land use objectives.			x		Ongoing rehabilitation.	An operational rehabilitation plan must be implemented and audited by the SHERQ	SHERQ, Engineering and Mining/Geology Department.	Quarterly, throughout life of mine

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						mining on the south mine should be undertaken, via the use of infill of the pits with excess mine residue. These areas should be shaped to be free draining, resembling the natural surface topography. In-fill the pits with excess mine residue. Shaping of the in-filled pits to be free draining, resembling the natural surface topography. Annually revisit the MWP in parallel with the Annual Rehabilitation and Final rehabilitation plan.									Department. Mine planning and Engineering Department annual involvement in the development of the NEMA Financial Rehabilitation planning.		
Stockpiling of Mine Residue (WRD)	2		Operation of WRD will significantly alter the topography of the area.	-13	R	The slopes of the WRD should be operated with a slope of at least 1:3. As far as possible involve ongoing rehabilitation of opencast pits into the mine plan - thereby reducing the requirement to stockpile or deposit mine residue on WRDs. Annually revisit the MWP in parallel with the Annual Rehabilitation and Final rehabilitation plan.	-7	Ensure to optimise backfilling practices.	Meeting final land use objectives.			x		Ongoing rehabilitation.	Monthly environmental meetings must be implemented to discuss the mining plan, implementation thereof, implication on current Environmental Regulations and potential constraints and liabilities. Minutes must be kept of these meetings and action plans with responsibilities must be drafted.	SHERQ Department	Audit: Monthly Updated: Annually
Removal of Resources	3		The presence of cavities below	-14	CbA	There is evidence that dewatering	-10	Reduction of sinkhole					x	Dolomite Risk	Development of a Dolomite Risk	Engineering Department	DRMP development –

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
(opencast pit mining)		Dolomite impact on pits	the base of Wolhaarkop Formation breccia has been shown to occur on the site. One such large cavern is present as exposed in the BN Pit annex. While this may be a once off occurrence, this cannot be assumed to be the case with any certainty. The occurrence of these is difficult to predict as they occur within the bedrock at the base of the Wolhaarkop chert breccia where solution cavities may be present. Although they are likely to be rare occurrences, they do pose a significant risk to mining activities.			has had some effect on surface instability on the property. It is recommended that a study be conducted to explore techniques that will aid the identification of potential problems area. Such techniques include inter alia geophysical methods such as a gravity survey to identify low gravity anomalies that will aid identifying voids in bedrock. There is a suggestion from a dewatering borehole near the western pit that a similar cavity may exist at depth in this area too. Investigation of known or suspected features will give a good opportunity to test if such geophysical methods will indicate cavernous conditions and can be used in future to identify these ground conditions in advance so they can be mitigated. The eastern doline can be investigated in a similar fashion to confirm ground conditions that		development risks on site.	Meeting safety ratings						Management Plan (DRMP) Surface mapping of outcrops and ancillary (potential) geological aspects (surface risk mapping) Remote sensing/gravity surveys for near-surface and deep risk issues Wet services, such as water supply and slurry pipelines delivering waste to the Slimes Dam and stormwater accumulation and ponding should be monitored especially where they traverse ground where dolomite bedrock dolomite outcrops or occurs beneath a blanketing horizon of recent soils or deposits.		once off Once off. Annually Daily site inspection

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						lead to these surface deformation events.											
						The development of a Dolomite Risk Management Plan (DRMP) is recommended to mitigate the risks posed by dolomite related instability and involves devising an appropriate monitoring programme and reaction plan to incidents to mitigate against the risks. Specific recommendations are: • Surface mapping of outcrops and ancillary (potential) geological aspects (surface risk mapping) • Remote sensing/gravity surveys for near-surface and deep risk issues											
Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation Water Management Infrastructure Operation Railway Line Operation	3, 4, 5, 6	Dolomite impacts on infrastructure	The impact of dolomite related instability on infrastructure is likely to be the highest risk where dolomite bedrock is shallow or underlies a blanketing layer or layers of unconsolidated soils and	-13	CbA	Wet services, such as water supply and slurry pipelines delivering waste to the Slimes Dam and stormwater accumulation and ponding, should be monitored especially where they traverse ground where dolomite bedrock dolomite outcrops	-8										

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			deposits. This is particularly relevant where water-bearing services are involved and the risk of leakage is always possible. Concentrations of surface water such as from stormwater or from unlined impoundments such as tailings storage facilities that are unlined pose a risk. Infrastructure such as roads bridges and pipelines will be at risk due to the presence of a blanketing layer of recent soils which overlie buried karst ground at depth. Leaking services and other concentration of water in the vicinity of infrastructure such as stormwater ponding result in water ingress into the ground causing subsurface erosion into receiving cavities in the dolomite bedrock. A geotechnical			or occurs beneath a blanketing horizon of recent soils or deposits. Small scale surface mapping of which areas of the mine site are underlain or have inferred underlying dolomite will be necessary, if these are not already available, to characterise risk.											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			investigation of the Beeshoek TSF embankment wall in a report titled "Beeshoek Iron Ore Mine Tailings Storage Facility - Geotechnical Investigation – SRK Report no. 547755" shows seepage to be occurring through the wall of the embankment. The CSIR InSAR deformation reports show two instances of subsidence within the basin of the TSF, which is underlain by dolomite at a shallow depth. The relationship between these observations and the risk to stability of the basin and embankments must be established by further investigation.														
Stockpiling of ROM Material Beneficiation Plants Operation Water	1, 4, 5, 6	Soil and Land Use	Soil compaction due to the potential movement of service vehicles.	-8	CbA	All activities must remain within the approved footprints. A system must be implemented on site to address all significant or	-5	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful	The integrity of the soils stockpiled must remain suitable for the purposes				x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent ECO to assess compliance with the EMP. The SHERQ Department should undertake	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken.

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
Management Infrastructure Operation Railway Line Operation						recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation.		rehabilitation. Protect the soil resources within the area in which the mine operates. Retaining soil integrity for rehabilitation.	of rehabilitation.						ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.		SHERQ: Weekly monitoring
Stockpiling of Mine Residue (WRD) Removal of Resources (opencast pit mining)	2, 3			-9	CbA	As part of ongoing rehabilitation, compacted soils adjacent to the mining and associated infrastructure footprint should be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation	-5										
Stockpiling of Mine Residue (WRD) Removal of Resources (opencast pit mining)	2, 3		Soil Erosion Constant disturbances of soils, resulting in detachment of soil particles, reduced soil quality and risk of erosion, attributed to mining activities. Ongoing disturbances to soils, resulting in increased sedimentation and risk of erosion, arising from mining activities.	-11	CbA	Stockpiled soils should be stored for a maximum of 5 years. Concurrent rehabilitation should strongly be considered to reduce the duration of stockpile storage to ensure that the quality of stored soil material does not deteriorate excessively; especially with regard to leaching and acidification Ensure the required erosion protection measures are monitored and	-5										

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						corrected where necessary.											
						Ensure the required erosion protection measures are monitored and corrected where necessary.											
						Maintenance of all Storm Water Management systems must be undertaken regularly on site.											
						Where erosion is observed, corrective measures must be put in place.											
						The mine should implement adequate wet suppression techniques to limit dust release.											
						Regulated speed limits of 40km/hr must be maintained on gravel roads to minimize dust generation.											
Stockpiling of ROM Material	1, 4, 5, 6			-9		All disturbed areas adjacent to the expansion project infrastructural areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	-4										

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Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
Beneficiation Plants Operation Water Management Infrastructure Operation Railway Line Operation																	
Stockpiling of Mine Residue (WRD) Removal of Resources (opencast pit mining)	2, 3		Soil Contamination due to potential seepage and runoff from mining infrastructure (e.g. overburden) to high potential agricultural soils within the footprint, as well as the potential leakages in equipment/machinery leading to contamination.	-9	CbA	Regular monitoring of site activities and machinery must be undertaken to identify spills or leaks. All areas containing hazardous waste must be bunded with a capacity of at least 110% of stored volume. The spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans must be implemented. Any spills occurring during the collection process must be cleaned up immediatel. Soil that has been contaminated by spillages, seepages and leachates will be sampled and analysed. If necessary, the soils	-4	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation.	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent ECO to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	Independent ECO and SHERQ Department.	ECO: Monthly for the construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring
Stockpiling of ROM Material Beneficiation Plants Operation Water Management Infrastructure Operation Railway Line Operation	1, 4, 5, 6																

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Activities		**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						will be treated, ameliorated or removed for safe disposal.											
						Withdraw equipment for maintenance if change in emission characteristics is noticeable											
						Spill kits (such as spill-sorb or a similar type of product) must be kept on site and used to clean up hydrocarbon spills in the event that they should occur											
						Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited unless authorised and all construction rubble waste must be removed to an approved disposal site											
									Maintaining soil	x			x	Soil Erosion and incorrect	Appointment of an Independent		ECO: Monthly for the

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Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
								Retaining soil integrity for rehabilitation.	integrity, with successful vegetation establishment.					stockpiling of topsoil.	ECOto assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHERQ Department.	construction phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring
Removal of Resources (opencast pit mining)	3		Loss of Agricultural Land Capability due to Ongoing disturbances to soils, resulting in increased leaching of soil nutrients and risk of erosion, attributed to mining activities, potential increase in concentrations of contaminant concentration in the soil and ongoing disturbance as a result of maintenance activities, leading to altered terrestrial vegetation community structures, and consequently altering the quality and	-9	CbA	Due to the extent of the proposed expansion projects, mining (i.e., opencast pits excavation) should done in a phased manner and concurrent rehabilitation should occur as far as practically possible. This will allow the post closure land uses to potentially commence on the rehabilitated portions.	-4	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation.	Maintaining soil integrity, with successful vegetation establishment.	x			x	Soil Erosion and incorrect stockpiling of topsoil.	The SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	SHERQ Department.	ECO: biennial external audits can be undertaken. SHERQ: Weekly monitoring
Stockpiling of Mine Residue (WRD)	2			-11			-8	Protect the soil resources within the area in which the mine operates.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation.								
Stockpiling of ROM Material Beneficiation Plants Operation Water Management Infrastructure Operation	1 ,4, 5			-7			-4	Retaining soil integrity for rehabilitation.	Maintaining soil integrity, with successful vegetation establishment.								

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
Railway Line Operation	6		nutrient status of the soil	-13		No construction or project related activities may be undertaken outside of the demarcated areas. Clean and dirty water systems must be established prior to construction. Due to the extent of the proposed expansion projects, mining (i.e., opencast pits excavation) should done in a phased manner and concurrent rehabilitation should occur as far as practically possible. This will allow the post closure land uses to potentially commence on the rehabilitated portions Direct surface disturbance of the identified arable soils can be avoided where possible to minimise loss of arable soils	-6	Protect the soil resources within the area in which the mine operates.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation.								
Stockpiling of ROM Material Opencast Mining Operations Stockpiling of Mine Residue (WRD)	1, 2, 3, 4, 5, 6	Ecology (fauna and flora)	Proliferation of AIP species that colonise areas of increased disturbances and that outcompete native species, including the ongoing transformation of adjacent or	-13	CbA	Ongoing alien and invasive plant monitoring and clearing/control should take place throughout all phases of the project activities and within a 20m buffer of all activities. The project perimeters	-6	Limit the impact of the mining operation on the Ecological Setting of the area. Awareness creation on the importance of that natural	Eradication of invasive species within the mining area footprint. Successful self succession				x	Environmental Awareness Biodiversity Monitoring Assessments	Induction with the view on creating environmental awareness. Mine planning and Engineering Department annual involvement in the development	SHERQ, Engineering and Mining/Geology Department.	Induction: Annual refresher Annual Rehabilitation Plant: Annual update, and quarterly review Monitoring of

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
Beneficiation Plants Operation Water Management Infrastructure Operation Railway line operation			nearby natural and more sensitive habitat.			should regularly be checked for AIP proliferation to prevent spread into surrounding natural areas; and Management of AIPs during the construction-phase and operational-phase activities must be focused on limiting their introduction and preventing their spread. For example, roadsides should be monitored, as they serve as common corridors along which AIP species are introduced and dispersed, and disturbed areas should regularly be monitored for AIP recruitment until successfully rehabilitated		ecosystem in which the mine operates. Rehabilitation of disturbed areas with indigenous vegetation. Smallest possible area of disturbance.	to be achieved. 100% complianc e to remain with approved footprint areas. Initiate ongoing rehabilitati on practices						of the NEMA Financial Rehabilitation planning. Monitoring of fire breaks. Monitoring of compliance with EMPr.		fire breaks: Quarterly at least EMPr Internal Compliance Inspections: Annually EMPr External Independent Compliance Inspections: Annually Monitoring of the conditions of the Wetland Systems biannually (winter and summary monitoring). Annual vegetation monitoring of rehabilitated areas.
			Potential overexploitatio n through the removal and/or collection of important or sensitive floral SCC beyond the direct footprint area due to increased presence of employees and contractors on site.	-12		A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances. This could include the department infringing to supply new endemic tree species or plants to be planted in areas earmarked for rehabilitation.	-5										
			Additional pressure on floral habitat by	-13		No collection of indigenous floral or fauna species	-6										

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Activities		**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
			increased human movement associated with the proposed construction and operational activities, including increased vehicular movement, contributing to: • Overexploitation through the removal and/or collection of important or sensitive floral SCC beyond the direct footprint area; • Increased introduction and spread of AIPs; and • Increased risk of fire frequency			must be allowed by construction personnel, especially with regards to floral and faunal SCC. Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020) (see Section 4.3.2 of Annexure 7).											
			Possible increased fire frequency during operational phase.	-8		No illicit fires must be allowed during the operational phases of the proposed project. Fire breaks should be maintained during the construction and operational phases.	-5										
			Dust generated during construction and operational activities accumulating on the surrounding floral	-7		An effective dust management plan must be designed and implemented to mitigate the impact of dust on flora throughout the construction phase.	-4										

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			individuals, altering the photosynthetic ability of plants4 and potentially further decreasing optimal growing /re-establishing conditions.			Dust pollution have been associated with poor photosynthetic functionality in plants5. There is evidence of dust pollution leading to a reduction in chlorophyll, including chlorophyll degradation and reduced photosynthetic activity, resulting from dust deposition on leaf surfaces. Dust deposition also result in stomata clogging, which causes a decreased rate of carbon dioxide exchange, carbon assimilation, transpiration, and therefore decreased net photosynthesis.											
			Please refer to the construction phase for impacts relating to clearance, should this be required during the operational phase.	-		All management measures association for clearance during the construction phase remains relevant should this be required during the operational phase.	-										
			On-going disturbance during operational phase may lead to erosion and sedimentation	-9		In terms of ongoing rehabilitation: Rehabilitation of natural vegetation should proceed in accordance with the rehabilitation	-5										

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			of surrounding floral habitat.			plan – concurrent rehabilitation is recommended. This rehabilitation plan should consider all phases of the project indicating rehabilitation actions to be undertaken during and once construction has been completed, ongoing rehabilitation during the operational phase of the project as well as rehabilitation actions to be undertaken after operations have ceased; Appropriate shaping of disturbed areas is essential. To promote successful establishment of vegetation, the slopes must not be steeper than 1(V):5(H) or 1(V):3(H) (depending on engineering input and recommendations). New slopes should resemble/mimic the natural topography of the surrounding area. Where slopes are left steeper than what is											

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						recommended for whatever reason, additional measures will be required to prevent soil erosion and to appropriately manage stormwater; Any natural areas beyond the direct footprint, which have been affected by the construction or operational activities, must be rehabilitated using indigenous species; Floral monitoring should be done annually during operational activities. Please also refer to the monitoring guidelines in section 5.5; Rehabilitation must be implemented concurrently as per the rehabilitation plan, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and costs associated with it;											

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Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						and All soils compacted because of construction activities falling outside of the project area should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas.											
						Maintain Storm Water Management measures in good order.											
			Impact a fauna due to mining the presence of operations.	-12		Strictly enforced speed limits on all roads - not to exceed 40km/ hr.	-7		No animal fatalities to occur.								
						Keep an animal fatality register on site.											
						All vehicles must remain within demarcated footprint areas and haul roads.											
						At a minimum a short herbaceous layer must be maintained around the Railway Line Link Project so that a semblance of faunal habitat is reinstated in these areas.											
						Monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the											

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Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						species have established self-sustaining populations. Culverts under the railway lines should be placed in such a way to allow faunal species to move around these areas.											
Opencast Mining Operations	3	Freshwater Ecosystems	Operation of expanded Village Pit, including monitoring of sump in open pit and dewatering pipeline, and repairs if necessary, could result in: - Complete loss of CWs 15 and 21; - Increased risk of sediment transport in surface runoff or via wind from the overburden stockpile into neighbouring CWs, leading to altered water quality, altered vegetation community composition and potentially smothering biota and/or affecting egg banks; and	-10	R	Pollution prevention through appropriate management and monitoring of pollution prevention systems, with specific mention of the management of clean and dirty water separation systems, in order to prevent, eliminate and/or control potential pollution of soils, groundwater and surface water must be implemented. Include in the existing monitoring programme to detect and prevent the pollution of soils, surface water and groundwater A detailed ongoing rehabilitation plan must be developed for the mine. This plan must include the following: Continuous backfilling of opencast pit opportunities;	-6	Remain within or approve upon the current Aquatic Health and Water Quality baseline conditions. Remain with the conditions of the WUL	Improve upon the current aquatic health and water quality baseline conditions and where this is not possible, investigate rehabilitation opportunities to address impacts.				x	Compliance in terms of the current Water Use License. Remain within demarcated areas. Ongoing rehabilitation programmes (Annual Rehabilitation Plans) Compliance in terms of dust fall out limits.	Induction with the view on creating environmental awareness. Mine planning and Engineering Department annual involvement in the development of the NEMA Financial Rehabilitation planning. Monitoring of compliance with EMPr. Monitoring Aquatic and Ecological health. Monitoring soil.	SHERQ, Engineering and Mining/Geology Department.	Induction: Annual refresher Annual Rehabilitation Plant: Annual update, and quarterly review Groundwater monitoring: As per WUL EMPr and WUL Internal Compliance Inspections: Annually EMPr and WUL External Independent Compliance Inspections: Annually Monitoring of the conditions of the Wetland Systems biannually (winter and summary monitoring). Biennial soil monitoring.

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			Increased risk of erosion, leading to further altered topography/geomorphology, in turn resulting in altered runoff patterns and formation of preferential flow paths.			Rehabilitation trials to determine the most practical and suitable manner to rehabilitate waste rock dumps, unused haul roads, historically mined areas; Offsetting and/or recreation of disturbed Cryptic Wetlands.											Annual vegetation monitoring of rehabilitated areas.
						If possible, the overburden stockpiles must not be located within the catchments of the identified watercourses and should be located in an area where they will not impact on any hydrological features of increased importance within the study area, nor on those within the greater MRA, and outside the 100m GN704 Zone of Regulation associated with any freshwater resources within the MRA. Where existing WRDs are to be extended, should they encroach on watercourses or the applicable Zone of Regulation, authorisation must											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
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						be obtained prior to extension.											
			Blasting/mining activities in order to remove overburden and to extract the ore and removal of ore and overburden from the open cast pits, may result in: *Increase in dust; *Nitrates from blasting leading to potential eutrophication of the receiving environment and resulting in impairment of water quality within the catchment; *Complete loss of the CWs within the Village Pit expansion area.	-9	CbA	In applying the risk assessment, it was assumed that the mitigation hierarchy as advocated by the DEA (2013) would be followed, i.e. impacts would first be avoided. As the proposed expansion of the Village Pit will result in the irreversible impacts on two CWs, this is not feasible.	-5										
						Conduct biennial soil monitoring around areas where mining is not being conducted (within the Mining Rights area) to determine the impact of blasting and the effectiveness of dust suppression on soil resources - the outcomes of the analysis should be compared with an unimpacted baseline soil area.											
						Reduce airborne dust during blasting activities through damping dust generation areas with water (although not in sufficient quantities to generate runoff).											
			Increased risk of pollution of	-8	CbA	Measures to contain and reuse	-5										

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
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			surface water resulting from decant from the open pit (not further assessed - no decant to occure. Risk of leaks along the dewatering pipeline, potentially leading to contamination of ground and surface water, contamination of soil, and formation of preferential flow paths if not attended to.			as much water as possible within the mine process water system must be sought, and very strict control of water consumption must take place. Detailed monitoring must be implemented and maintained to ensure that all water usage is continuously optimised. The pipeline must be regularly inspected for leaks. Should any leaks be detected, pumping of water to the PCD must be stopped immediately whilst the leak is repaired. the event of any leaks/spills, all possible steps are to be taken to prevent the pollution of the receiving freshwater environment and the surrounding environment during repair.											
			Risk of formation of a cone of depression along the open cast area.	-12	R	Groundwater monitoring should be undertaken to determine the impact of dewatering on groundwater levels. Dewatering should only be	-11										

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						undertaken if absolutely necessary and in line with the WUL..											
			Operation of drill rigs, may result in increased risk of pollution of surface water resulting from spills (hydrocarbons) from drill rigs, and the increased risk of sediment transport due to movement of drill rigs and activities within freshwater resources (Sedimentation of cryptic wetlands could lead to altered water quality, altered vegetation community composition smothering of macroinvertebrate egg banks).	-8	CbA	Drilling must not take place within the delineated boundaries of cryptic wetlands (within the MRA) or their associated catchments, which must be determined by a suitably qualified specialist. Operation of drill rigs must preferably only take place during the dry winter period in order to minimise the risk of sedimentation; A spill prevention and emergency spill response plan should be compiled to guide the drilling works; and an emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur. Drill muds and fluids used must be chemically environmentally friendly.	-5										
			The drilling activities my result tin the alteration of the hydrological characteristics	-8	CbA	Operation of drill rigs near Cryptic Wetlands and recharge zones must preferably only take place	-5										

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
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			of the cryptic wetlands due to disturbances directly within the delineated boundaries of the CWs and/or their respective catchments.			during the dry winter period in order to minimise the risk of sedimentation.											
			Mining in the detrital area will lead to the damage to or outright loss of vegetation, leading to exposure and compaction of soil, in turn leading to increased risk of wind erosion and wind-borne sediment reaching downgradient episodic drainage line. Other impacts may also include: Increased sedimentation of the episodic drainage line may lead to changes to habitat, potentially altered surface water quality, smothering of vegetation and/or altered vegetation composition; Decreased ecoservice provision; Decreased	-9	CbA	Retain as much indigenous vegetation as possible as this will aid in preventing runoff from reaching the episodic drainage line.	-6										
						Please also refer to the construction management measures for clearance in this regard.											
						Reduce airborne dust during mining activities through damping dust generation areas with water (although not in sufficient quantities to generate runoff).											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			ability to support biodiversity; and Proliferation of alien vegetation as a result of disturbances.														
Stockpiling of Mine Residue (WRD)	2		Please refer to the construction phase for impacts relating to clearance, should this be required during the operational phase.	-	CbA	All management measures association for clearance during the construction phase remains relevant should this be required during the operational phase.	-										
			Seepage and runoff from WRDs, which could result in increased risk of pollution of groundwater, potentially leading to the formation of a contaminated groundwater plume, which may migrate downgradient of the WRD, thus possibly affecting the downgradient CWs and the increased risk of sediment transport in surface runoff (low risk due to climate) or via wind from the WRD to CWs, leading to altered water quality and sedimentation	-7	CbA	Water to be collected by means of stormwater trenches/berms, and recycled and utilised within the Beeshoek water circuit, or pumped to a Pollution Control facility for evaporation.	-4										
						Implement monitoring programme to detect and determine the formation and/or extent of any potential groundwater pollution plume as per an approved groundwater management plan.											

Name of Activity	**Project**		**Potential Impacts**	**Rating**		**Mitigation Type**	**Rating**			**Timeframes**				**Monitoring Requirements**			
Activities		**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughou t LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
			of CWs. Potential impacts may include: *Possible contamination of surface and ground water, leading to impaired water quality and salinations of soil (CWs are not driven by groundwater; risk is therefore considered negligible) (this is highly unlikely due to the characteristics of the waste rock and the outcomes of the hydrogeological report; and *Sedimentation of CWs could lead to altered water quality, altered vegetation community composition and smothering of macroinvertebrate taxa and/or their egg banks.														
			Alteration of the hydrological characteristics of the local catchment due to the deposition of the waste rock, which could lead to	-10	CbA	All Storm Water Management Measures must be maintained. Monitoring of erosion must take place throughout the life of mine, in order to prevent the formation of	-5										

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Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			potential erosion of terrestrial areas as preferential flow paths are formed in the landscape and the altered runoff peaks leading to changes in the pattern, flow and timing of water in the landscape.			erosion gullies as a result of altered flow paths, and the possible sedimentation of the receiving freshwater environment.											
			Loss of catchment yield due to stormwater containment, which could result in the reduction in volume of water entering the CWs, potentially impacting vegetation and macroinvertebrate communities	-10	ID	Determination of the loss of catchment yield did not form part of the scope of this study, however, due to the semi-arid climate and high evaporation rates of the region, loss of catchment yield is expected to be negligible. All Storm Water Management Measures must be maintained in line with GN704 requirements.	-7										
			Operation of drill rigs, may result in increased risk of pollution of surface water resulting from spills (hydrocarbons) from drill rigs, and the increased risk of sediment transport due to movement of drill rigs and	-8	CbA	Drilling must not take place within the delineated boundaries of cryptic wetlands (within the MRA) or their associated catchments, which must be determined by a suitably qualified specialist.	-4										
						Operation of drill rigs must preferably only take place during											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			activities within freshwater resources (Sedimentation of cryptic wetlands could lead to altered water quality, altered vegetation community composition smothering of macroinvertebrate egg banks).			the dry winter period in order to minimise the risk of sedimentation. A spill prevention and emergency spill response plan should be compiled to guide the drilling works; and an emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur. Drill muds and fluids used must be biodegradable.											
			The drilling activities my result tin the alteration of the hydrological characteristics of the cryptic wetlands due to disturbances directly within the delineated boundaries of the CWs and/or their respective catchments.	-11	CbA	Operation of drill rigs near Cryptic Wetlands and recharge zones must preferably only take place during the dry winter period in order to minimise the risk of sedimentation.	-5										
			Mining in the detrital area will lead to the damage to or outright loss of vegetation, leading to exposure and compaction of soil, in turn leading to increased risk of wind erosion	-10	R	Retain as much indigenous vegetation as possible as this will aid in preventing runoff from reaching the episodic drainage line. Reduce airborne dust during mining activities through damping dust	-6										

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Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			and wind-borne sediment reaching downgradient episodic drainage line. Other impacts may also include: Increased sedimentation of the episodic drainage line may lead to changes to habitat, potentially altered surface water quality, smothering of vegetation and/or altered vegetation composition; Decreased ecoservice provision; Decreased ability to support biodiversity; and Proliferation of alien vegetation as a result of disturbances.			generation areas with water (although not in sufficient quantities to generate runoff).											
Stockpiling of ROM Material Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation Plants	1, 2, 3, 4, 5, 6	Hydrology	Contamination of surface water resources. There are no surface water resources in the area, however, the natural runoff, which must be managed internally on site could	-6	CbA	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP. Excess water will be pumped out of the pit and stored as dirty water in the slimes dam. Surface water monitoring must continue in	-5	Remain within or approve upon the current Aquatic Health and Water Quality baseline conditions.	Improve upon the current aquatic health and water quality baseline conditions.				x	Compliance in terms of the current WUL. Remain within demarcated areas.	Ongoing Biodiversity and water quality assessments. Demarcation on site of all activities to be undertaken. Develop a procedure and schedule for the exploration	Aquatic Specialist. SHERQ Department and Hydrologist (for the GN704 Compliance)	Quarterly review of the drilling schedule in line with climatic considerations. Surface and Biomonitoring in line with the current monitoring programme.

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughou t LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
Operation Water Management Infrastructure Operation Railway line operation			become impacted			accordance with the approved WUL.. The opencast operations should be undertaken in line with the approved Mining Work Programme and EMP. Enviroberms should be implemented along the perimeter of the Opencast Pits. Erosion Control should be implemented on the Enviroberms to ensure the maintenance of its integrity. Maintenance of all Storm Water Management systems must be undertaken regularly on site.									activities in terms of the wet and dry seasons.		Inspection of the location of drilling sites - prior to commencemen t of each site. Surface Water Monitoring: Monthly. GN704 Compliance: Annually
Stockpiling of Mine Residue (WRD) Removal of Resources (opencast pit mining)	2,3		Alteration in the natural topography through the development of the pits and WRDs.	-11	R	Pits and WRDs should be kept to minimum footprint area. The creation of steep slopes should be avoided as far as possible. Avoidance of exploration activities taking place within the 1:50 year floodlines or within a 100m horizontal distance of a drainage line as required by GN704 Regulations.	-5										

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Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						Avoidance of exploration activities taking place near or within wetlands, seasonal depressions and recharge zone.											
Stockpiling of ROM Material Opencast Mining Operations Stockpiling of Mine Residue (WRD) Railway line operation	1,2,3,6		Potential hydrocarbon spillages washed into drainage lines and depressions	-10	CbA	Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide. Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be used under leaking machinery. Spillages should be reported immediately and spill kits should be readily available at all times.	-5										
Stockpiling of ROM Material Opencast Mining Operations Railway line operation	1,3,6		Loss of water quantity to downstream users. Due to the arid climate this is likely to be a very small to negligible impact.	-8	CbA	Berms placed around the pits to divert runoff around the pits. Backfilling of the pits. Reuse of runoff captured in the pits. Culverts should be maintained at the railway line to ensure that surface water runoff is not	-5										

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Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						impacted detrimentally.											
Beneficiation Plants operation Water Management Circuit	4, 5		Siltation of existing Storm Water Management systems	-9	CbA	The required clean and dirty water measures must be put in place around the two proposed plants, and where reworking activities are undertaken in order to rather contribute to the improvement of the overall water management circuit.	-5	Operate the water management circuit on site to increase mining efficiency and reduce the need for maintenance of these facilities.	implement the SWMP on site				x	Compliance in terms of GN704 and the SWMP; as well as Surface Water Contamination.	Annual compliance in terms of the designs of the facility and compliance in terms of GN704 must be undertaken. The water quality (constituents listed in the WUL) of the dam must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.	SHERQ Department and Hydrologist (for the GN704 Compliance)	Surface Water Monitoring: Monthly. GN704 Compliance: Annually
						Silt traps must be implemented in accordance with the SWMP, and these must be managed regularly to ensure that the capacity of the dams is not compromised by silt build up.											
			Potential contamination of clean water areas	-11	CbA	No water may be released directly into the environment without the necessary GN704 and NWA approvals.	-5	Restrict dirty water from clean water areas.	Limit water contamination and/or soil contamination.				x				
						Any dirty water spills/discharges beyond the mine boundary should be reported to the DWS and DMRE and measures to rectify the occurrence of these discharges should be implemented.											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						Level meters must be available at each of the dirty dams, to ensure that a proactive approach can be taken when the levels are reaching capacity.											
						Record dam level readings at least weekly.											
						All containment dams will be maintained to ensure that no leakages occur. A freeboard of 0.8m must be maintained. Overflow pipes will be kept clean. Sumps will be kept clean and all pumps will be maintained.											
						Slurry pipelines must be regularly inspected for spills and/or leaks.											
						All significant spills must be reported to the relevant authority.											
			Optimisation of water use circuit.	-11	CbA	The water balance must be updated annually, or as stipulated within the WUL conditions, with a strong focus on improving the management of the internal water circuit on site.	11										
						All containment dams will be maintained to ensure that no leakages occur. A											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						freeboard of 0.8m must be maintained. Overflow pipes will be kept clean. Sumps will be kept clean and all pumps will be maintained.											
						The water circuit must be managed at one central location to ensure that there is integration between the plant, Slimes Dam, and general surface water needs and requirements.											
Opencast Mining Operations	3	Hydrogeology	For this iron ore mines in dolomitic areas, groundwater drawdown is the most severe impact on the groundwater environment. With high hydraulic conductivities in the dolomite, cones of groundwater depressions are large, stretching over tens of kilometres. In comparison, groundwater contamination is minor due to the chemical inactive iron ore. During the operational phase, it is	-13	CbA	There are no obvious means of mitigating the impact of groundwater lowering by mining, except for monitoring surrounding boreholes and replacing lost groundwater extraction potential where applicable (where it can be demonstrated that external groundwater users have been impacted upon by the mine). Dewatering is primarily achieved through wellfields of abstraction boreholes and in pit dewatering points, and the combination	-11	Remain with the conditions of the WUL	Protection of groundwater resources.				x	Compliance in terms of the current Water Use License. Remain within demarcated areas.	Ongoing groundwater monitoring. induction with the view on creating environmental awareness.	SHERQ Department	Groundwater monitoring quarterly. Groundwater levels: monthly. Regional hydrocensus: every five years.

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			expected that the main impact on the groundwater environment will be dewatering of the surrounding aquifer. Water entering the mining areas will have to be pumped out to enable mining activities. This will cause a lowering in the groundwater table in- and adjacent to the pits being actively mined. Mining in this area has been ongoing for many decades, and there are historical impacts on the surrounding aquifer which are impractical to simulate in a numerical model. Thus, the currently prevailing groundwater levels (obtained from N&Z telemetric data from the UWQ website, mine monitoring data and the WIMS/Tshiping database) have been used as baseline for this			thereof functions with the purpose of keeping the pit floor dry by creating a cone of depression around the excavation. The pit floor was thus modelled as a drain, which in MODFLOW uses the bottom elevation of the drain as the hydraulic head that controls flow into the drain. In this way the individual position of dewatering boreholes has no effect on the extent of the cone of depression or groundwater level lowering. Dewatering borehole positions may be changed without notice as objectively they will be placed as close as possible to the excavation to maintain a dry pit floor. Currently, no additional groundwater is to be abstracted from the catchment as part of this project expansion. The groundwater monitoring programme must be implemented and undertaken in accordance with the approved WUL..											

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			study, and all dewatering impacts related to the current water levels. It was assumed that mining at Kolomela will continue to be mined at least for the lifetime of Beeshoek. The following observations were made: • No drawdown is expected for further mining at East Pit as the declining groundwater levels is predicted to be below the bottom of mining. • Drawdown at Village pit is predicted to extent to up to 2km from the pit in a mostly westerly direction, for an insignificant drawdown of 5 – 10 metres. Areas of significant drawdown is expected only in in the immediate vicinity of the pit, which could even decline with time as Leeuwfontein mining impacts			Establish the extent and nature of groundwater draw down zones with opencast mining over the remaining operational life of mine, to determine the possible adverse yield effects on the local groundwater users.											
						Excess water will be pumped out of opencast pits and stored as dirty water in the slimes dam (or licensed water tanks for reuse).											
						Dewatering of opencast pits should only be undertaken were absolutely necessity to ensure safe mining conditions.											
						A detailed Water Balance and Water Conservation and Demand Management Plan must be developed and continuously assessed to ensure that water is used in the most effective and conservative manner.											
						The mine must include the measurement of groundwater levels on the farm Aucampsrus and conduct a once off											

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			northward into this area. • HF Pit is predicted to have a minor impact limited to the immediate surroundings of the pit itself. • The BN Pit will have the biggest area of impact due to substantial increase in mining depth. Drawdown of groundwater levels will be up to about 100 m but limited to an area of about 1 km around the pit.			pump test, prior to the expansion of the Village Opencast Pit. A communication forum must be established between Kolomela Mine and Beeshoek to monitor the cumulative impact of dewatering on the region.											
			Surface water structures in this area is limited and serve mostly only as stormwater conduits. Furthermore, groundwater levels in the area are generally deep below surface, well beyond the depth of streams. Streams are not supported by baseflow (i.e. groundwater discharge into streams/rivers). It will thus not be affected by	-	-	No impact.	-	-	-	-	-	-	-	-	-	-	-

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			lowering of the groundwater levels.														
Stockpiling of ROM Material Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation Water Management Infrastructure Operation Railway line operation	1, 2, 3, 4, 5, 6		There have been several studies in the past proving that there is very little contamination potential at the mine. Nevertheless, the flow of a hypothetical contamination has been modelled to be thorough. A contaminant with a concentration of 100 (reflecting a value of 100% of initial contamination) has been modelled and projected 50 years into the future as if mining will extend that long. The flow in the aquifer will be directed mainly towards the mine at this stage and very little groundwater pollution is thus expected. some contamination could escape from the source in the north-east but is	-9	CbA	Identify and where possible, maximise areas of the mine that will result in clean storm water runoff (for example open veld areas) as well as infrastructure associated with the mine (for example office areas) and ensure that runoff from these areas is routed directly to natural watercourses and not contained or contaminated. Ensure that clean storm water is only contained if the volume of the runoff poses a risk, if the water cannot be discharged to watercourses by gravitation, for attenuation purposes, or when the clean area is small and located within a large dirty area. This contained clean water should then be released into natural watercourses under controlled conditions. Ensure the minimisation of contaminated areas, reuse of dirty water	-5	Remain within the current baseline groundwater conditions.	Improve of the current baseline groundwater conditions in terms of water quality. Ensure compliance with GN704 Compliance.				x	Remain within designed capacity of dirty water systems. Groundwater Quality	The capacity of the facility should be monitored and managed to ensure that no overflows are present. Groundwater monitoring	SHERQ and Engineering Departments.	Capacity monitoring: Daily Groundwater Quality monitoring: Quarterly

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			drawn into BN and Village Pit cone of depression. It is thus concluded that no contamination of the surrounding aquifer could take place during mining. This phase is not expected to influence the groundwater qualities. With the exception of minor oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality.			wherever possible and planning to ensure that clean areas are not lost to the catchment unnecessarily.											
						Ensure that seepage losses from storage facilities (such as polluted dams) are minimised and overflows are prevented.											
						Ensure that all possible sources of dirty water have been identified and that appropriate collection and containment systems have been implemented and that these do not result in further unnecessary water quality deterioration. This specifically relates to the WHIMS Plant dirty water infrastructure (Central Process Water Dam and Staging Stockpiles) and the new Section 21(g) water tanks.											
						Where contaminants are transported along construction roads, emergency containment and mitigation measures must be developed to minimize impacts should accidental											

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Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						spillages occur along the transport routes.											
						All water containment facilities, must maintain a 0.8m freeboard and comply with GN704 requirements.											
						Store all potential sources of contamination in secure facilities with appropriate Storm Water management systems in place to ensure that contaminants are not released to the water resource through Storm Water runoff.											
						Separate and collect all storm water that has a quality potentially poorer than the water quality specified and negotiated for the specific catchment into dirty water storage facilities for reuse within the mining operations.											
						Ensure that all storm water structures that are designed to keep dirty and clean water separate can accommodate a defined precipitation event. (The magnitude of the											

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						precipitation event used in such an objective statement must, as a minimum, adhere to the relevant legal requirements.)											
						Route all clean storm water directly to natural watercourses without increasing the risk of a negative impact on safety and infrastructure, e.g. loss of life or damage to property due to an increase in the peak runoff flow.											
						Ensure that the maximum volume of clean water runoff is diverted directly to watercourses and the minimum amount of storm water reports to the pit floor of an open cast mine.											
						The size of unrehabilitated areas (pit, spoils, unvegetated areas) that produce contaminated runoff should be minimised.											
						Monitoring of water storage facilities, particularly pollution control dams, is imperative to manage the risk of											

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Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						spillage from the dams. Stage-storage (elevation-capacity) curves are useful tools to monitor the remaining capacity within a water storage facility.											
						Prevent the erosion or leaching of materials from any residue deposit or stockpile from any area and contain material or substances so eroded or leached in such area by providing suitable barrier dams, evaporation dams or any other effective measures to prevent this material or substance from entering and polluting any water resources.											
						Water quantity and quality data should be collected on a regular, ongoing basis during mine operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements											

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						of the IWWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the catchment management agency.											
						Water that has been in contact with residue, and must therefore be considered polluted, must be kept within the confines of the Mine Residue Dumps until evaporated, treated to rendered acceptable for release, or re-used in some other way.											
						A system of storm water drains must be designed and constructed to ensure that all water that falls outside the area of the Mine Residue Dumps is diverted clear of the deposit. Provision must be made for the maximum precipitation to be expected over a period of 24 hours with a probability of once in one hundred years. A freeboard of at least 0.5 m must be provided throughout the system above the											

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						predicted maximum water level. This requirement applies to all Mine Residue Dumps , both fine and coarse-grained WRDs.											
						Ensure that the water use practices on and around the Mine Residue Dumps do not result in unnecessary water quality deterioration, e.g. use of the return water dam for storage of poorer quality water.											
						Where material spills take place along conveyors and railway systems, these should be collected and the area cleaned.											
Stockpiling of Mine Residue (WRD)	2		Rehabilitated WRDs	-9	CbA	The groundwater monitoring programme must be implemented and undertaken in accordance with the approved WUL.	-5		Achieve 100% complianc e to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.					Groundwate r monitoring Facility Stability	Mine planning and Engineering Department annual involvement in the development of the NEMA Financial Rehabilitation planning.	SHERQ, Engineering and Mine Planning	Groundwater monitoring quarterly. Annual rehabilitation plan update: Annually Rehabilitation review meetings: Quarterly
						Vegetation establishment must be monitored to ensure self-succession takes place.											
						Any signs of erosion on rehabilitated WRDs must be rehabilitated immediately.											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
			Decommissioned WRDs (West WRD partially rehabilitated;	-10		A rehabilitation plan for the decommissioned WRDs must be formulated to ensure that timeframes and actions are in place.	-5										
Beneficiation Plants Operation	4		Poor management of the slimes dam and improper monitoring of the geotechnical setting may result in contamination of groundwater	-9	CbA	A risk monitoring, surveillance and audit system (including boreholes for environmental monitoring) should be implemented for the life cycle of the slimes dam. The critical parameters should be monitored and analysed on a routine basis.	-6	Operate the Slimes Dam to contribute to the water management circuit on site to increase mining efficiency and reduce the need for maintenance of these facilities.	Improve the water circulation between the Plant and the Slime Dam to reduce the volumes of water held on the Slimes Dam by 2% every year for the next 5 years.	x	x		x	Compliance in terms of the current Water Use License. Remain within demarcated areas. Slimes Dam Stability	Ongoing groundwater monitoring. induction with the view on creating environmental awareness. Geotechnical Stability	SHERQ, Engineering Department	Groundwater monitoring quarterly. Groundwater levels: monthly. Regional hydrocensus: every five years. Stability Audit of Slimes Dam: Annually
						The Numerical Groundwater Model should be updated in line with the approved WUL.		Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.				x				
						The Slimes Dam will be maintained to ensure that no leakages occur. Overflow pipes will be kept clean. Feed water piping and return water piping will be maintained.											
						The disposal of slimes from the WHIMS plant should fulfil the facilities Code of Practice.											

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Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						The final rehabilitation strategy for the Slimes Dam will be dependent on the rehabilitation practices, for this reason the mine will reassess the rehabilitation strategy for the Slimes Dam annually with the closure cost assessment.			Reduce the need for water abstraction from the aquifer for the plant process by 5%.		x						
			Presence of additional Conservancy Tanks.	-6	CbA	The impact of the Conservancy Tanks is minimal considering the size and that these fall within the General Authorisation Limits. These limits should not be exceeded and no additional sewage sumps to those stipulated in the WUL should be constructed.	-5	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Operate dirty water systems to have no seepage.				x				
						The sludge from the Conservancy Tanks must be removed by licensed contractors and should be disposed of at a licensed facility fit for such purpose.			Operate a Storm Water System which is 100% in line with the approved SWMP.				x				
						Sporadic monitoring must be undertaken to determine whether any bacteriological contamination is present in the boreholes in											

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						proximity to the Conservancy Tanks.											
						Records of removal and safe disposal certificates must be available at the mine at any given time.											
						Any spills occurring during the collection process must be cleaned up immediatel.			Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.				x				
						A clean up procedure (i.e. Works Instruction) must be in place.											
ROM Stockpiling	1		For the ROM Stockpiles: - Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative. - For PM10, PM2.5 and dust fallout the extent of the potential impact is limited to the ROMs and does not extend beyond	-5	CbA	Install air quality monitoring stations that determine fallout and respirable dust (PM10) concentrations that could arise from the mining activities.	-5	Recording of dust fall out to determine trends.	Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.				x	Dust dispersion.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHERQ Department.	Monthly Monitoring with Annual Reporting.
						Dust suppression should be undertaken where and when dust is present.											

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			the mine boundary. • The predicted ambient concentrations resulting from the consolidated ROM activities are very low and the intensity is rated as very low for PM10, PM2.5 and dust fallout. • Although the intensity is very low, any impact will endure for the life of the consolidated ROM activities. The duration is therefore long term. • The consequence of the potential impact is very low for PM10, PM2.5 and dust fallout from the consolidated ROM activities. • As the intensity is low, the probability of air quality impacts beyond the mine boundary from the consolidated ROM are improbable for all pollutants.														

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			The significance rating is considered low for PM10, PM2.5 and dust fallout.														
Waste Rock Dump Operation	2		For the WRDs: • Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative. • For PM10, PM2.5 and dust fallout the extent of the potential impact is limited to the WRDs and does not extend beyond the mine boundary. • The predicted ambient concentrations resulting from the amended WRD emissions are very low and the intensity is rated as very low for PM10, PM2.5 and dust fallout. • Although the intensity is low, any impact will endure for the life of the amended WRD. The duration is	-8		Strictly enforce speed limits on all mine roads. Limiting site clearance to design areas. Rehabilitation of all areas on completion of construction activities. Implementation of dust control measures in the form of slope stability and implementation of a re-vegetation programme.	-5										

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			therefore long term. - The consequence of the potential impact is therefore very low for PM10, PM2.5 and dust fallout from the amended WRD. - As the intensity is low, the probability of air quality impacts from the amended WRD beyond the mine are improbable for all pollutants. The significance rating is considered low for PM10, PM2.5 and dust fallout.														
Opencast Operation	3		In terms of the opencast operations: - Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative. - For PM10, PM2.5 and dust fallout the extent of the potential impact is concentrated over the	-8		Monitoring of activities causing high dust fallout and manage these specific activities accordingly by actively using the existing dust fallout network.	-6										

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			Village Pit and extends over the eastern mine boundary. It does not extend to commercial or residential areas. - The predicted ambient concentrations resulting from the increased opencast emissions are low and the intensity is rated as low for PM10, PM2.5 and dust fallout. - Although the intensity is low, any impact will endure for the life of the increased opencast. The duration is therefore long term. - The consequence of the potential impact is therefore low for PM10, PM2.5 and dust fallout from the increased opencast. - The intensity is regarded as low, but as the predicted concentrations are exceeded														

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			beyond the eastern mine boundary air quality impacts from the increased opencast are probable for PM10. The significance rating is considered medium for PM10 and low for PM2.5 and dust fallout.														
Beneficiation Plants Operation	4		Beneficiation projects may result in the following impacts: • Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative. • For PM10, PM2.5 and dust fallout the extent of the potential impact is limited to the jig plant and does not extend beyond the mine boundary. • The predicted ambient concentrations resulting from the jig plant emissions are very low and the intensity is	-10	CbA	Installation, operation and maintenance of dust extraction systems at the secondary and tertiary crushing and screening plants. For crushing and screening operations at mineral processing plants, fugitive dust can be controlled with dust extraction systems and water sprayers. The application of chemical dust suppression systems at the primary crushing and screening (including the WHIMS and Jig Plants) plants. Where excessive dust is observed or analysed for in the dust monitoring programme, effective measure	-5										

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Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			rated as very low for PM10, PM2.5 and dust fallout. • Although the intensity is very low, any impact will endure for the life of the jig plant. The duration is therefore long term. • The consequence of the potential impact is therefore very low for PM10, PM2.5 and dust fallout from the Jig Plant. • As the intensity is very low, the probability of air quality impacts from the increased opencast are improbable for all pollutants. The significance rating is considered low for PM10, PM2.5 and dust fallout.			must be put in place to reduce such dust fall out. Covering all product transported by vehicles using tarpaulins.											
Railway Line Operation	6		The activities will be undertaken within existing authorised sidings (at TFR and Beeshoek). Limited increase in air quality is foreseen	-5	CbA	Install air quality monitoring stations that determine fallout and respirable dust (PM10) concentrations that could arise from the mining activities.	-5										

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
Opencast Mining Operations Beneficiation Plants Operation Railway line operation	3, 4, 6	Noise and Vibration	The undertaking of mining activities, operation of vehicles and machinery may lead to increased noise levels in the area, even though the mine has been operational in this area.	-9	CbA	Machinery and vehicles will be well maintained to prevent excessive nose and to comply with national and provincial regulations. All employees working within the area will be issued with protective gear. Blasting and train loading activities should be restricted to the day time as far as practically possible. Blasting arrangements and procedures must be in place to ensure that surrounding landowners are informed of blasting schedules. Property owners whose dwellings have been negatively affected should be compensated by the responsible mining company once it has been scientifically determined that such structures have been negatively affected by blasting activities related to mining activities. Seismological monitoring should	-5	Protect the ambiance of the area, as well as maintain good relationships with surrounding land users.	Implement a noise and vibration monitoring network.				x	Elevated Noise Levels. Elevated Vibration Levels.	Ambient noise monitoring should be undertaken. Vibration monitoring should be undertaken.	SHERQ Department.	Annual ambient noise and vibration monitoring must be undertaken: Annually Stakeholder Forum Meetings: Annually Seismological monitoring on boundary of mine: at each blast

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						be undertaken on the boundaries of the mine, especially to the east and west of the mining area (near East Pit, Village Pit and near HF Pit)											
						The mine must retain the 500m blasting radius around privately owned properties. Where the 500m buffer cannot be retained, the mine should engage with the impacted parties, and obtain written approval from the DMRE.											
						To mitigate the concern, it is recommended that vibration monitoring be undertaken on the boundary of the mine – The Drill and Blast Supervisor is in the process together with the Technical Services Department to acquire and additional Seismograph for further monitoring. Beeshoek has already set up a seismograph to measure the vibration in this area.											
-	-	Heritage	No further impacts foreseen during	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Activities		**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
			the operational phase. Please refer to the construction phase.														
Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation	2, 3, 4	Visual	Alteration in the current topography through the development of the pits and WRDs.	-11	CbA	The pits should be backfilled where possible. The WRDs should be vegetated as soon as practicably possible. Dust suppression measures should be implemented to limit the generation of dust.	-6	Stable Stockpile Designs Effective dust suppression. Well designed lighting system.	No exceedances in terms of dust emissions. Maintain relationships with surrounding landowners.				x	Compliance in terms of Dust Regulation limits.	Effective management of transfer points and wet suppression techniques. Ongoing dust monitoring.	Engineering Department and SHERQ Department.	Inspection on effectiveness of transfer points: Daily Dust monitoring: Monthly Stakeholder Forum Meetings: Annually
			The presence of additional Mine infrastructure such as the WHIMS and Jig Plants as well as the expansion of the pits and increase in the heights of the WRDs leading to impact on the cultural and heritage landscape.	-10	CbA	The natural landscape of the area has already been altered by mining. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed infrastructure. However, it is recommended that should the plant and other proposed infrastructure be painted, that earthy colours are used to blend in with the surrounding landscape. It is further recommended	-6										

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Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						that the pits are backfilled where possible and that the WRDs are vegetated upon rehabilitation.											
			Additional night lighting from proposed infrastructure.	-11	CbA	Down lighting and lighting shields should be used as far as possible, especially on WRDs.	-5										
			The movement of vehicles and heavy machinery during the operational phase will create a visual presence and will generate dust.	-9	CbA	Machinery, trucks and vehicles are already present on the Mine site and are unlikely create any additional significant presence. Dust suppression measures should be implemented to limit the generation of dust.	-5										
Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation	2, 3, 5	Social	It must be noted that the proposed developments at Village Pit and the East Pit are in close proximity to the residential area of Boichoko. Residents of Boichoko have complained about asthma related illnesses and the impact of mining on their overall health. The air quality study specifically considers the potential	-	No impact identified.	Install air quality monitoring stations that determine fallout and respirable dust (PM10) concentrations that could arise from the mining activities.	-	Effective dust suppression.	No exceedances in terms of dust emissions or PM2.5 and 10 emissions beyond the boundary where it can affect the health of land users. Maintain relationships with surrounding landowners.	-	-	-	x	Compliance in terms of Dust Regulation limits.	Ongoing dust monitoring.	SHERQ Department.	Dust monitoring: Monthly Stakeholder Forum Meetings: Annually

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Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			impact in terms of PM10 and 2.5 on sensitive receptors. No impacts in this regard has been found on sensitive receptors.														
			The dust pollution can be a nuisance factor to nearby communities and can impact negatively on the vegetation. The findings of the Air Quality Assessment indicated that the predicted concentrations (PM2.5 and PM10) and dust fallout are significantly below the respective NAAQS for all sensitive receptors. The impacts of the dust concentrations associated with the RoM consolidation and the WRD amendments, as well as for the Jig Plant and WHIMS would only occur in the immediately vicinity of these individual sources and within the mine boundary.	-8	CbA	Beeshoek Mine to keep a grievance register that is easily accessible and regularly monitored. Dust suppression methods as recommended in the Air Quality Assessment should be strictly implemented as required. On-going dust fall out monitoring must be undertaken to monitor emissions from the project.	-5										

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			These impacts were thus rated as low. The Air Quality Impact Assessment further found that the dust impacts in the vicinity of the Village Pit will mainly occur within the mine boundary, but can exceed over the southern and eastern mine boundary. The relatively high predicted concentrations are as a result of dust generated on the haul roads. These dust impacts, however, are not anticipated to reach residential or business areas. The impact was rated as medium prior to mitigation measures being implemented.														
Stockpiling of ROM Material Opencast Mining Operations Stockpiling of Mine Residue (WRD)	1, 2, 3, 4, 5, 6		The existing employment profile and staff compliment will be sustained during the operational period. No significant additional inflow of	-10	CbA	Beeshoek Mine must continue to prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of the Contractor Management Plan.	12	Positive contribution to the Socio-Economic Setting of the Local Municipality. Maintenance of logistical characteristics	Maintenance of relationships with surrounding landowners, mines and road users.				x	Monitoring of the Social and Labour Plan. Stakeholder Grievances	The HR department should remain in ongoing consultation with the Local Municipality. Regular stakeholder focus meetings	HR and SHERQ	Annual review and update of the SLP.

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Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
Beneficiation Plants Operation Water Management Infrastructure Operation Railway line operation			workers is thus expected. Beeshoek will function in a way as to continue the constant positive impact in terms of employment through their procurement and Human Resources department, who manages the employment in line with the relevant Score Cards.			Sub-contractors should adopt a recruitment policy to enhance employment positive impacts, limit in-migration of outside jobseekers and mitigate the potential impact of residual in-migration.		and requirements of the local area.	Meeting the approved objectives and goals of the SLP.						should be scheduled to discuss any perceived impacts or concerns.		
						Communities within the Tsantsabane Local Municipal area should be given preference if any new employment opportunities will be created, as these communities will be mostly affected by the existing approved mining activities and proposed infrastructure development. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally be available.											
						Beeshoek Mine, through their SLP, must continue to provide skills development opportunities for employees that could include functional literacy and numeracy											

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						programme, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training.											
						Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community.											
						Beeshoek Mine to continue to adhere to the Statutory Plans such as the Spatial Development Framework (SDF) with regards to infrastructure and housing.											
						Beeshoek Mine to continue with the mine's LED programme with the aim of strengthening the local economy and assist with socio-economic upliftment through sustainable initiatives.											
						Beeshoek Mine to continue to adhere to the Social and Labour Plans as per the Regulation 46 of the Mineral and Petroleum Resources Development Act											

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Activities		**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						(Act 28 of 2002) and the Mining Charter (2018).											
			Further continued economic benefits to the area will materialise through taxes, procurement of local goods and services, continued spending of employees and downstream employment creation. The latter can include the production of mining supplies (e.g. tools, protective clothing, steel and chemical products etc.) and other types of services to the mine e.g. catering, security services and so forth.	-10	CbA	Beeshoek Mine must continue to prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of the Contractor Management Plan. Sub-contractors should adopt a recruitment policy to enhance employment positive impacts, limit in-migration of outside jobseekers and mitigate the potential impact of residual in-migration. Communities within the TLM area should be given preference if any new employment opportunities will be created, as these communities will be mostly affected by the existing approved mining activities and proposed infrastructure development. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities	12										

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						where skills are locally be available.											
						Beeshoek Mine, through their SLP, must continue to provide skills development opportunities for employees that could include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training.											
						Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community.											
						Beeshoek Mine to continue to adhere to the Statutory Plans such as the Spatial Development Framework (SDF) with regards to infrastructure and housing.											
						Beeshoek Mine to continue with the mine's LED programme with the aim of strengthening the local economy and assist with socio-											

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Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						economic upliftment through sustainable initiatives.											
						Beeshoek Mine to continue to adhere to the Social and Labour Plans as per the Regulation 46 of the MPRDA) and the Mining Charter (2018).											
						Beeshoek Mine to continue with its Local Economic Development (LED) programme to strengthen the local economy and assist with projects that will uplift the community as a whole with local, sustainable initiatives relating to community and enterprise development, as well as infrastructural development.											
						Beeshoek Mine's Social Development Fund to be aligned with the requirements as set out in the Mining Charter of 2018.											
			Sense of Place: The presence of additional Mine infrastructure such as the WHIMS and Jig Plants as well as the expansion of the pits and increase in the heights of the	-10	CbA	The mitigation measures of the Visual Impact Assessment should be implemented.	-6	Stable Stockpile Designs Effective dust suppression.	No exceedances in terms of dust emissions. Maintain relationships with surrounding				x	Compliance in terms of Dust Regulation limits.	Effective management of transfer points and wet suppression techniques. Ongoing dust monitoring.	Engineering Department and SHERQ Department.	Inspection on effectiveness of transfer points: Daily Dust monitoring: Monthly Stakeholder Forum

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			WRDs leading to impact on the cultural and heritage landscape.						landowners.								Meetings: Annually
			Sense of Place: Additional night lighting from proposed infrastructure.	-11	CbA	· The mitigation measures of the Visual Impact Assessment should be implemented.	-5	Well designed lighting system.	Maintain relationships with surrounding landowners.				x			Engineering Department and SHERQ Department.	Stakeholder Forum Meetings: Annually
Opencast Pit Operations	3		Impact of dewatering on the yield of boreholes on the farm Aucampsrus	-11	CbA	The Mine must include the measurement of groundwater levels on the farm Aucampsrus and conduct a once off pump test, prior to the expansion of the Village Opencast Pit.	-8	Remain within the current baseline groundwater conditions.	Improve of the current baseline groundwater conditions in terms of water quality. Ensure compliance with GN704 Compliance.				x	Compliance in terms of the current Water Use License.	Ongoing groundwater monitoring.	SHERQ, Engineering and Mining/Geology Department.	Groundwater monitoring quarterly. Groundwater levels: monthly. Regional hydrocensus: every five years.
			Impact on dewatering on the groundwater resources of the overall municipality (specifically considering the Boichoko properties). The following observations were made: • No drawdown is expected for further mining at East Pit as the declining groundwater levels is predicted to be below the bottom of mining.	0	No impact identified.	Ongoing groundwater monitoring and level monitoring must be undertaken. Develop a resource use plan with the specific objective to minimise the mining operations' energy and water use as far practical Beeshoek Mine to ensure that the water quality and quantity issues are managed appropriately through engineering controls and through regular and required quality and quantity	0										

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			• Drawdown at Village pit is predicted to extent to up to 2km from the pit in a mostly westerly direction, for an insignificant drawdown of 5 – 10 metres. Areas of significant drawdown is expected only in in the immediate vicinity of the pit, which could even decline with time as Leeuwfontein mining impacts northward into this area. • HF Pit is predicted to have a minor impact limited to the immediate surroundings of the pit itself. • The BN Pit will have the biggest area of impact due to substantial increase in mining depth. Drawdown of groundwater levels will be up to about 100 m but limited to an area of about 1 km around the pit.			groundwater monitoring. The forum already established (if not yet in place) where the TLM, Sedibeng Water, DWS and all mining companies in the Postmasburg area should remain in order to discuss mitigation measures and the way forward in terms of the impacts of mining on the water resources. · The management and mitigation measures of the Hydrological Assessment and Numerical Groundwater Assessment must be strictly implemented.											
Stockpiling of ROM	1, 2, 3, 4, 5, 6		Community Safety and	-10	CbA	· A Fire/Emergency	-8	Positive contribution to	Maintenance of				x	Monitoring of the Social	The HR department	SHERQ, Engineering	Stakeholder Forum

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
Material Opencast Mining Operations Stockpiling of Mine Residue (WRD) Beneficiation Plants Operation Water Management Infrastructure Operation Railway line operation			Security Related Impacts As limited additional employees are foreseen and as the optimisation projects would be located within the mining rights area, few added safety and security risks are foreseen in the long term. Neighbouring residents however would remain concerned about the possible indirect impact of the increase in crime and trespassing on private properties due to a possible increase in people movement. Increased criminal activity (due to mining activities in the area and in general) could have increased negative impacts on livestock farming due to increased security costs such as electric fencing,			Management Plan should be developed and implemented, if not yet in place. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners. · Unauthorised entry onto the mining area must not be allowed. Access control should continue to be implemented. Mining areas must be secured and fenced. Warning signs would have to be posted to alert residents and road users to possible dangers associated with the construction of the road bridge on the R385. |Fences must be regularly inspected and damage to fences repaired.		the Socio-Economic Setting of the Local Municipality. Maintenance of logistical characteristics and requirements of the local area.	relationships with surrounding landowners, mines and road users. Meeting the approved objectives and goals of the SLP.					and Labour Plan. Stakeholder Grievances	should remain in ongoing consultation with the Local Municipality. Regular stakeholder focus meetings should be scheduled to discuss any perceived impacts or concerns.	and Mining/Geology Department.	Meetings: Annually Grievance Registered to be kept

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			additional costs to safeguard livestock and so forth. Concerns are further that some individuals involved with mining activities (e.g. casual labour) and/or jobseekers do remain in the area. Such practices result in unauthorised sub-letting which, if not contained, could not only become an indirect intensifying safety and security problem but also cause additional environmental pollution in the residential areas. Various heavy vehicles and general traffic make use of the R385 and the construction activities associated with the road bridge and railway link line could increase the risk of accidents. Warning signs would have to be posted to alert residents														

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			and road users to possible dangers.														
Opencast Mining Operations Beneficiation Plants Operation Railway line operation	3, 4, 6		The undertaking of mining activities, operation of vehicles and machinery may lead to increased noise levels in the area, even though the mine has been operational in this area.	-9	CbA	Machinery and vehicles will be well maintained to prevent excessive nose and to comply with national and provincial regulations. All employees working within the area will be issued with protective gear. Blasting and train loading activities should be restricted to the day time as far as practically possible. Blasting arrangements and procedures must be in place to ensure that surrounding landowners are informed of blasting schedules. Property owners whose dwellings have been negatively affected should be compensated by the responsible mining company once it has been scientifically determined that such structures have been negatively affected by blasting activities related to mining activities.	-5	Protect the ambiance of the area, as well as maintain good relationships with surrounding land users.	Implement a noise and vibration monitoring network.				x	Elevated Noise Levels. Elevated Vibration Levels	Ambient noise monitoring should be undertaken. Vibration monitoring should be undertaken.	SHERQ Department.	Annual ambient noise and vibration monitoring must be undertaken: Annually Stakeholder Forum Meetings: Annually Seismological monitoring on boundary of mine: at each blast

Name of Activity	**Project**		**Potential Impacts**	**Rating**		**Mitigation Type**	**Rating**			**Timeframes**				**Monitoring Requirements**			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	Throughout LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						· A Blasting and Vibrations Study must be considered. The aim of such as study would be to record and assess the conditions of the current structures in the area and how it could be affected by blasting activities.											
						Seismological monitoring should be undertaken on the boundaries of the mine, especially to the east and west of the mining area (near East Pit, Village Pit and near HF Pit)											
						The mine must retain the 500m blasting radius around privately owned properties. Where the 500m buffer cannot be retained, the mine should engage with the impacted parties, and obtain written approval from the DMRE.											
						To mitigate the concern, it is recommended that vibration monitoring be undertaken on the boundary of the mine – The Drill and Blast Supervisor is in the process together with the Technical											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**Throughout LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						Services Department to acquire and additional Seismograph for further monitoring. Beeshoek has already set up a seismograph to measure the vibration in this area.											
Waste Management		All	Please refer to Construction Phase measures	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 88: Impacts to be mitigated in their respective phases (Decommissioning Phase)

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
Legal Requirements (Environmental Permits)	1, 2, 3, 4, 5, 6	Legal Compliance	Unlawful activities could lead to NWA Directives and Section 24G Rectification fines.	-14	CbA	A legal assessment of all activities must be undertaken annually to ensure that all are licensed are in place and the team responsible for rehabilitation is aware of the latest legal requirements.	17	Operation in terms of the relevant legal requirements.	To operate within the enviro-legal ambits of South Africa.	Ensure that all activities undertaken by the mine are lawful with the required environmental licences in place.			x		Compliance in terms of Regulatory Requirements and the implementation of the EMP.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. Quarterly (construction); Biannually (after construction) internal audits must be undertaken during the construction phase, whereafter biannual internal audits can be undertaken, to ensure compliance with	Independent ECO & SHERQ
						A detailed closure plan must be developed five (5) years prior to closure and submitted to the relevant departments for approval.			To be aware of the latest environmental legal requirements.	Ensure that all environmental authorisations on site is implemented on site and ongoing monitoring of compliance are undertaken to reach 100% compliance.			x				
						All legally appointed personnel responsible or involved in activities				All Departments responsible for development of the mine, must			x				

Name of Activity			**Potential Impacts**	**Rating**		**Mitigation Type**	**Rating**			**Timeframes**				**Monitoring Requirements**			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						on site must receive training on the requirements of the Environmental Authorisations and EMPs				understand the requirements of the environmental legislation and must involve this into their planning processes.						the Environmental Authorisation and EMP. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.	
						Quarterly in ternal audits must be undertaken, on the lawful implementation of the Environmental Authorisation.											
						Environmental Authorisations must be available on site at all times.											
						The legal register must be updated to indicate all updated activities.											
General Surface Rehabilitation	-	Geology	No direct impact	-		-	-	-	-	-	-	-	-	-	-	-	-
	1, 4, 5, 6	Topography	Removal of infrastructure may impact on the topography.	-13	CbA	Linear Infrastructure constructed by the mine (roads, conveyors, railway lines, power lines) will be removed if it proves to inhibit land use at decommissioning. Where possible infrastructure will remain for social investment opportunities, this will be decided in conjunction with the Integrated Development Plan of the area and the local authorities.	14	Lawful removal of all infrastructure. Achieving final land use objectives.	Availability of safe disposal certificates. Free draining environment, with successful self-succession establishmen t.				x	Waste Disposal Ongoing Rehabilitation	Audits on safe disposal records and inspections at disposal sites. Inspections in terms of compliance with EMP commitments.	SHERQ Department	Monthly inspection of waste disposal records Biannual inspections of disposal sites Weekly inspections of rehabilitation progress.
						All haul roads and access roads will be rehabilitated by ripping these structures to a depth of 500mm or where											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						hard rock is encountered.											
						The overland conveyors and railway lines, if not used as a community initiative, will be dissembled and the components removed from the site. The material can either be sold as a unit or the components sold as scrap to the community initiative, will be dissembled and the components removed from the site. The material can either be sold as a unit or the components sold as scrap.											
						The overland conveyors and railway lines, if not used as a community initiative, will be dissembled and the components removed from the site. The material can either be sold as a unit or the components sold as scrap.											
						Ensure the entire site remains fenced for the duration of rehabilitation.											
						Retain security access control to the site for the duration of rehabilitation.											
						All fixed assets that can be profitably removed will be removed for salvage or resale (the salvage											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						and resale value have however not been incorporated into the closure cost estimate as per the legislative requirements).											
						All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the DMRE.											
						All surface infrastructure (pipelines, roads, temporary foundations) would be demolished and removed to a depth of 1m. Any infrastructure below 500cm will be sealed, made safe and left in situ. The Slimes Dam will be sloped to blend into the environment as far as practically possible											
						All fences erected around the infrastructure be dismantled and either disposed of at a permitted disposal site or sold off as scrap (provided that											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						these structures will no longer be required by the post mining land owner). Fences erected to cordon off dangerous excavations will remain in place and will be maintained as and when required. Water pollution control structures will remain until the completion of all demolition and associated rehabilitation activities where after these will be rehabilitated.											
		Landscape character	Rehabilitation towards final land use may not be achieved without the necessary planning.	-12	R	All haul roads and access roads will be rehabilitated by ripping these structures to a depth of 500mm. All infrastructure will be removed and rehabilitated, should no alternative use be found for the structures. Foundations will be removed to a depth of 500cm below surface or until hard rock is encountered. Compacted soils will be ripped and topsoil (where required) will be replaced. After ripping has been completed or the topsoil has been replaced the area should be ameliorated and	15	Achieving final land use commitments .	Free draining environment with successful self-succession in place.			x		Ongoing rehabilitation	An operational rehabilitation plan must be implemented and audited by the SHERQ Department.	SHERQ Department	Audit: Monthly Updated: Annually
															Monitoring of Vegetation Establishment	Ecologist	Quarterly
															Free drainage of surface water runoff establishment	Hydrologist	Quarterly

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						seeded, should self succession of vegetation not take place. Only species indigenous to the area will be included.											
						Drainage systems should subsequently be restored to reduce erosion and return flow patterns. Water diversion channels that have no further purpose will be backfilled and revegetated (where self succession does not take place).											
						Mining areas could be rehabilitated to a wilderness final state with a final land capability of about 60% of the original land capability according to the 2009 EMP.									Erosion formation inspection	SHERQ Department	Weekly
						The overland conveyors and railway lines, if not used as a community initiative, will be dissembled and the components removed from the site. The material can either be sold as a unit or the components sold as scrap.											
		Soil, Land Use and Land Capability	Spills in the area (hydrocarbons and tailings spills) may result in the contamination of soils.	-11	CbA	Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately.	-5	Protection of Soil Integrity.	Zero presence of contaminated land due to early detection and implementation of actions.				x	Soil Integrity	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHERQ department should	SHERQ Department	Annual External Audit. Daily internal inspections. Recording of incidents
						Regular monitoring of site activities and machinery must be undertaken to											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						identify spills or leaks spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans must be developed and be implemented. Withdraw equipment for maintenance if change in emission characteristics is noticeable. Spill kits (such as spill-sorb or a similar type of product) must be kept on site and used to clean up hydrocarbon spills in the event that they should occur Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site.									undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.		when occurring.
			Loss of soils due to decommissioning activities present on site.	-11	CbA	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas. Implement a strict	-5		Maintaining soil integrity, with successful vegetation establishment.				x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHERQ department should undertake ongoing site monitoring to	Independent ECO and SHERQ Department.	ECO: biennial external audits can be undertaken. SHERQ: Weekly monitoring

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						penalty fine system for rule breaking with regard to vehicular movement.									determine whether activities on site are undertaken in accordance with the EMP Requirements.		
						Maintain clean and dirty water systems and undertake regular monitoring and maintenance thereof.								Soil integrity analysis	Assessment of the fertility of Soils	Soil Scientist	Prior to placement of soils.
			The placement of soils as part of the rehabilitation programme must be undertaken a manner to protect the integrity of these resources. Incorrect placement and management could result in the loss of soil resources for rehabilitation.	-11	CbA	Soil must be place in line with an approved rehabilitation programme, where deemed necessary.	-6	Develop the area to its intended final land use.	Obtain buy in from stakeholders on the intended final land use.				x	Soil Erosion and incorrect stockpiling of topsoil.	Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept. Inspection of rehabilitation areas.	Independent ECO and SHERQ Department.	ECO: Weekly for the decommissioning phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring
						The rehabilitated areas should be demarcated to prohibit access to these sites until vegetation establishment has succeeded.			Implement an action plan to systematically plan for closure.								
						Chemical analysis must be imitated to determine the fertilisation and/or amelioration requirements if any.		Protect the soil resources within the area in which the mine operates.	Utilised stockpiled soils for rehabilitation .								
						Any signs of erosion must be rehabilitated immediately.			Self-succession of vegetation should establish within the first rainy season after construction has been completed.								
			The rehabilitation activities will ensure that the area be rehabilitated to its final land use.	-12	R	All compacted areas must be ripped. Topsoil must be placed in line with an approved	14	Develop the area to its intended final land use.	Obtain buy in from stakeholders on the intended final land use.				x				

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						rehabilitation programme.											
						The rehabilitated areas should be demarcated to prohibit access to these sites until vegetation establishment has succeeded.			Implement an action plan to systematically plan for closure.								
						Monthly inspections of the rehabilitation activities must be undertaken.											
						Storm Water Management Systems must remain in place up until rehabilitating in that area has succeeded.			Self-succession of vegetation should establish within the first rainy season after construction has been completed.								
						A detailed rehabilitation programme must be implemented and audited.											
						All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible.											
						Compacted soils adjacent to the mining and associated infrastructure footprint should be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation.											
						During the decommissioning phase the footprint should be thoroughly cleaned, and all											

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						building material should be removed to a suitable disposal facility											
						During the operational phase the mine would have conducted various rehabilitation trials. The most successful rehabilitation options recorded during the operational phase must be implemented on site.											
						A short-term fertiliser program should be based on the soil chemical status after levelling and should consists of a pre-seeding lime and fertilizer application, an application with the seeding process as well as a maintenance application for 2 to 3 years after rehabilitation or until the area can be declared as self-sustaining by an appropriately qualified soil scientist.											
		Ecology and Freshwater Ecosystems	The establishment of Weeds and Invader Species.	-13		An AIP control plan must be implemented on site and enforced. This programme must stipulate the monitoring plan, which should include capturing of areas where invader species are present; action plan to	-5	Limit the impact of the mining operation on the Ecological Setting of the area.	Return the site to the intended land use.				x	Invasion of Weeds and Alien Vegetation.	A weed eradication plan must be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to	SHERQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study (annually)

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						remove these; % successful removal). Where self-succession does not establish, harvested seeds and plants must be used in concurrent rehabilitation for any areas along the area which may be affected.									determine the status of revegetation on the site especially around the rehabilitated areas.		
			Unplanned loss of floral and faunal species of conservation importance	-14	CbA	Ensure that no further clearing of faunal habitat occurs. All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated as per the post-closure objective Rehabilitation efforts must be implemented for a period of at least five years after decommissioning and closure; The rehabilitation plan should consider all development phases of the project indicating rehabilitation actions to be undertaken during and once construction or operation has been completed. This will not only reduce the total disturbance footprint but will also reduce the	-6	Achieving final land use commitments .	Self-succession of vegetation should establish within the first rainy season after construction has been completed. Zero removal of species of conservation importance without the necessary permits in place.				x	Ongoing rehabilitation.	An operational rehabilitation plan must be implemented and audited by the SHERQ department.	SHERQ Department	Monthly

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						overall rehabilitation effort and cost.											
						No hunting/trapping or collecting of faunal species is allowed											
						Following heavy rains, all stormwater structures and erosion susceptible areas must be inspected, and any damage or early onset erosion rectified											
						Monitor the success of rehabilitation efforts of all areas that were disturbed and revegetated during the operational phase.											
						Prior to the removal of plant species, an ecologist should investigate the site (if not already done) to record all species of importance and which should be removed under tree removal permits. All such species should be demarcated by signage or tape.											
						Obtain tree removal permit prior to the removal of any protected species.								Vegetation Establishment.	An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHERQ Department	Monthly
						All employees, or contractors on site, involved in this project, should receive a detailed								Invasion of Weeds and Alien Vegetation.	A weed eradication plan must be implemented on site. This must	SHERQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						induction on the expectations for the protection of fauna and flora on site.									be undertaken prior to the growing season.		(annually or as required); Ecological Study (annually)
						No open fires must be allowed.											
						Harvesting of plants and poaching of animals will be prohibited and a fine system will be developed for any person not complying.											
						Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the closure/ decommissioning phase, and the immediate surrounding area (30m from the perimeters) should be regularly checked during the decommissioning phase for alien vegetation proliferation to prevent spread into surrounding natural areas. Alien vegetation control must be monitored. The alien floral control plan must be implemented for a period of at least 5 years after decommissioning and closure;											
			Accidental death of animals on the roads.	-13	CbA	Clearly marked signs will be erected along the transportation routes to create	-7	Awareness creation on the importance of	Zero animal fatality.				x	Creation of Awareness.	Induction with the view on creating	SHERQ Department	Annually for permanent staff.

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						awareness of animal crossings. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes. A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads. Vehicles may only travel on demarcated roads on site.		that natural ecosystem in which the mine operates. Implementation of safe operation practices.							environmental awareness.		Start of each visit for contractors.
		Surface Water	Erosion control over rehabilitated areas and the prevention of erosion gullies.	-10	CbA	The topography of all disturbed areas must be rehabilitated in such a manner that the surrounding natural area blends naturally with the rehabilitated areas well as to be free-draining. This will reduce soil erosion and improve natural re-vegetation. Temporary erosion measures should be employed at exposed areas until vegetated. The topography should be returned to its former state (as far as practically possible). Exposed areas should be vegetated as soon as possible. The soil stockpiles should be used to fill in areas and to	-6	Protect the water resources within the area in which the mine operates.	Maintenance of storm water management systems. Meeting the conditions in terms of Section 21c & of the WUL.				x	Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The water quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken	SHERQ Department	Assessments: Weekly. Monitoring: Monthly

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						create a suitable substrate to re-vegetate areas.									by an accredited laboratory. Monitoring of the effectiveness of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly inspections and keeping a photographic record.		
			Contamination of surface water as a result of removal of infrastructure.	-11	Cba	No water may be discharged into watercourses, if this water has not been treated to the correct quality OR if approval from the DWS for such activity has not been obtained. An alternative, would be to evaporate the water from these facilities.	-6										
						Once the dams are empty, any silt remaining in the dams should be disposed of on the approved Slimes Dam after chemical analysis proofs that the quality of the silt is in line with the disposal qualities in the approved WUL. If this is not the case the silt will either have to be treated, or disposed of at a licensed facility.											
						The dams should be demolished, and the liner and rubble should be classified to determine the type of landfill site suitable to cater for this material.											
						The containment dams will only be demolished should the area proof to be free draining with no pollution potential after rehabilitation.											

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			Natural runoff in the area must remain free flowing, which could be impacted if the opencast pits are not backfilled and compacted correctly. In the event that the opencast pits are not backfilled the runoff from the surrounding area can accumulate in the pits reducing the run off in the area.	-12	CbA	If opencast pits are not backfilled, enviroberms or a similar structure should be implemented to keep runoff from the opencast pits. Where backfilling is undertaken, only material as approved in the WUL may be used for such purpose. Backfilled areas must be compacted and shaped to ensure that subsidence is avoided. Backfilled areas must be demarcated to avoid any unauthorised access to these areas. Where self-succession does not establish, it is recommended that the mine investigate a seeding programme. Weekly inspection must be implemented to monitor and measure the progress of rehabilitation. Clean and dirty water systems must remain in the area until rehabilitation has been completed.	14										
			Rubble and waste from site could pollute local water resources.	-8	CbA	Waste must be removed to a licenced landfill site, if not possible to lawfully dispose on site.	-6										
		Geohydrology	No direct impact	0	-	-	0	-	-	-	-	-	-	-	-	-	-

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
		Heritage	Areas of the north mine can be demarcated as historical mining sites.	-13	R	Demarcate portions of the mining area which has a heritage value and preserve these in terms of a heritage plan, which includes the historical mining workings, and infrastructure associated with the North Mine.	14	Enhancement of the cultural heritage of the area.	Registration of historical infrastructure with the SAHRA. Protocol in place and implemented to create awareness of these facilities.			x		Enhancement of Cultural Significance in the area.	Identification of specific sites to be demarcated as historical site for protection. Management of the demarcated historical site to protect the integrity.	Heritage Specialist	Once Off Monthly
		Visual	Fugitive dust emissions as a result of infrastructure removal and associated exposed/bare areas may have an impact in terms of air quality and visual characteristics.	-11	CbA	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity. Establish and implement a dust suppression plan in consultation with the environmental control officer and an air quality specialist as part of the contractor's responsibility.	-5	Remain within the regulated guidelines and limits.	Recording of dust fall out to determine trends.				x	Dust dispersion.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHERQ Department.	Monthly Monitoring with Annual Reporting.
		Air Quality	All activities associated with the removal of infrastructure and rehabilitation has the potential to release dust.	-7	CbA	The dust monitoring network and dust suppression programme established during the construction phase of the project	-5	Remain within the regulated guidelines and limits.	Recording of dust fall out to determine trends.				x	Dust dispersion.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHERQ Department.	Monthly Monitoring with Annual Reporting.
									Meeting ambient dust				x				

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity.			fall out limits in terms of applicable NEM:AQA Regulations.								
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	-7	CbA	The removal of all infrastructure is to take place during daytime periods only.	-5	Remain within the regulated guidelines and limits.	Machinery with low noise levels and maintained in a good order to be used and to comply with the IFC's Health and Safety Regulations.				x	Noise Monitoring.	Adjacent landowners will be informed of the planned dates of the significant demolition activities where applicable. Daily noise monitoring will be undertaken in the areas where high levels of noise take place during decommissioning.	SHERQ Department.	Ongoing consultation with surrounding landowners. Daily noise monitoring.
						Where noise becomes a nuisance, management measures will be investigated and implemented to address these.			Health and Safety Regulations in terms of noise monitoring should be met.				x				
		Social	Disruption and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts.	-7	CbA	Local residents, with the focus on the surrounding landowners, should receive accurate information with regards to the project status, timeframes for decommissioning and other relevant information about issues that could influence their daily living and movement patterns.	-5	Remain within the regulated guidelines and limits.	The community forum established should continue, through which issues can be addressed, and a representative from Beeshoek should				x	Ongoing stakeholder consultation	Adjacent landowners will be informed of the planned dates of the significant demolition activities where applicable.	SHERQ Department.	Ongoing consultation with surrounding landowners.

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
									become involved.								
Earth Moving, shaping and ripping of ground	1, 2, 3, 4, 5, 6	Geology	No direct impact	0	-	-	0	-	-	-	-	-	-	-	-	-	-
		Topography	The shaping of the site should be undertaken in such a manner that it improves the overall topography of the site.	13	CbA	Pre-mining topography should be reasonably restored through shaping and landscaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas.	14	Develop the area to its intended final land use.	Implement an action plan to systematically plan for closure.				x	Final Land use	An operational rehabilitation plan must be implemented and audited by the SHERQ department.	SHERQ Department.	Monthly monitoring.
			Soil erosion	-16	CbA	Re-vegetate as soon as possible	-5	Develop the area to its intended final land use.	Continuous rehabilitation of the decommissioning area will be conducted in line with the Best Practice Guidelines released by the DWA.				x	Soil Erosion and incorrect stockpiling of topsoil.	Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	Independent ECO and SHERQ Department.	ECO: Weekly for the decommissioning phase. Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring Pedologist: Weekly assessment of soil rehabilitation.
			Ripping and topsoil replacement will restore the soil physical characteristics prior to re-vegetation.	13	CbA	Compacted soils will be ripped and topsoil will be replaced. After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. Where sites have been alienated of vegetation or where soils have been compacted or covered with concretes, these sites will be ripped and ploughed. The soils with the appropriate seedbed as stripped during the construction and operational phases will be placed over these areas to a depth as specified by a qualified specialist, should this be	14										

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						required. The soils shall be appropriately ameliorated to allow vegetation to grow rapidly if required – it should be noted that the mine will encourage self-succession of vegetation, if this does not take place effectively a re-vegetation project will be implemented											
		Terrestrial Ecology (Fauna & Flora)	The rehabilitation of the site will allow reestablishment of natural vegetation.	10	CbA	Compacted soils will be ripped and topsoil will be replaced. After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. Remove alien vegetation post decommissioning, with long term follow-up afterwards. On-going AIPcontrol are required through all phases of rehabilitation. If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil needs to be analysed and any deleterious effects must be corrected and the area be	13	Protect the Ecology within which the mine operates	Free draining environment with successful self-succession in place.			x		Invasion of Weeds and Alien Vegetation.	A weed eradication plan must be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHERQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study (annually)

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						seeded with a seed mix to specification											
						Access to rehabilitated areas should be restricted to vehicles/machinery specifically required for the implementation of the closure plan.											
		Hydrology	Runoff from rehabilitated areas will impact on sensitive pan systems especially during intensive rainstorms especially if the area is not free draining.	-5		The areas will be landscaped to be free draining in line with the approved storm water management plan.	13										
						Berms, should they be necessary, must remain upstream and downstream of the areas to ensure that clean water is kept separate from dirty water until the area is free draining and re-vegetation has occurred.		Protect the water resources within the area in which the mine operates.	Continuous rehabilitation of the decommissioning area will be conducted in line with the Best Practice Guidelines released by the DWA.	x				Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The water quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Monitoring of the effectiveness	SHERQ Department	Assessments: Weekly. Monitoring: Monthly

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
															of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly inspections and keeping a photographic record.		
		Geohydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-		-	-	-	-	-	-	-	-	-	-	-	-
		Visual	The rehabilitation (ripping, topsoil replacement and landscaping) will remove the visual incongruity.	11	CbA	An overall visual improvement will be noticed once all mining related infrastructure has been demolished and the area has been landscaped and re-vegetated. Demarcate the decommissioning area and limit the decommissioning activities as far as possible. Final shaping will be implemented such that the final profile of the rehabilitated areas is formed to emulate natural contours of the area.	13	Successful establishment of vegetation.	Remain within the designated area demarcated for activities. Remain within the National Environmental Management: Air Quality Act, 2004 Dust Regulation guidelines for rural communities.				x	Dust dispersion.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHERQ Department.	Monthly Monitoring with Annual Reporting.

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						Any foundations will be removed to a depth of 1m below the surface and the area rehabilitated. All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site, or made available to the local community as building materials (provided they are in a satisfactory condition following demolition). Linear infrastructure constructed by the mine (i.e. roads, railway line, conveyors and power lines) will be removed if it proves to inhibit land use at decommissioning. All fences erected around the infrastructure will be dismantled and disposed of at a permitted disposal site.								Vegetation Establishment.	An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHERQ Department	Monthly
		Air Quality	All activities associated with the removal of infrastructure has the potential to release dust.	-7	CbA	Dust sampling will be undertaken on a monthly basis. Monthly monitoring reports will be generated by the mine or through a suitably qualified air quality specialist. In the event that air quality or dust issues are identified based	-5	No concerns raised by surrounding landowners regarding air quality.	Remain within the designated area demarcated for activities. Remain within the National Environmental Management : Air Quality Act, 2004				x	Dust dispersion.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHERQ Department.	Monthly Monitoring with Annual Reporting.

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						on the monitoring programme, an independent specialist should be appointed to determine the best course of action to ameliorate the situation.			Dust Regulation guidelines for rural communities.								
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	-4	CbA	The removal of all infrastructure is to take place during daytime periods only. Where noise becomes a nuisance, management measures will be investigated and implemented to address these. Machinery with low noise levels and maintained in a good order to be used and to comply with the IFC's Health and Safety Regulations. Speed control measures will be implemented by the mine through the placement of adequate signage. Implement a penalty system for non-compliance to speed control measures and ensure that all workers are made aware of the penalty systems. Gravel roads to be maintained in as good and smooth a condition as possible.	-5	No concerns raised by surrounding landowners regarding air quality.	Remain within the designated area demarcated for activities. Remain within the National Environmental Management: Air Quality Act, 2004 Dust Regulation guidelines for rural communities.				x	Noise Monitoring.	Adjacent landowners will be informed of the planned dates of the significant demolition activities where applicable. Daily noise monitoring will be undertaken in the areas where high levels of noise take place during decommissioning.	SHERQ Department.	Ongoing consultation with surrounding landowners. Daily noise monitoring.
		Social	No direct impact	-		-	-	-	-	-	-	-	-	-	-	-	-
Specifics: Rehabilitation	2, 4	Topography	Reinstate the natural runoff to	-12	R	Ensure the WRDs are closed in line with	15	Achieving final land use	Free draining environment			x		Ongoing rehabilitation	An operational rehabilitation	SHERQ Department	Audited Monthly

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
of Waste Rock Dumps and Slimes Dam			limit seepage from the closed slimes dam.			the approved designs. Manage erosion on the slopes of the facilities to retain rehabilitated material. Provide suitable cover on the modified outer slope.		commitments .	with successful self-succession in place.						plan must be implemented and audited on site.		
		Ecology	Presence of invader species could impact on the natural succession of vegetation on the slopes of WRDs.	-13	CbA	An AIP eradication programme must be implemented on site and enforced. This programme must stipulate the monitoring plan, which should include capturing of areas where invader species are present; action plan to remove these; % successful removal).	-7	Limit the impact of the mining operation on the Ecological Setting of the area.	Reduce the presence of invader species by 90% on site.				x				
		Surface Water	Erosion of the side walls of the WRD could lead not only to instability, but also siltation of water resources.	-11	CbA	The side walls should be sloped to a degree which will allow stability and self succession of vegetation. The WRD must be shaped to be free draining and to blend in with the natural topography of the area.	14	Successful rehabilitation of WRDs to blend into the natural environment and ensure a free draining environment.	Slopes of WRDs should not exceed 1:3.				x	Surface Water Pollution & Soil Assessments. Rehabilitation Monitoring.	To ensure a proactive approach, the SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The water quality (constituents listed in the WUL) of the dam must be monitored monthly and records must be kept of these	SHERQ Department	Assessments: Weekly. Monitoring: Monthly
						Where self-succession does not establish, it is recommended that the mine investigate a seeding programme.			No ponding may be present on WRDs.				x				
						Clean and dirty water measures must be implemented around and on top of the			Self-succession of vegetation should establish				x				

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						facilities to manage water and runoff on and around the WRDs.			within the first rainy season after construction has been completed.						result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Monitoring of the effectiveness of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly inspections and keeping a photographic record.		
		Groundwater	Long term seepage, although indicated in the Waste Classification that it should not have a significant impact, can be reduced to improve the groundwater quality in the area.	-7	R	The side walls should be sloped to a degree which will allow stability and self succession of vegetation. The WRD must be shaped to be free draining and to blend in with the natural topography of the area. Where self-succession does not establish, it is recommended that the mine investigate a seeding programme. Any signs of erosion must be rehabilitated immediately. Clean and dirty water measures must be implemented around and on top of the facilities to manage water and runoff on	14	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.				x	Groundwater Pollution & Soil Assessments. Rehabilitation Monitoring.	To ensure a proactive approach, the SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The water quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited	SHERQ Department	Assessments: Weekly. Monitoring: Quarterly

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
						and around the facility.									laboratory. Monitoring of the effectiveness of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly inspections and keeping a photographic record.		
						Groundwater monitoring must continue up until closure is obtained.											
			Decommissioning and removal of facilities could lead to the infiltration of dirty water to groundwater resources.	-7	CbA	No water may be discharged into watercourses, if this water has not been treated to the correct quality OR if approval from the DWS for such activity has not been obtained.	14	Develop the area to its intended final land use.	Obtain buy in from stakeholders on the intended final land use.				x	Groundwater Pollution and potential trends & Soil Assessments.	To ensure a proactive approach, the SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory	SHERQ Department	Assessments: Weekly. Monitoring: Quarterly
						Once the dams are empty, any silt remaining in the dams should be disposed of on the lined Slimes Dam.			Implement an action plan to systematically plan for closure.				x				
						The dams should be demolished, and the liner and rubble should be classified to determine the type of landfill site suitable to cater for this material.		Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.				x				
						Groundwater monitoring must continue up until closure is obtained.											
			Contamination of soil resources due to hydrocarbon spills.	-6	R	Clean and dirty water separation systems should be incorporated in	-5	Utilise soil resources in a manner as to retain its	Implement the SWMP on site.				x	Soil Pollution.	Appointment of an Independent Environmental Control Officer to	Independent ECO and SHERQ Department.	ECO: Weekly for the decommissioning phase.

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Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						terms of the approved SWMP. Vehicles must be well maintained.		integrity for rehabilitation.							assess compliance with the EMP. The SHERQ Department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.		Thereafter biennial external audits can be undertaken. SHERQ: Weekly monitoring
						All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site			Maintain a 100% no-spill record.				x				
						Any spills occurring during the collection process must be cleaned up immediately. Any significant spills must be captured in the incident reports and must be reported to the relevant department (NCDENC, WUA, CMA, DWS). A clean up procedure (i.e. Works Instruction) must be in place.			Clean spills, if occur witan 24 hours.				x				
Specifics: Rehabilitation of Opencast Pits	3	Surface Water	Natural runoff in the area must remain free flowing, which could be impacted if the opencast pits are not backfilled and compacted correctly. In the event that the opencast pits are not backfilled the runoff from the surrounding area	-12	CbA	If opencast pits are not backfilled, enviroberms or a similar structure should be implemented to keep runoff from the opencast pits. The shape of the outer slopes of the opencast pits will be 16 degrees. Where backfilling is undertaken, only material as approved	14	Develop the area to its intended final land use.	Obtain buy in from stakeholders on the intended final land use.				x	Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP	SHERQ Department	Assessments: Weekly. Monitoring: Monthly

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			can accumulate in the pits reducing the run off in the area.			in the WUL may be used for such purpose.									Requirements. The water quality (constituents listed in the WUL) of the dam must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Monitoring of the effectiveness of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly inspections and keeping a photographic record.		
						Backfilled areas must be compacted and shaped to ensure that subsidence is avoided and that the area is free draining, resembling the natural surface topography.			Implement an action plan to systematically plan for closure.								
						Backfilled areas must be demarcated to avoid any unauthorised access to these areas.											
						Where self-succession does not establish, it is recommended that the mine investigate a seeding programme.			Self-succession of vegetation should establish within the first rainy season after construction has been completed.				x				
						Weekly inspection must be implemented to monitor and measure the progress of rehabilitation.											
						Clean and dirty water systems must remain in the area until rehabilitation has been completed.			No unnatural ponding of water on site should occur.				x				
		Groundwater	Natural runoff in the area must remain free flowing, to avoid unnecessary ponding in the opencast pits. In the event that the opencast pits are not backfilled the runoff from the surrounding area can accumulate in the	-11	CbA	If opencast pits are not backfilled, enviroberms or a similar structure should be implemented to keep runoff from the opencast pits.	14	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.				x	Groundwater Pollution & Soil Assessments. Rehabilitation Monitoring.	To ensure a proactive approach, the SHERQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance	SHERQ Department	Assessments: Weekly. Monitoring: Quarterly
						Where backfilling is undertaken, only material as approved in the WU may be used for such purpose.											

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**R, ID, CbA**	**Mitigation Measures**	**SaM**	**Objectives**	**Goals**	**ST (1-12 months)**	**MT (1-5 years)**	**LT (5 Years +)**	**LoM**	**Impacts Requiring Monitoring Programmes**	**Functional Requirements for Monitoring**	**Roles and Responsibilities**	**Monitoring and Reporting Frequency**
			pits reducing the run off in the area.			Backfilled areas must be shaped to ensure that subsidence is avoided. Backfilled areas must be demarcated to avoid any unauthorised access to these areas. Where self-succession does not establish, it is recommended that the mine investigate a seeding programme. Weekly inspection must be implemented to monitor and measure the progress of rehabilitation. Clean and dirty water systems must remain in the area until rehabilitation has been completed. Groundwater monitoring should continue up until closure has been obtained.									with the EMP Requirements. The water quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Monitoring of the effectiveness of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly inspections and keeping a photographic record.		
		Ecology	Presence of invader species could impact on the natural succession of vegetation on the slopes of WRDs.	-13	CbA	A weed eradication programme must be implemented on site and enforced. This programme must stipulate the monitoring plan, which should include capturing of areas where invader species are present; action plan to remove these; % successful removal).	-7	Limit the impact of the mining operation on the Ecological Setting of the area.	Reduce the presence of invader species by 90% on site.				x	Invasion of Weeds and Alien Vegetation.	A weed eradication plan must be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status of revegetation on the site especially around	SHERQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study (annually)

Name of Activity			Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities	Project	Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
															the rehabilitated areas.		
Cessation of Labour Contracts	1, 2, 3, 4, 5, 6	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil, Land Use and Land Capability	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Terrestrial Ecology (Fauna & Flora)	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Wetland	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Geohydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	Infrastructure areas could benefit the local community.	-15	CbA	Instead of demolition of certain areas, these areas could be sold off as commercial property for use in the local community. All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the Department of Mineral Resources (DMRE).	14	Optimally utilise buildings and infrastructure.	Safe disposal and lawful operation of infrastructure.				x	Socio-Economic Character	Engage in consultation with municipalities and local industries to determine the need and recycling of existing infrastructure.	SHERQ Department.	Ongoing consultation prior to demolition.
			Loss of Employment.	-15	CbA	The mine should continue with the skills development programme and Social and Labour	11	Ensuring successful skills development to allow for	Successful implementation of skills development and				x	Socio-Economic Character	Compliance with the Social and Labour Plan.	HR Department	Biannually up until closure has been achieved.

Name of Activity	Project	Impact Area	Potential Impacts	Rating		Mitigation Type	Rating	Objectives	Goals	Timeframes				Monitoring Requirements			
Activities			Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM			ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
						Plan commitments to empower the workforce to undertake other economically viable activities.		continued economically active people and opportunities in the area post mining.	opportunities on site.								
			Other impacts identified as part of the SIA includes: • Decline in the sustainability of the local economy as a result of the loss of employment, household income and capital investments; • Reduced economic activities within the area with subsequent negative impacts on smaller businesses; • A decline in the local economy would also have a direct impact on the financial status of the Tsantsabane Local Municipality; • Negative impact on the revenue base of the Tsantsabane Local Municipality; • Population changes and out-migration of people from the area, as well as	-15	CbA	Decommissioning and its associated closure programmes must ensure that communities are not left stranded without alternative forms of livelihoods, with subsequent degradation of the communities' socio-economic quality of life. As the timing with regards to decommissioning or the replacement of the infrastructure cannot be determined at this stage, it is recommended that a detailed Social Impact Assessment be undertaken at the time of decommissioning to determine the actual impacts on the changing social environment at that stage.	-10	Ensuring successful skills development to allow for continued economically active people and opportunities in the area post mining.	Successful implementation of skills development and opportunities on site.				x	Socio-Economic Character	Compliance with the Social and Labour Plan.	HR Department	Biannually up until closure has been achieved.

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			relocation of families; - Negative impact on the social fabric and social networks; - A new class of jobseekers targeting other mines in the area; - Skilled workers moving out of the area in search of employment elsewhere; - Decrease in the quality of life of the surrounding communities due to the discontinuation of social development support and local economic development programmes; - Negative impact on infrastructure development and maintenance; - A change in community infrastructure; - Disruptions and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts; - Increased safety risks associated with the decommissionin														

Name of Activity	Project		Potential Impacts	Rating		Mitigation Type	Rating			Timeframes				Monitoring Requirements			
Activities		Impact Area	Potential Impacts	SbM	R, ID, CbA	Mitigation Measures	SaM	Objectives	Goals	ST (1-12 months)	MT (1-5 years)	LT (5 Years +)	LoM	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency
			g of the infrastructure; - Possible negative impact on the crime levels due to increased unemployment rate; - Remnants of possible environmental impacts; and Remaining visual impact as a result of mining.														
Waste Management		All	Please refer to Construction Phase measures	-	-	-	-	-	-	-	-	-	-	-	-	-	-

2.e Impact Management Outcomes

Please refer to Table 85 to Table 88 for the impact management outcomes.

2.f Impact Management Actions

Please refer to Table 85 to Table 88 for the action plan recommended.

2.g Financial Provision

2.g.i Determination of Financial Provision

2.g.i.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22(2)(d) as described in 2.4 herein.

The proposed final land use would be to return the area to wilderness area as committed to in the various EMPr's preceding this application. The 2009 EMPr as approved states: "The post-operational land use is aimed at returning the entire Beeshoek footprint area to wilderness at 60% pre-mining capability". This would include demolishing surface infrastructure that will not be handed over to a third party and promoting indigenous plant growth through either achieving self-succession, or where this is not possible, reintroduce species through a seeding programme. It is evident that the re-establishment of this vegetation biome on site will not be difficult as areas that have already undergone rehabilitation have seen a large success in terms of the revegetation. The key in this area will be the management of Alien Invasive Species.

The Tsantsabane Local municipal area falls in the Gamagara Corridor. The Northern Cape Province Spatial Development Plan (NCPSDF (2012: 68)) defines the Gamagara Corridor as comprising the mining belt of the John Taolo Gaetsewe and ZF Mgcawu districts and runs from Lime Acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese. Economically, Tsantsabane Local Municipality is known for being rich in minerals, and for its mining, agriculture, manufacturing and farming sectors. The municipality has become one of the leading investment areas in the Northern Cape. Agriculture, mining, and tourism form the key economic drivers in this area. The spatial vision of the ZF Mgcawu District Municipality thus include:

- Tourism: Cultural, wilderness, floristic, river tourism ranging from the Kgalagadi international trans frontier park to the culture of the Riemvasmaak community to river tourism on the Orange River;
- Mining and mining beneficiation;
- Agriculture: riverbank vineyards and expansive stock and game farming in the Kalahari; and
- Renewable energy technology opportunities.

Wilderness setting, or the continuation of exploration to further develop opencast resources with in the approved Mining Rights Area falls within the spatial vision of the District Municipality.

It should be noted that the closure plan for the proposed projects will be revised as the implementation of the project progresses; this will ensure that the mine operation take advances in technology and rehabilitation methods into consideration.

The closure objectives leading to the financial provision determination is presented id Section 2.d.i of Part B).

2.g.i.2 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

The final landuse as presented in this report is based on the outcomes of the approved 2009 EMPr.

In addition to this, please refer to Part A, for the detailed discussion regarding I&AP Consultation. The detailed issues and response report is attached to Annexure 4. The draft EIA report and EMPr was made available electronically to all stakeholders and in hard copy to all commenting authorities. In general the rehabilitation objectives remains the same as per the approved EMPrs. However, a stronger ongoing rehabilitation approach is recommended as part of the presented management measures to ensure that the Mine Plan is developed considering the opportunities for rehabilitation – such as rather backfill before depositing waste rock onto WRDs.

2.g.i.3 Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure

This rehabilitation plan has taken into consideration all possible areas that need to be rehabilitated on the mine site either at closure, or as part of concurrent rehabilitation. The result of rehabilitation should be to return the entire project area to as close to its previous pre-mining state as is possible and practical.

All acceptable options for waste minimisation in terms of recycling and reuse should be considered before final disposal of any waste rock material, product or ROM, building materials, steel structures, electrical equipment or any associated equipment that could be reused, recycled or appropriately scrapped. When considering the latter, the license holder must consider the necessary licensing requirements in terms of the relevant waste legislation.

The rehabilitation plan is a working document and should be reassessed annually as part of the Closure and Rehabilitation Regulations as presented in the NEMA. The process of concurrent and ongoing rehabilitation may result in the realisation of alternative practices or potential obstacles. In this event, the plan will require updating.

Maintenance and monitoring will be required for at least a period of three years or until the end land use is achieved.

This maintenance should be undertaken in such a manner to ensure that all rehabilitated areas, re-vegetated areas and alien invasive control is undertaken effectively. Rehabilitation of disturbed areas, as far as is practical, should proceed concurrently with the remainder of the operational period. Disturbed areas should be rehabilitated as quickly as possible. The requirements for such are similar for concurrent and closure rehabilitation

As presented in Part A of this document, the following table presents the key closure requirements:

Table 89: Summary of Rehabilitation and Closure Actions

	Requirement	Target	Responsible Person	Timeframes
	General Surface Rehabilitation			
A	**Planning**			
A1	The closure plan will be reviewed during the life of the mine (closure, operational and decommissioning phases) as part of the NEMA Regulations for financial provision.	Legal closure review compliance.	Environmental Specialist	Annually during operational phase.
A2	Notify the DMRE of intended cessation of mining activities and rehabilitation in accordance with the NEMA.	Notification	Environmental Department	Five (5) years prior to closure.
A3	Apply for the necessary Environmental Authorisation for the decommissioning of activities in terms of the NEMA, NEMWA and NWA.	Environmental Authorisation.	Environmental Department	At least 2 years prior to intended decommissioning.
A4	Appoint a project manager to oversee the process.	Appointment of suitably qualified project manager.	Mine Manager	Prior to the commencement of closure planning and implementation.
A5	Where still present, asbestos roofs and materials containing asbestos must be identified and removed by a person competent to do so. Asbestos waste must be disposed of to an appropriately licenced facility.	Disposal of waste in terms of Asbestos regulations and the NEM:WA.	Engineering Manager and Environmental Department.	Demolition phase
A6	Identify any protected species that may require permitting prior to disturbing.	Biodiversity Permits	Environmental Specialist	Prior to commencement of rehabilitation.
A7	A storm water management plan (clean and dirty water separation) for the purposes of rehabilitating towards the final land use should be developed.	Free draining environment	Hydrologist/Engineer	Prior to commencement of rehabilitation.
A8	If any archaeological artefacts of potential significance are identified at any stage, work must cease and SAHRA must be notified for instruction on how to proceed.	Protection of artefacts	Environmental Specialist	Ongoing
B	**Removal of Surface Infrastructure and Structures**			

	Requirement	Target	Responsible Person	Timeframes
B1	Photographs of the infrastructure, before, during and after rehabilitation will be taken at selected fixed points and kept on record for the Manager (Group Environmental Department) and the DMRE's purpose.	Documentation of rehabilitation process.	Environmental Department	Ongoing
B2	All temporary buildings (pre-fabricated buildings) should be removed and their footprints rehabilitated.	Surface rights area cleared up of all mining related infrastructure and structures.	Project Manager	Ongoing
B3	All fixed assets that can be profitably removed will be removed for salvage or resale (the salvage and resale value have however not been incorporated into the closure cost estimate as per the legislative requirements).	Surface rights area cleared up of all mining related infrastructure and structures.	Project Manager	Ongoing
B4	All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the DMRE	Surface rights area cleared up of all mining related infrastructure and structures.	Project Manager	Ongoing
B5	Any item that has no salvage value to the mine but could be of value to individuals will be treated as waste, unless otherwise defined in terms of the NEMWA	Surface rights area cleared up of all mining related infrastructure and structures.	Project Manager	Ongoing
B6	All structures will be demolished, terracing removed and foundations demolished to 1m below the original ground level.	No remaining sub-surface structures that may impede further phases of rehabilitation or vegetation establishment.	Project Manager	Ongoing
B7	Dismantle and remove redundant fencing for salvage.	Surface rights area cleared up of all mining related infrastructure and structures.	Project Manager	Ongoing
B8	Water pollution control structures will remain until the completion of all demolition and associated rehabilitation activities where after these will be rehabilitated.	Free draining environment	Hydrologist/Engineer	Prior to commencement of rehabilitation.
B9	The soils beneath any structures used for the bulk storage of hazardous substances (i.e. bulk fuel and oil storage facilities, oil-water separators/sumps), must be made subject to a hydrocarbon contamination screening exercise undertaken by a suitably qualified, independent, professional.	Documented proof of contamination assessments on record. Compliance with any further recommendations from appointed specialist prior to further rehabilitation of contaminated site(s).	Project Manager	Ongoing
C	**Soil Preparation**			
C1	Where sites have been alienated of vegetation or where soils have been compacted or covered with concretes, these sites will be ripped and ploughed.	No topsoil replacement on compacted soil horizons.	Project Manager	Ongoing
C2	The topsoil and subsoils with the appropriate seedbed as stripped during the construction and operational phases will be placed over these areas to a depth as specified by a qualified specialist. The topsoil shall be appropriately ameliorated to allow vegetation to grow rapidly if required – it should be noted that the mine will encourage self-succession of vegetation, if this does not take place effectively a revegetation project will be implemented	Replacement of fertile topsoil.	Environmental Scientist	Ongoing
C3	On-going alien and invasive floral species control is required through all phases of rehabilitation.	No establishment of weeds or invasive species.	Environmental Scientist	Ongoing inspections.
C4	Pre-mining topography should be reasonably restored through shaping and landscaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas.	No evidence of significant alteration.	Project Manager	Ongoing

	Requirement	Target	Responsible Person	Timeframes
C5	The areas will be landscaped to be free draining in line with the approved storm water management plan.	Area to be fee draining	Project Manager	Ongoing
C6	If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil need to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification.	Successful vegetation establishment	Ecologist	Ongoing inspections.
C7	Appropriate erosion control measures (i.e. contour banks) must be taken where required.	No evidence of significant alteration.	Project Manager	Ongoing
C8	Care should be taken in choosing a method/machinery to implement C4 and C5 above, such that ripped soils are not compacted through efforts to appropriately shape the disturbed sites.	No topsoil replacement on compacted soil horizons.	Project Manager	Ongoing
C9	Access to rehabilitated areas should be restricted to vehicles/machinery specifically required for the implementation of the closure plan.	No unauthorised access.	Project Manager	Ongoing
D	**Soil and Vegetation replacement**			
D1	A topsoil/gravel mixture should be replaced over all rehabilitated area. Where topsoil is insufficient, subsoil must be treated in accordance with the specification of a soil specialist.	Replacement of fertile topsoil.	Environmental Scientist	Ongoing
D2	Topsoil should be screened, as necessary, to remove any foreign objects, rocks, etc., prior to the replacement thereof.	Replacement of topsoil that is fit for purpose.	Project Manager	Ongoing
D3	Any areas with slope ≥ 3° should be inspected weekly for signs of topsoil erosion following the replacement thereof, and appropriate action taken to curb any problematic areas.	No evidence of significant alteration.	Project Manager	Ongoing
D4	Self-succession should be encouraged. One rainy season will be allowed for self-succession to take place.	Successful vegetation establishment.	Ecologist	Ongoing inspections.
D5	If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil need to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification. Should self-succession of vegetation not take place, the Mine will implement a vegetation strategy to establish vegetation on these disturbed areas. Appropriate erosion control measures (i.e. contour banks) must be taken where required.	Successful vegetation establishment.	Ecologist	Ongoing inspections.
D6	No grazing on rehabilitated areas is to occur within three years of reseeding completion.	Documentation of rehabilitation process.	Project Manager	Three years from re-seeding.
E	**Disposal of Material**			
E1	Waste will be classified in terms of the NEM:WA to determine the required waste disposal strategies.	Classification of waste in terms of the NEMWA	Environmental Specialist	Prior to the commencement of closure planning and implementation.
E2	Rubble will be disposed of at a suitable site which will be rehabilitated once it serves its purpose. As per the 2009 EMP, the objective was made that the rubble shall be dumped in the waste landfill site on the Mine with approval by the relevant authorities. This activity should also comply with the relevant NEMWA requirements.	Safe disposal certificates.	Environmental Department	Ongoing
E3	All types of waste shall be removed entirely from the area and appropriately dealt with in respect of the general waste handling procedure	Safe disposal certificates.	Environmental Department	Ongoing
E4	Inert ceramics such as bricks, concrete, gravel etc. will be used as backfill or disposed of in a permitted waste disposal site according to the approved EMP, 2009.	Disposal of waste in terms of the NEMWA.	Environmental Department	Ongoing
E5	Inert waste, which is more than 1m underground, such as pipes will be left in place.	Disposal of waste in terms of the NEMWA.	Environmental Department	Ongoing
E6	Inert ceramic and buried waste with a salvage value to individuals such as scrap metal, building materials, etc. will be removed and disposed of at a proper facility.	Disposal of waste in terms of the NEMWA.	Environmental Department	Ongoing
F	**Ongoing monitoring and maintenance**			

	Requirement	Target	Responsible Person	Timeframes
F1	All rehabilitated areas will be fenced off up until the area is regarded as stable	No unauthorised access.	Project Manager	Ongoing
F2	All illegal invader plants and weeds shall be dealt with as required in terms of the relevant legislation	No establishment of weeds or invasive species.	Environmental Scientist	Ongoing inspections.
F3	External, independent, 'Mine Rehabilitation' compliance audits must be undertaken by a competent auditor for all areas where rehabilitation is being implemented at the mine at least quarterly. Audit to at least document compliance with this plan, as well as any other relevant provisions of the EMP revision approval by the DMRE.	Compliance with closure plan.	External Auditor	Quarterly
F4	The mine should undertake monthly internal compliance audits for all areas where rehabilitation is being implemented at the Mine.	Compliance with closure plan.	Environmental Department	Monthly
F5	Monitoring and maintenance of all natural physical, chemical and biological processes for which a closure condition has been specified must be monitored for three (3) years after closure or as long as required by the relevant authorities. Such processes include erosion of the rehabilitated surfaces, surface water drainage, air quality, surface water quality, groundwater quality, vegetative re-growth, weed encroachment and colonisation by animals.	Compliance with closure plan with at least 90% sustainable establishment of vegetation.	Environmental Department	Ongoing
	Specific Infrastructure Requirements			
G	**Product Stockpiles**			
G1	All material will be removed from the footprint area: - Where possible the product will be sold; - If the product cannot be sold, the material will be backfilled into the past opencast voids.	Optimal use of economically viable resources.	Mine Manager and Geologist.	Ongoing
G2	General Surface rehabilitation in terms of Part C and Part D will be implemented.	Successful implementation of General Rehabilitation Requirements.	Environmental Department	Ongoing
H	**Mine Residue Stockpiles**			
H1	Where possible Mine Residue Stockpiles, as indicated in the approved EMP will be reworked.	Optimal use of economically viable resources. Implementation of the waste reduction hierarchy.	Project Manager, Environmental Department.	Ongoing
H2	The slopes of the waste rock dumps will be shaped to be stable and that the structure blends into the surrounding environment. An overall gradient of 18 degrees should be achieved for the Mine Residue Dumps and WRDs to an overall gradient of 18 degrees and the associated gradient between benches of degrees. Slope modification will be achieved by means of either shaping existing WRDs to predetermined side slopes and associated bench configurations or adding waste rock shells with the required outer slopes and associated benches onto existing waste rock dumps with waste material as it is produced.	Ultimate compliance to the final land use requirements - free draining suitable for grazing land. (The properties adjacent to Beeshoek Iron Ore Mine have a very low grazing capacity (3ha per sheep and goat unit).	Project Manager, Civil Engineer	Ongoing, at least 2 years after final deposition of waste on site.
H3	Engineering design drawings for shaping and closure of the Mine Residue facilities, as developed by a competent civil engineer, must be submitted to the DWS and DMRE for written approval prior to commencing with the closure thereof.	Ultimate compliance to the final land use requirements.	Project Manager, Civil Engineer	Once-Off
H4	Clean and dirty water systems will be implemented to remain as long terms structures to ensure that the area is free draining as far as practically possible.	Free draining environment.	Hydrologist/Engineer	Prior to commencement of rehabilitation.

	Requirement	Target	Responsible Person	Timeframes
H5	Terraces and berms will be implemented to encourage the self-succession of vegetation and the reduced potential for erosion.	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
H6	Should self-succession not establish the Mine will cover the remaining waste rock dumps with the necessary topsoil and subsoil mixture, with the associated seedbed.	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
H7	The re-vegetation process will be monitored and encouraged until the area is regarded as stable.	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
H8	The waste rock dump will be fenced off until the vegetation is stable, and the rehabilitation is regarded to be finalised.	No unauthorised access.	Project Manager	Ongoing
I	**Slimes Dam**			
I1	The slopes of the Slimes Dams will be shaped to be stable and that the structure blends into the surrounding environment.	Ultimate compliance to the final land use requirements - free draining suitable for grazing land (The properties adjacent to Beeshoek Iron Ore Mine have a very low grazing capacity (3ha per sheep and goat unit).	Project Manager, Civil Engineer	Ongoing, at least 2 years after final deposition of waste on site.
I2	Clean and dirty water systems will be implemented to remain as long terms structures to ensure that the area is free draining as far as practically possible.	No evidence of significant alteration.	Project Manager	Ongoing
I3	Terraces and berms will be implemented to encourage the self-succession of vegetation and the reduced potential for erosion.	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
I4	Should self-succession not establish the mine will cover the remaining waste rock dumps with the necessary topsoil and subsoil mixture, with the associated seedbed.	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
I5	The re-vegetation process will be monitored and encouraged until the area is regarded as stable.	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
I6	The dam will be fenced off until the vegetation is stable and the rehabilitation is regarded to be finalised.	No unauthorised access.	Project Manager	Ongoing
J	**Opencast Pits and Detrital Mining Areas**			
J1	The opencast pits will be backfilled as part of the operational phase. The aim and objective of the final land use will be to limit any open voids. However, should it be found that opencast pit voids remain at the end of the mining operations, the following points will be initiated.	Ultimate compliance to the final land use requirements - free draining suitable for grazing land. (The properties adjacent to Beeshoek Iron Ore Mine have a very low grazing capacity (3ha per sheep and goat unit).	Project Manager, Civil Engineer	Ongoing, at least 2 years after final deposition of waste on site.
J2	The area will be made safe by the establishment of enviro-berms around the perimeter of the remaining voids in order to make the area safe and limit access.	No unauthorised access.	Project Manager	Ongoing
J3	The enviro-berms will be covered with indigenous thorny vegetation.	No unauthorised access.	Project Manager	Ongoing
J4	The outside slopes will be landscaped to be free draining.	Ultimate compliance to the final land use requirements.	Project Manager, Civil Engineer	Ongoing
J5	The surrounding topography of the area will be designed in such a manner as to allow storm water to run around the facility.	Free draining environment.	Hydrologist/Engineer	Prior to commencement of rehabilitation.

	Requirement	Target	Responsible Person	Timeframes
J6	The topsoil and subsoils with the appropriate seedbed as stripped during the construction and operational phases will be placed over these areas to a depth as specified by a qualified specialist. The topsoil shall be appropriately ameliorated to allow vegetation to grow rapidly if required – it should be noted that the mine will encourage self-succession of vegetation, if this does not take place effectively a revegetation project will be implemented..	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
J7	If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil need to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
J8	Appropriate erosion control measures (i.e. contour banks) must be taken where required.	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
J9	All rehabilitated areas will be fenced off up until the area is regarded as stable	No unauthorised access.	Project Manager	Ongoing
J10	All illegal invader plants and weeds shall be dealt with as required in terms of the relevant legislation.	No establishment of weeds or invasive species.	Environmental Scientist	Ongoing inspections.
K	**Clean and dirty water systems**			
K1	Clean and dirty water systems will be implemented to remain as long terms structures to ensure that the area is free draining as far as practically possible.	Protection of water integrity.	Project Manager	Ongoing
	The soils and sediment, contained in the dams, must be made subject to a hydrocarbon contamination screening and waste classification exercise undertaken by a suitably qualified, independent, professional.	Documented proof of contamination assessments on record. Compliance with any further recommendations from appointed specialist prior to further rehabilitation of contaminated site(s).	Project Manager	Ongoing
K2	Silt and sediment contained in these facilities should be disposed of onto the licensed Slimes Dam if classification proves allowed. If the material is regarded as hazardous with a contamination potential, lawful disposal of such material should be undertaken at a licensed facility.	Lawful disposal of waste.	Project Manager	Ongoing
K3	Proceed with general surface rehabilitation Part B-F.	Successful implementation of General Rehabilitation Requirements.	Environmental Department	Ongoing
L	**General Landfill**			
L1	The landfill on site should be backfilled during the life of mine. If space remains, then inert waste from demolition must be used to backfill the landfill to the height of the surrounding land profile.	Free draining environment	Hydrologist/Engineer	Prior to commencement of rehabilitation.
L2	The natural recharge over the landfill site should be reduced by the compaction of the area and vegetation of the site.	Free draining environment	Hydrologist/Engineer	Prior to commencement of rehabilitation.
	A storm water management system will be designed and implemented around the facility to reduce runoff over this system.	Reduce recharge.	Civil Engineer.	Prior to the commencement of closure planning and implementation.
L3	Engineering design drawings for capping and closure of the aforementioned facilities, as developed by a competent civil engineer, must be submitted to the DWS and DMR for written approval prior to commencing with the closure thereof.	Ultimate compliance to the final land use requirements	Project Manager, Civil Engineer	Once-Off

2.g.i.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The rehabilitation requirements stipulated in this EMPr is based on current approved closure conditions as approved in the mine's overall approved EMPr, as well as the input of various specialist studies as discussed in this report.

The rehabilitation measures require:

- Removal of infrastructure;
- Sloping of areas to be free draining where possible;
- Replacement of topsoil; and
- Allowance for self-succession, but where this is not possible, the implementation of a revegetation programme.

2.g.i.5 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

The amount that is required to both manage and rehabilitate the environment in respect of rehabilitation is **R 28 962 329,40** (excluding VAT). Please refer to Section 2.q in Part A for the detailed assessment.

Table 90: Financial Provision Summary

Summary	Total
Total excluding VAT, P&Gs and contingencies	**R 24 967 525,34**
Preliminary & General (6%) (6% as this is part of the overall processing activities)	R1 498 051,52
Contingency (10%)	R2 496 752,53
TOTAL (Excluding VAT)	**R 28 962 329,40**

2.g.i.6 Confirm that the financial provision will be provided as determined.

It is confirmed that the amount for outstanding rehabilitation can be provided from operating expenditure and in the form of either a Bank Guarantee or included in the mine's current Financial Rehabilitation Fund.

All areas disturbed will be included in the financial provision as calculated during the annual evaluation and will be updated and provided for annually as per the required Regulations.

2.h Mechanisms for monitoring compliance with and performance assessment against the EMPr and reporting thereon

The following sections present the monitoring requirements of the mine.

2.h.i Water Monitoring Programme

The main monitoring system applied at the mine is a combination of the OSHAS 18001 and the ISO 14001 and ISO 9000 Environmental Management Systems. This monitoring system requires frequent monitoring, record keeping, as well as auditing.

Beeshoek has adopted a no-discharge policy which ensures that all the dirty water is being reused in the mining system and will be monitored.

The current Beeshoek Mine Water Monitoring Programme consists of two major components of monitoring:

1. Groundwater monitoring – Quarterly frequency
2. Surface water monitoring (process water) – Monthly frequency

The Annual Consolidation Monitoring Report, dated May 2020, by GPT, stated that the monitoring programme is adequate in addressing the requirements for impact prediction. This was again confirmed in the 2021 Hydrogeological Report.

2.h.i.1 Groundwater Monitoring

The sampling of groundwater from the boreholes is undertaken utilising a tap which is installed at all supply boreholes or a top and bottom feeding bailer, depending on accessibility to the borehole.

All samples are sent for analysis at a South Africa National Standard (SANS) accredited laboratory.

Sampling is conducted by qualified personnel in order to obtain a representative sample as well as the highest possible scientific integrity. All Aquatico field technicians receive in-house training on sampling methodology to ensure the highest possible integrity of samples taken.

Sampling procedures are based on ISO standards such as:

- ISO 5667-1:2006 Part 1: Guidance on the design of sampling programmes;
- ISO 5667-2: 1991 Part 2: Guidance on sampling techniques;
- ISO 5667-3: 2003 Part 3: Guidance on preservation and handling of samples;
- ISO 5667-6: 2005 Part 6: Guidance on sampling of rivers and streams;
- DWAF Best Practice Guidelines Series G3: General Guidelines for Water Monitoring Systems; and
- DWAF Quality of domestic water supplies, Volume 02: Sampling Guide, 2003.

The current borehole monitored are indicated in the following table:

Table 91: Groundwater Monitoring Locations and Surface Water Monitoring Locations

Beeshoek Mine Water Monitoring Programme							
Locality	Description	Coordinates		Sampling Frequency			
		Latitude	Longitude	Monthly Jan - Dec	Quarterly Jan / Apr / Jul / Oct	Bi Annual Apr / Oct	Annual
Potable Water Localities							
BH SW02	Plant JIG	S28.29192	E22.99976	Inorg + Bact	-	In-situ Cl2	-
BH SW03	Tommys Field	S28.26646	E22.99061	Inorg + Bact	-	In-situ Cl2	-
BH SW05	Random drinking water locality	S28.28752	E23.00098	Inorg + Bact	-	In-situ Cl2	-
BH SW06	Uitsig Village	S28.28094	E22.99306	Inorg + Bact	-	In-situ Cl2	-
BH SW07	Beeshoek Main Reservoir	S28.30013	E23.00242	Inorg + Bact	-	In-situ Cl2	-
Surface Water Localities							
BH SW01	Slimesdam	S28.27417	E23.01333	Inorg + Bact	-	In-situ Cl2	-
BH SW08	BN Pit	S28.27764	E23.00479	Inorg + Bact	-	In-situ Cl2	-
Monitoring Boreholes							
WG11	Beeshoek Monitoring Borehole	S28.29913	E22.99435	-	Inorg + Bact + Zn	-	TPH
WG12	Beeshoek Monitoring Borehole	S28.29057	E22.98970	-	Inorg + Bact + Zn	-	TPH
WG28	Beeshoek Monitoring Borehole	S28.27392	E22.99548	-	Inorg + Bact + Zn	-	TPH
WG34	Beeshoek Monitoring Borehole	S28.31813	E22.98935	-	Inorg + Bact + Zn	-	TPH
WG35	Beeshoek Monitoring Borehole	S28.31984	E22.98395	-	Inorg + Bact + Zn	-	TPH
WG37	Beeshoek Monitoring Borehole	S28.32033	E22.98775	-	Inorg + Bact + Zn	-	TPH
WG62	Beeshoek Monitoring Borehole	S28.30110	E23.00093	-	Inorg + Bact + Zn	-	TPH
WG66	Beeshoek Monitoring Boreole	S28.27058	E23.00005	-	Inorg + Bact + Zn	-	TPH
WG70	Beeshoek Monitoring Borehole	S28.29937	E22.99231	-	Inorg + Bact + Zn	-	TPH
WG74	Beeshoek Monitoring Borehole	S28.29024	E23.01630	-	Inorg + Bact + Zn	-	TPH
Landfill	Landfill - Open Borehole	S28.27786	E22.99396	-	Inorg + Bact + Zn + Waste	-	TPH

Please refer to the following figure for the location of the monitoring points

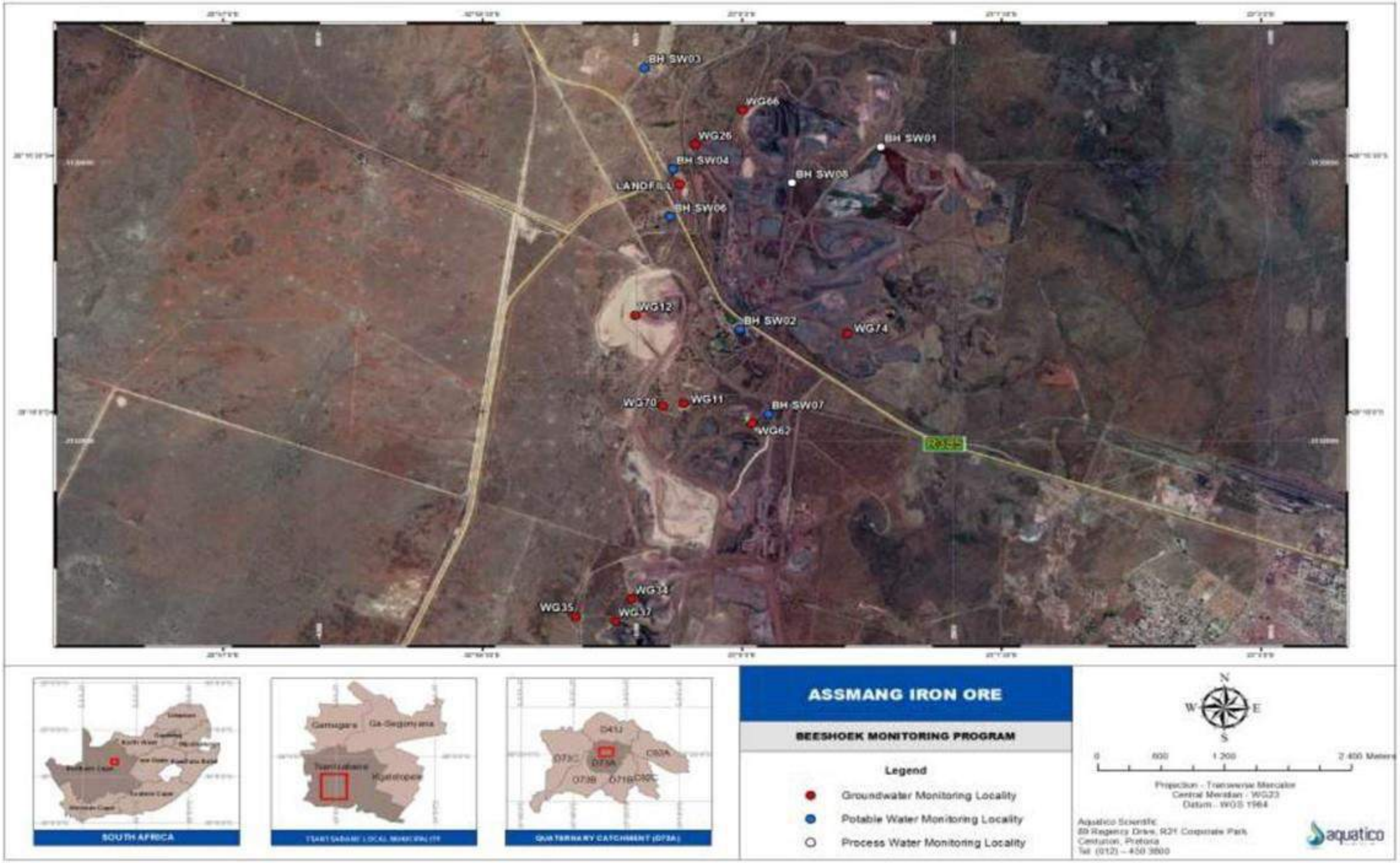

Figure 119: Ground Water Monitoring Location

The following constituents and compliance guidelines are considered:

Table 92: Monitoring parameters and compliance guidelines

BEESHOEK IRON ORE							
WATER MONITORING PROGRAMME - COMPLIANCE GUIDELINES							
Variable / Parameter	Description	Unit	DWAF General Limit	License Conditions Groundwater Quality Reserve	SAWQG Irrigation TWQGR	Quality of Domestic Water Supplies: Class 1 UL	SANS 241:2015 Drinking Water Limits
pH	pH level	-	5.5 - 9.5	4 - 10	6.5 - 8.4	4.5 - 10	5 - 9.7
EC	Electrical Conductivity	mS/m	150	150 - 370	40	150	170
TDS	Total Dissolved Solids	mg/l	(1000)*	1000 - 2450	-	1000	1200
Total Hard	Total Hardness	mg/l	-	-	-	300	-
M-Alk	Total Alkalinity	mg/l	-	-	-	-	-
Cl	Chloride	mg/l	-	200 - 600	100	200	300
SO4	Sulphate	mg/l	-	400 - 600	-	400	500
F	Fluoride	mg/l	1	1.5 - 3.5	2	1	1.5
NO3-N	Nitrate as Nitrogen	mg/l	15	10 - 20	-	10	11
NH4-N	Ammonium as Nitrate	mg/l	6	-	-	-	1.5
PO4	Phosphate	mg/l	10	-	-	-	-
Ca	Calcium	mg/l	-	150 - 300	-	150	-
Mg	Magnesium	mg/l	-	70 - 100	-	100	-
Na	Sodium	mg/l	-	200 - 400	-	200	-
K	Potassium	mg/l	-		-	50	-
Fe	Iron	mg/l	0.3	-	5	1	0.3
Al	Aluminium	mg/l	-	-	5	-	0.3
Mn	Manganese	mg/l	0.1	-	0.02	0.4	0.1
SAR	Sodium Adsorption Ratio	-	-	-	2	-	-
SOG	Soap, Oil and Grease	mg/l	2.5	-	-	-	-
T.coli	Total coliforms	CFU/100ml	-	-	-	10	10
E.coli	*Escherichia coli*	CFU/100ml	1000	1 - 10	10000	1	0
Turb	Turbidity	NTU	-	-	-	1	1

* Inferred, based on calculation using EC

2.h.i.2 Water Quality Limits

The following water limits have been included into the 2018 WUL:

Table 93: Water Quality Limits

Constituent	Attainable (C)
pH	4-5 & >9.5-10
Electric Conductivity (mS/m)	150-370
Total Dissolved Solids (mg/l)	1000-2450
Sodium (mg/l)	200-400
Magnesium (mg/l)	70-100
Calcium (mg/l)	150-300
Chloride (mg/l)	200-600
Sulphate (mg/l)	400-600
Fluoride as F (mg/l)	1.5-3.5
Nitrate as N0x-N (mg/l)	10-20
Faecal coliforms (counts/100ml)	1-10

2.h.i.3 Groundwater Level Monitoring

Groundwater levels must be monitored quarterly.

2.h.i.4 Surface Water Monitoring

No monitoring is proposed on natural water systems at this time, since the Groenwater Spruit is situated too far from the mining area – groundwater monitoring is being done to determine the impact of the dewatering on the water. Water monitoring is however undertaken at Process Water Systems, such as the Slimes Dam and BN Opencast Pit (in-pit).

2.h.i.5 Data Management

Water quality monitoring results are stored on a database for use in determining water quality trends. The results are used to update and confirm the groundwater model at the end of the operational phase. Quarterly reporting to the DWS is instituted as part of the IWWMP implementation.

2.h.ii Soil Monitoring

Dust fallout shall not contaminate soil and /or pollute any watercourse. For this reason it is recommended that the mine conduct annual soil monitoring events to determine the impact of dust fallout on the receiving environment.

Specific objectives of soil analysis are to:

- Measure soil acidity (using pH as scale);
- Measure the Electrical Conductivity (EC) using a saturated paste extract;
- Estimate the available concentrations of the following major nutrients in the soil: nitrogen as nitrate (NO_{3^-}) Calcium (Ca), Potassium (K) and Magnesium (Mg).
- Quantify selected trace elements that can be measured effectively in soil and are required in small amounts by crops, including, Iron (Fe) and Manganese (Mn); and
- Measure the concentration of Gasoline Range Organics (BTEXMN) and Total Petroleum Hydrocarbons (TPH).

Soil samples shall at least be analysed for pH, electrical conductivity (mS/M), Calcium (Ca) (mg/l), Aluminium (Al) (mg/l), Iron (Fe) (mg/l), Manganese (mg/l), BTEX and TPH (mg/l), and nitrate (NO_3 as N) (mg/l). Soil samples are to be compared with a reference site.

The monitoring reports must include recommended actions for implementation where required.

2.h.iii Flora Monitoring Programme

A floral monitoring plan must be designed and implemented throughout all phases of the proposed mining project, should it be approved. The following points aim to guide the design of the monitoring plan, and it must be noted that the monitoring plan must be continually updated and refined for site-specific requirements:

- Permanent monitoring plots must be established within (target area) and surrounding (reference area) all rehabilitated areas. These plots must be designed to accurately monitor the following parameters:
  - Species diversity and species abundance;
  - Recruitment of indigenous species and of alien and invasive species, including alien vs indigenous plant ratios;
  - Erosion levels and the efficacy of erosion control measures; and
  - Vegetation community structure including species composition and diversity which should be compared to pre-development conditions and work towards the post-closure objective.
- Monitoring of all the natural areas and relocated SCC should continue throughout the operational phase to ensure these systems are not adversely affected by associated activities;
- The rehabilitation plan must be continuously updated (i.e., adaptive management) in accordance with the monitoring results to ensure that optimal rehabilitation measures are employed. Adaptive management is an integral part of any rehabilitation plan as it assesses monitoring results to allow rehabilitation measures to be revisited and to be adapted accordingly;
- Results of the monitoring activities must be considered during all phases of the proposed project and action must be taken to mitigate impacts as soon as negative effects from mining activities become apparent; and
- The method of monitoring must be designed to be subjective and repeatable to ensure consistent results.

Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the closure/ decommissioning phase, and the immediate surrounding area (30m from the perimeters) should be regularly checked during the decommissioning phase for alien vegetation proliferation to prevent spread into surrounding natural areas. Alien vegetation control must be monitored. The alien floral control plan must be implemented for a period of at least 5 years after decommissioning and closure.

2.h.iv Storm Water and Clean and Dirty Water Infrastructure

Stormwater infrastructure must be monitored on a monthly basis during the dry season, and on a weekly basis during the wet season. The freeboard of the dirty water containment facilities (where these are open systems) must be inspected daily and records must be kept. Water infrastructure should further be monitored immediately after any large storm event. Should blockages, silted up structures or breaches occur, then immediate action must be undertaken to remove debris and repair breaches. Monitoring should be undertaken by the onsite Environmental Control Officer (ECO) or maintenance manager. Inspections must be recorded and should include the following:

- Date of inspection;
- Rainfall amount received in a 24-hour period prior to inspection;
- Photographs of blockages, silted up structures or breaches witnessed;
- Actions taken to fix issues and the amount of time taken to address them; and
- Photographs post action taken.

Inspection reports should be prepared on a monthly/quarterly basis and should be kept ready and supplied to the DWS when requested, or as part of the WUL conditions.

GN704 Audits must be conducted annually by a hydrologist.

2.h.v Air Quality Monitoring

Beeshoek Mine has been measuring dust fallout since 2005.

Monitoring is currently done at nine sites using the SANS 1929:2005 and ASTM Standard, D1739-98: Standard Test Method for the Collection and Measurement of Dust fall (Settleable Particulate Matter). Dust monitoring is undertaken using the latest ASTM standards. PM10 and 2.5 monitoring is also undertaken at the South Mine area.

Fall out monitoring is undertaken within a 28—31 day schedule.

Please refer to the following figure for the location of the monitoring points.

Figure 120: Location of the dust fallout buckets at Beeshoek (DustWatch, 2019), the PM10/PM2.5 sampler and the SAWS weather station

2.h.vi Socio-Economic Monitoring

From a social perspective the following objectives and measures, as summarised in the table below must be implemented.

Table 94: Socio-Economic Risk Management and Monitoring Plan

Objective 1:	**Maximise local employment opportunities and local procurement during construction and operation and minimise job losses during decommissioning and closure; impact on socio-economic development through continued operations**	
Mitigation: Action/Control	**Responsibility**	**Timeframe**
Prioritise any possible new local labour in the recruitment process as part of the company's own recruitment policy or as part of the contractor management plan and stipulate the procurement of new employees, especially in the unskilled category, from the local communities.	Beeshoek Mine and contractor	Construction and Operations
Provide up-skilling opportunities for unskilled and semi-skilled local workers during the construction phase to allow them to become more employable for operational activities.	Beeshoek Mine and contractor	Construction
Explore possible placement of local construction workers in mining operations.	Beeshoek Mine and contractor	Construction
Beeshoek Mine must continue to prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of the Contractor Management Plan.	Beeshoek Mine and contractor	Construction and Operations
Sub-contractors should adopt a recruitment policy to enhance employment positive impacts, limit in-migration of outside jobseekers and mitigate the potential impact of residual in-migration.	Beeshoek Mine and contractor	Construction and Operations
Communities within the TLM area should be given preference if any new employment opportunities will be created, as these communities will be mostly affected by the existing approved mining activities and proposed infrastructure development. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally be available.	Beeshoek Mine and contractor	Construction and Operations
Beeshoek Mine, through their SLP, must continue to provide skills development opportunities for employeesthat could include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training.	Beeshoek Mine	Construction and Operations
Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community.	Beeshoek Mine	Construction and Operations
Beeshoek Mine to continue to adhere to the Statutory Plans such as the Spatial Development Framework (SDF) with regards to infrastructure and housing.	Beeshoek Mine	Construction and Operations
Beeshoek Mine to continue to adhere to the Social and Labour Plans as per the Regulation 46 of the MPRDA and the Mining Charter (2018).	Beeshoek Mine	Construction and Operations
Beeshoek Mine to continue with its Local Economic Development (LED) programme to strengthen the local economy and assist with projects that will uplift the community as a whole with local, sustainable initiatives relating to community and enterprise development, as well as infrastructural development.	Beeshoek Mine	Construction and Operations
Beeshoek Mine's Social Development Fund to be aligned with the requirements as set out in the Mining Charter of 2018.	Beeshoek Mine	Construction and Operations
Monitoring	Annually as per the agreed commitments and procurement strategies	
Objective 2:	**Minimise any potential negative impacts associated with the inflow of workers and jobseekers**	
Mitigation: Action/Control	**Responsibility**	**Timeframe**
Maximise the use of local labour and contractors where possible by developing a strategy to involve local labour in the construction and operational process.	Beeshoek Mine and contractor	Construction and Operations
The development, publication and widespread dissemination of a recruitment policy could serve to encourage local employment and reduce the potential influx of jobseekers to the area.	Beeshoek Mine	Construction and Operations
The communication strategy should ensure that unrealistic employment expectations are not created.	Beeshoek Mine and contractor	Construction and Operations
A representative of Beeshoek Mine could liaise with the local leaders and local councillors to either attend key community meetings arranged within the affected wards to discuss the possible employment and recruitment process; or liaise with the local leaders and local councillors to ensure that	Beeshoek Mine	Construction and Operations

the correct information regarding this issue is portrayed to the communities.		
Beeshoek Mine should, where possible, support efforts by TLM to limit squatting and sub-letting in the area, e.g., no informal settlements should be allowed within the mining rights area.	Beeshoek Mine and TLM	Construction and Operations
As per the Beeshoek SLP, the Beeshoek Mine has through the Khumani Housing Development Company, built 357 homes in the main residential areas of Postmasburg, namely Boichoko (51), Postdene (163) and Airfield (143). Beeshoek Mine plans to continue with this strategy and has stipulated the plans in the SLP.	Beeshoek Mine	Construction and Operations
Beeshoek Mine must continue with their assistance in the provision of housing infrastructure as discussed in the Assmang Iron Ore Social and Labour Plan for Beeshoek Iron Ore Mine: 2019-2024.	Beeshoek Mine	Construction and Operations
Review and update of the SLP after 2024 must specify efforts by Beeshoek Mine to continue to seek sustainable and collective solutions to the issue of housing for employees and other housing challenges in the area.	Beeshoek Mine	Construction and Operations
There should be ongoing engagements between Beeshoek Mine, the relevant housing forums and working groups, as well as the TLM with regards to housing policies, models and challenges	Beeshoek Mine	Construction and Operations
Monitoring	Beeshoek Mine and TLM annually	
Objective 3:	**Minimise intrusion impacts**	
Mitigation: Action/Control	**Responsibility**	**Timeframe**
Unauthorised entry onto the mining area must not be allowed. Access control should continue to be implemented.	Beeshoek Mine and contractor	Construction and Operation
Mining areas must be secured and fenced.	Beeshoek Mine and contractor	Construction and Operations
All construction vehicles should be in a good condition and adhere to road worthy standards.	Beeshoek Mine and contractor	Construction
Construction vehicles must keep to speed limits.	Beeshoek Mine and contractor	Construction
Limit construction hours to daylight hours e.g., 6am to 6 pm.	Beeshoek Mine and contractor	Construction
Road users must be notified if delays would be experienced due to the road bridge construction.	Beeshoek Mine and contractor	Construction
Warning signs with regards to the construction activities need to be erected at strategic places along the R385 and must be clearly visible at night.	Beeshoek Mine and contractor	Construction
Road deviations must be clearly indicated by road signs and must be clearly visible at night.	Beeshoek Mine and contractor	Construction
Access to the R385 and Olifantshoek Road to Kolomela Mine must be ensured at all times.	Beeshoek Mine and contractor	Construction
Speed limits around the construction sites should be lowered for the duration of the construction period.	Beeshoek Mine and contractor	Construction
The construction schedule of the railway link line and bridge on the R385 must be discussed and finalised in consultation with directly affected landowners and Kolomela Mine.	Beeshoek Mine and contractor	Construction
Dust suppression (e.g., wetting of road) to be implemented on the road deviation during windy conditions and peak traffic periods, if feasible.	Beeshoek Mine and contractor	Construction
Access to the Tommy's Field Airport must be ensured at all times.	Beeshoek Mine and contractor	Construction
Temporary closure of the Tommy's Field Airport and the impact on flight patterns should be communicated to all parties involved and alternative available airport options must be finalised	Beeshoek Mine and contractor	Construction
Concurrent rehabilitation to be undertaken e.g., establishment of vegetation or covers (where feasible) to assist with dust suppression.	Beeshoek Mine	Construction and Operation
Dust management plan and recommendations of the Air Quality Assessment should be strictly implemented	Beeshoek Mine	Construction and Operation
Unauthorised entry onto the mining area must not be allowed. Access control should continue to be implemented.	Beeshoek Mine	Construction and Operation

Beeshoek Mine should inform the TLM, community representatives and affected stakeholders of the proposed construction schedule and development plan through various forums including the forums stipulated by the Environmental authorisation application process.		Beeshoek Mine	Construction and Operation
Beeshoek Mine to communicate openly and frequently with the TLM, community representatives and affected stakeholders to ensure they are informed about activities that will generate nuisance factors.		Beeshoek Mine	Construction and Operation
Beeshoek Mine to keep a grievance register that is easily accessible and regularly monitored.		Beeshoek Mine	Construction and Operation
Dust suppression methods as recommended in the Air Quality Assessment should be strictly implemented as required.		Beeshoek Mine	Construction and Operation
The approved dust management plan should be amended to incorporate the Beeshoek Optimisation Project. The erection of additional dust buckets can be considered		Beeshoek Mine	Construction and Operation
On-going dust fall out monitoring must be undertaken to monitor emissions from the project		Beeshoek Mine	Construction and Operation
A Fire/Emergency Management Plan should be developed and implemented, if not yet in place. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners		Beeshoek Mine	Construction and Operation
Monitoring	Annual environmental performance audits		
Objective 4:	**Mitigate impact on sense of place**		
Mitigation: Action/Control		**Responsibility**	**Timeframe**
The mitigation measures of the Visual Impact Assessment should be implemented.		Beeshoek Mine	Construction and Operations
Concurrent rehabilitation to be undertaken where feasible. Mining areas should be rehabilitated as soon as the Mining Works Programme allows.		Beeshoek Mine	Construction and Operations
Un-rehabilitated and poorly rehabilitated mining areas must not be allowed to remain.		Beeshoek Mine	Operation and Decommissioning
Environmental management of the mining activities must adhere to environmental regulations and strive towards international best practice.		Beeshoek Mine	Construction and Operation
Landscaping mitigation measures as recommended by the Visual Impact Assessment must be considered.		Beeshoek Mine	Construction and Operation
The eradication of alien invasives, aimed at ensuring the integrity of the biodiversity, should form part of the mitigation to limit further negative impacts on the overall sense of place.		Beeshoek Mine	Construction and Operation
Placement of lighting at infrastructure such as the WRD's should be reconsidered to ensure optimal placement with the least negative visual impacts possible		Beeshoek Mine	Construction and Operation
Monitoring	Annual environmental performance audits		
Objective 5:	**Minimise risks to community safety**		
Mitigation: Action/Control		**Responsibility**	**Timeframe**
A Fire/Emergency Management Plan should be developed and implemented, if not yet in place. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners.		Beeshoek Mine	Construction and Operations
Unauthorised entry onto the mining area must not be allowed. Access control should continue to be implemented.		Beeshoek Mine and contractor	Construction and Operations
Mining areas must be secured and fenced.		Beeshoek Mine and contractor	Construction and Operations
Monitoring	Beeshoek Mine, SAPS and TLM annually		
Objective 6:	**Minimise health related risks**		
Mitigation: Action/Control		**Responsibility**	**Timeframe**
The Social and Labour Plan (SLP) of Beeshoek Mine should make provision for addressing any possible direct health related risks and providing a supporting role to minimise the vulnerabilities of the communities, without having to take over the role of the local health services and municipality.		Beeshoek Mine	Construction and Operations
On site, all the appropriate health, hygiene and distancing measures aimed at protecting the employees' safety and health, must be implemented		Beeshoek Mine and contractor	Construction and Operations
Beeshoek Mine should continue to support to the local clinics through their community support programmes and SLP initiatives.		Beeshoek Mine	Construction and Operations

Educational videos on COVID-19, and general health and hygiene measures associated with the pandemic should be provided to employees.	Beeshoek Mine	Construction and Operations
Beeshoek Mine can, through their formalised community support programmes, support efforts to ensure greater access to water and sanitation and support measures to maintain household food security.	Beeshoek Mine	Construction and Operations
Beeshoek Mine can consider during the SLP update to redirect corporate social investment (CSI) and social and labour plan (SLP) funding to Covid-19 lockdown mitigation	Beeshoek Mine	Construction and Operations
Care should be taken to limit any possible health related impacts by striving towards international best practice.	Beeshoek Mine and contractor	Construction and Operations
Monitoring	SLP Programmes and Corporate Social Investment initiatives	
Objective 7:	**Management of Impact on Resource Use**	
Mitigation: Action/Control	**Responsibility**	**Timeframe**
Beeshoek Mine can develop a resource use plan with the specific objective to minimise the mining operations' energy and water use as far practical.	Beeshoek Mine	Construction and Operations
Beeshoek Mine to ensure that the water quality and quantity issues are managed appropriately through engineering controls and through regular and required quality and quantity groundwater monitoring.	Beeshoek Mine	Construction and Operations
The management and mitigation measures of the Hydrological Assessment and Numerical Groundwater Assessment must be strictly implemented.	Beeshoek Mine	Construction and Operations
A forum can be established (if not yet in place) where the TLM, Sedibeng Water, DWS and all mining companies in the Postmasburg area can discuss mitigation measures and the way forward in terms of the impacts of mining on the water resources.	Beeshoek Mine, DWS, TLM, other mining companies	Construction and Operations
Monitoring	Beeshoek Mine annual environmental performance audits	
Objective 8:	**Management of Decommissioning / Closure Impacts**	
Mitigation: Action/Control	**Responsibility**	**Timeframe**
Develop mechanisms to assist employees, prior to retrenchment date, in the transition phase after closure of the operations. This includes offering portable skilled development programmes during the operational phase of the project, providing assistance in accessing available and suitable jobs with other local mines or companies, providing positions during the Aftercare and rehabilitation phase etc.	Beeshoek Mine	Operations, Decommissioning and Closure
Focus on non-core related local supply links during the operational phase to facilitate easier transitioning of local suppliers to other industries	Beeshoek Mine	Decommissioning and Closure
Develop and implement an exit strategy of any social projects that was implemented during the operational phase well in advance (2 years) before closure of the Project: For example hand-over of projects that does not generate their own income to relevant organisations that can ensure sustainable implementation	Beeshoek Mine	Decommissioning and Closure
Follow a clear communication strategy to inform the local community of arrangements made related to any social spending and project closure. The communication strategy should commence two years prior to project closure	Beeshoek Mine	Decommissioning and Closure
Commence discussions with local community related to post-closure land-use. Final agreement with the representative community forum on the post-closure management will be needed before signing off on the project closure	Beeshoek Mine and community representatives	Decommissioning and Closure
Pollution control measures must be implemented over a long period of time	Beeshoek Mine	Decommissioning and Closure
Monitoring	Beeshoek Mine annual environmental performance audits	

2.h.vii Closure Monitoring

The mine has to undertake the following during the life of mine:

- Annual financial provision for ongoing rehabilitation. This annual rehabilitation plan must take into consideration the Mining Works Programme to optimise opportunities to rather backfill opencast pits before disposing of material on WRDs.

- Annual assessment of the status quo and provision of financial guarantees or trust to be able to close the mine based on the status quo during the assessment.

Five year before closure, the Mine must develop a final Closure Plan with detailed design drawings for the final landscape.

The following monitoring programme is recommended upon closure:

Table 95: Post Closure Monitoring Programme

Component / Aspect	Monitoring		Performance / success criteria	Corrective action
	Methodology	**Frequency / duration**		
Soil Management				
Land Stability Monitoring	- Gravity surveys	Up until land stability and closure has been achieved.	- Land Stability	- Ensure no ponding of water in areas where high risk areas or infrastructure has been identified.
Soil fertility	- Undertake a visual assessment and delineate areas where poor vegetation growth has occurred; - Submit soil samples to an accredit soil laboratory to conduct soil fertility analysis.	Yearly until soil fertility supports the final land use or for at least 5 years post-closure	- Soil analysis results comply with remediation targets at a 95 percentile level; and - Self-sustaining vegetation establishment.	- Apply amelioration where required as informed by sampling undertaken.
Erosion	- Conduct a visual assessment to determine areas of potential erosion; and - Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site	Twice yearly for at least 3 years post closure.	- No evidence of significant erosion; and - Good vegetation cover and species composition.	As required: - Re-shape areas to ensure that they are free-draining; - Establish vegetation on bare patches; and - Repair and stabilisation of erosion gullies and sheet erosion.
Post-mining end land use	- Assess activities completed, as well as legal and related documentation completed and signed-off; and - Ensure rehabilitation measures are aligned to the LUP.	Once off, at mine closure.	- Area has been rehabilitated to an aesthetic quality not to compromise potential tourism; - Transfer to third party operator has taken place once the area has been proven to be safe for redevelopment; - Legal and zoning issues have been addressed; and - Vegetation re-establishment, cover and composition are sustainable.	- Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Topography	- Conduct a visual assessment to determine areas of potential erosion; and - Undertake regular digital surveys of rehabilitated areas to confirm that final topography is aligned with landform designs.	During rehabilitation phase.	- No evidence of significant erosion. - No evidence of water pooling on rehabilitated areas. - The final profile achieved should be acceptable in terms of surface water drainage requirements and the end land use objectives.	As required: - Re-shape areas to ensure that they are free-draining; and - Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Vegetation establishment	o Determine whether re-established vegetation communities are on a trajectory of achieving a stable self-sustaining community dominated by species typical of the climax-species present in the adjacent areas; o Inspect rehabilitated areas to assess vegetation establishment and provide for early detection of erosion in recently planted/seeded areas (monthly); o Undertake fixed point photography at specific points at the rehabilitated sites to obtain a long term directly comparable method of determining changes in the landscape; and	Quarterly for at least 3 years post-closure.	- Limited to no erosion; and - Self-sustaining vegetation ecosystem.	As required: - Revegetate poorly established rehabilitated areas; - Reseed bare patches; and - Apply additional fertiliser and/ or organic matter, depending on the condition of the vegetation and the initial organic material application.

Component / Aspect	Monitoring		Performance / success criteria	Corrective action
	Methodology	Frequency / duration		
	○ Conduct evaluation of rehabilitated areas by means of field inspections. During these assessments measurement of growth performance and species abundance will be carried out to determine: i. Plant basal cover and species abundance in the grassed areas. Estimates of vegetation canopy and ground cover as well as height; ii. Distribution, growth and survival of woody species; iii. Dominant plant species (woody and herbaceous); iv. Presence of alien invasive species, and degree of encroachment; v. Browsing or grazing intensity; vi. Notes regarding erosion, such as, type, severity, degree of sediment build-up; and vii. Species composition and richness.			
Alien and Invasive floral species	• Visually inspect areas where invasive species have been previously eradicated and areas prone to invasive species (e.g. eroded/degraded areas, along drainage lines, etc.); and • Undertake surveys on relevant sites where bush encroachment has previously been identified to determine the status quo of invasive vegetation.	Yearly for at least 3 years post-closure.	• Limit and/or prevent declared Category 1, 2 and 3 invader species establishing; • Minimise extended threat to ecosystems, habitats or other species; • Increase the potential for natural systems to deliver goods and services; and • Minimise economic or environmental harm or harm to human health.	• Revisit mitigation measures; and • Continue control and management.
General site status	• Conduct a visual assessment with respect to compliance of the afore-mentioned closure measures and to ensure that the site is aesthetically neat and tidy, and that no health or safety risks exist on site.	Once-off following implementation of rehabilitation measures.	• Waste/rubble free sites.	As required: • Clear remnant rubble and dispose of in open quarry as backfill material.
Surface Water Quantity	• Visually assess the functionality of the surface water drainage systems feeding surface water runoff from rehabilitated areas. • Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site.	After the first major rains of the season and after any major storm.	• No evidence of significant erosion; and • No evidence of water pooling on rehabilitated areas.	As required: • Re-shape areas to ensure that they are free-draining; and • Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Surface Water and Groundwater Quality	• Sample and monitor surface and groundwater quality.	Quarterly for at least 3 years post-closure.	• Water quality results within ranges of the WUL and/or DWS standards.	As required: • Increase monitoring frequency and detect point sources. • Optimise monitoring plan if needed.
Groundwater Quantity	• Sample and monitor groundwater levels in the vicinity of the mine.	Quarterly for at least 3 years post-closure.	• No evidence of dewatering and lowering of water tables within the vicinity of the mine.	As required: • Increase monitoring frequency and detect point sources. • Optimise monitoring plan if needed.

2.i Monitoring frequency and Responsible person

Please refer to Table 85 to Table 88 for the management actions required. Also refer to Section 2.h for the monitoring programme recommendations.

2.j Period for implementing actions

Please refer to Table 85 to Table 88 for the management actions required. Also refer to Section 2.h for the monitoring programme recommendations.

2.k Mechanisms for monitoring compliance

Please refer to Table 85 to Table 88 for the management actions required. Also refer to Section 2.h for the monitoring programme recommendations.

2.l Indicate the frequency of the submission of the performance assessment report.

Internal Audits

Annual internal audits should be undertaken to ensure that the conditions of this EMP are implemented. This should be regarded in addition to regular site inspections.

External Performance Assessments

It is recommended that the independent external performance assessments be undertaken biennially (every second year) in line with the current EMPr, 2009.

The external performance assessments must also include the overall mine assessment of the financial provision and EMP commitment. The report should be submitted to the DMRE within 30 days of finalisation.

Other Performance Indicator Assessments

Due to the dynamic nature in which the mine is addressing the water management on site and considering the near-future projects that are planned, the following measure to ensure that performance measures are reached are recommended:

- Ongoing water monitoring in terms of the monitoring protocol.
- Biennial WUL Audit.
- Annual update of the IWWMP.
- Annual update of the Water Balance.
- Annual update of the Salt Balance.
- Annual Update of the Water Conservation and Demand Management Plan (WCDMP).

2.m Environmental Awareness Plan

2.m.i Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work

Assmang will ensure that the Environmental Awareness Plan (EAP) at the mine is implemented. The material/source of information for the EAP will be the approved Environmental Management Programme Report(s), as well as other relevant specialist reports. The environmental awareness plan is detailed in the sections below.

This environmental awareness plan sets out the mine's training procedures and objectives regarding environmental awareness. It is a stand-alone procedure, which serves to improve awareness, training and competency in the environmental field. It contains no detail on the actual training initiatives but rather serves to ensure that a responsible person is appointed to deal with and increase environmental awareness on the mine.

It should be the responsibility of the environmental manager, within the existing SHERQ Department at Beeshoek Mine, to implement the Environmental Awareness Plan.

The objectives of the Environmental Awareness Plan as defined by ISO14001 are as follows:

1. Competence, Training and Awareness:
- The organisation shall ensure that any person(s) performing tasks for it or on its behalf that have the potential to cause a significant environmental impact(s) identified by the organisation is (are) competent on the basis of appropriate education, training or experience, and shall retain associated records.
- The organisation shall identify training needs associated with its environmental aspects and its environmental management system. It shall provide training or take other action to meet these needs, and shall retain associated records.
- The organisation shall establish, implement and maintain a procedure(s) to make persons working for it or on its behalf aware of:
    - The importance of conformity with the environmental policy and procedures and with the requirements of the environmental management system.
    - The significant environmental aspects and related actual or potential impacts associated with their work, and the environmental benefits of improved personal performance.
    - Their roles and responsibilities in achieving conformity with the requirements of the environmental management system.
    - The potential consequences of departure from specified procedures.

The responsible person will revise the environmental awareness procedures from time to time. The date of commencement of the revised procedure will always be indicated on the relevant Work Instructions or Policies.

Please refer to the following table for the Environmental Awareness Plan.

Table 96: Environmental Awareness Plan

Aspects	Objectives	Description	Time Period	Responsible Party/Person
1. Environmental policy	Demonstrate management commitment to responsible environmental management	Top management has a role to play in building awareness and motivating employees by explaining the company's environmental values and communicating its commitment to environmental policy. All workers of the company should understand and be encouraged to accept the importance of implementing the environmental management program. Motivation to continually improve can be enhanced when employees are recognized for achieving environmental objectives and targets and encouraged to make suggestions that can lead to improved environmental performance.	In place	Environmental Manager
2.SHERQ Management System	Systematic implementation of Roles and Responsibilities to achieve environmental compliance.	Identify, assess and manage risks to employees, non-employees, the environment and the communities within which the activity is carried out. Set SHERQ targets, allocate appropriate resources to achieve those targets, and undertake periodic reporting of SHERQ performance.	Ongoing	Environmental Manager
3.Communication	Describe the manner in which Beeshoek will inform employees of any environmental risks which may result from their work and; The manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment	<u>Internal:</u> How do the employees receive the information? - At safety training sessions; - Induction programmes; - Regular publications and information leaflets; - Bulletin boards (posters), - Electronic mail messages, - Forum meetings, which involves the local I&AP's and the DME. - Communicate and consult with employees and contractors in developing SHERQ systems and improvements. <u>External:</u> A clear communication point should be established during construction that will be responsible for liaison with the I&APs should any concerns rise. A complete procedure for I&AP liaison must be made available to all on site. Communication from I&APs may be received by e-mail, fax, telephonically or by mail. Where required, a written response will be sent, on receiving such communication, by the appropriately appointed individual under signature of the Project Manager, to the respective I&AP. All events or concerns will be captured and actioned on an existing and/or future database.	Ongoing	Management & Environmental Manager
4. Information	Availability of Environmental Report in a format to allow compliance and implementation on all levels.	Information from internal (EMP, etc.) and external sources would be put in a language understandable to workers.	Ongoing	Environmental Manager

Aspects	Objectives	Description	Time Period	Responsible Party/Person
		Environmental information will be communicated via the methods spelled out above.		
5. Training	Knowledge on all levels to ensure compliance and implementation on all levels, as well as to ensure responsibility.	All employees should receive basic environmental awareness training, either as induction training or later at special training sessions. Different levels of responsibility in relation to individual's potential impact on the environment must be addressed in the training session. Induction: All full time staff and contractors are required to attend an induction session. Contractors and staff during the construction phase will be inducted prior to the commencement of their work for the construction. These workshops will be conducted in English, as well as one of the local languages. This induction will form part of the health and safety induction. Environmental issues and aspects related to the operation phase and other relevant phases will be addressed in the induction sessions. All environmental impacts and aspects and their mitigatory measures will be discussed, explained and communicated to all. The induction sessions will be modified according to the level of contractor and staff attending the induction session, so that all employees gain a suitable understanding of environmental issues and pollution. On the Job Training: On the job training is an essential tool in environmental awareness. Unskilled employees will be given details of the expected environmental issues and concerns specifically related to their occupation. Unskilled employees will be trained on how to respond if an environmental problem or source of environmental pollution arises during construction. Further Training: Further motivation of the workforce will be achieved through in-house training and attending short courses with regard to environmental management, etc. Appropriate training relevant to the achievement of the environmental policy, implementation of the environmental management program will be provided to all personnel. Employees shall have an appropriate knowledge base. Beeshoek will also ensure that the contractors working on site provide evidence that they have the requisite knowledge and skills to perform the work in an "environmentally responsible manner". Education and training is needed to ensure that the employees' knowledge of regulatory requirements, internal standards and policies and objectives is current.	Ongoing	Environmental Manager and Supervisors
6. Reporting	Record keeping to allow for the implementation of action plans and trends to work towards ongoing improvement.	Specialist Reports:	Ongoing	All

Aspects	Objectives	Description	Time Period	Responsible Party/Person
		Copies of relevant specialist study reports and Environmental Impact Assessments will be available on request from an external party. Queries from I&APs: Response to queries about environmental impacts and aspects will be addressed by the relevant department, and approved by the project manager. Incidents: Every environmental incident that might happen and which the workers become aware off should be reported to the manager. The worker can only report on incidents if he is made aware off the possible environmental risks through the communications methods indicated in section 1. A written reporting format should be put in place. Communication includes establishing processes to report internally and, where desired, externally, on environmental activities in order to: Demonstrate management commitment to responsible environmental management; Deal with concerns and questions about environmental issues (handled within the Forum); Raise awareness of the organization's environmental policies, environmental management program; and Inform internal or external interested parties about the mine's management system; A formal complaints/concerns reporting system to address I&AP will be put in place (complaints register); Beeshoek will regularly communicate with the affected community. This communication must address new developments, problems, achievements and all other relevant aspects of mutual interest.		
Risk Management	The following requirements of ISO14001 have bearing: 1. The organisation shall establish, implement and maintain a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on the environment and how it will respond to them. 2. The organisation shall respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental impacts. 3. The organisation shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations.	Environmental risks must be identified and procedures must be set in place to deal with risks, which could include: Fires; - Spills of hazardous substances, including explosions; - Leaks or breaks of pipes or vessels, including dam overflows; - Accidents, especially during adverse weather; - Slow environmental degradation related to continuous poor housekeeping; - Damage to heritage or environment; and - Social issues, either complaints about poor environmental management, or direct employment type issues. Many of these environmental risks have been identified in the EIA Report associated with the development of this EMP addendum and therefore the risk assessment exercise will not be repeated here. Once the mitigation measures have been read in the EMP chapter, it will be clear what training will assist with the prevention or reduction of each environmental risk.	Ongoing	Supervisor and Environmental Manager

Aspects	Objectives	Description	Time Period	Responsible Party/Person
	4. The organisation shall also periodically test such procedures where practicable.			

2.m.ii Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

The following protocols must be developed by the mine, in parallel to the actions recommended in Table 85 to Table 89. Protocols to be developed should include:

- Task/ Issue Based Risk Assessments must be undertaken with all workers involved in the specific task in order to establish an understanding of the risks associated with a specific task and the required mitigation and management measures.

Environmental emergencies occur over the short term and require an immediate response. A mine, as part of its management tools, especially if it is ISO 9000 and ISO 14001 compliant, should have an Emergency Response Plan. This plan should be placed around the mine where it will be easily viewed. The plan should contain a list of procedures, evacuation routes and a list of emergency contact numbers. It is advisable that the mine tests the emergency response plan in order to identify any areas for improvement.

The emergency response plan contained in the EMP should be communicated to all employees and a copy of the plan should be readily available where it can be viewed by workers who have to report there each morning.

A site specific plan needs to be drawn up and to contain a list of procedures, evacuation routes and a list of emergency contact numbers. It is advisable that the contractor tests the emergency response plan in order to identify any areas for improvement.

If the emergency has the potential to affect surrounding communities, they should be alerted via alarm signals or contacted in person. Road users will be informed prior to the upgrade of tie in points and the use of diversions via signage.

Communication is vital in an emergency and thus communication devices, such as mobile phones, two-way radios, pagers or telephones, must be utilized at the construction site. A checklist of emergency response units must be consulted and the relevant units notified. The checklist includes:

- Fire department;
- Police;
- Emergency health services such as ambulances, paramedic teams, poisons centres;
- Hospitals;
- Public health authorities;
- Environmental agencies, as well as the Environmental Officer of the mine;
- Other industrial facilities in the vicinity with emergency response facilities; and
- Public works and highways departments, i.e. the NCDRTPW.

The above list needs to be updated before construction commences. Emergency numbers need to be placed at the construction camp where it is visible.

The following protocols must also be developed as a minimum prior to construction commencing:

- Vegetation clearance;
- Heritage finds procedure;
- No-go zone requirements;
- Waste Management procedure;
- Emergency Preparedness' Procedure;
- Hydrocarbon Spill Management Procedure;
- Monitoring Protocol; and
- Alien Invasive Management and Monitoring Procedure.

2.n Emergency Procedures

In the case of a medical accident or problem, a first aid kit must be available and a First Aid officer should be on duty at all times. It is preferential that the mine has a First Aid room or a small clinic, which can be utilized by the construction crew if necessary.

In the event of an emergency a checklist of emergency response units must be consulted and the relevant units notified. In this case, many of the emergency services will be sourced from the nearest main town.

2.n.i Accident Handling Procedure for Contractors

1. Take down details from reportee including the following:
    a. Telephone number of reportee;
    b. Nature of injuries to accident victim;
    c. If assistance is required from the paramedic;
    d. Where the accident victim is located;
    e. If transport is required to casevac patient; and
    f. Instruct reportee to leave a messenger by the phone.
2. If the injuries are serious contact the relevant emergency services who will notify the paramedics.
3. Await paramedics and instruct them to proceed to the accident site.
4. Notify security and inform them of ambulance arrangements and where the said vehicle must go to.
5. Inform the paramedic called out on the following:
    a. Telephone number of reportee;
    b. Nature of injuries to accident victim or victims;
    c. Where is the injury, part of body (arm, leg, head, etc.);
    d. Where the accident victim is presently;
    e. What is the condition of victim (breathing, stable, etc.); and
    f. If an ambulance is required to casevac victim from surface location to hospital.
6. If necessary provide a guide, at security gate, to escort the ambulance or paramedics to the required location.
7. Inform manager of the accident.

NOTE:

The procedure does not change because there is more than one accident victim. One victim or 20 victims must be handled in the same manner.

2.n.ii Environmental Procedures and Remedial Action

The following define the most likely potential environmental emergencies:

2.n.ii.1 Fires

Veld fires and fires resulting from other sources must be handled with extreme caution.

Fire extinguishers should be placed at the construction camp and be available where necessary along the proposed route.

Procedure:

- In the event of a fire an alarm should be activated to alert all employees and contractors;
- Identify the type of fire and the appropriate extinguishing material. For example water for a grass fire, and mono ammonium phosphate based fire extinguisher for chemical and electrical fire;
- In the event of a small fire the fire extinguishers should be used to contain and extinguish the fire;
- In the event of a large fire, the local area council's fire department will be notified and should react timeously;
- All workers will receive training in response to a fire emergency on site;
- A Fire Association should be set up with the mine and surrounding land owners to facilitate communication during fire events and assist in fighting fires, where necessary;
- If possible all surrounding drains, such as storm water drains need to be covered and or protected to prevent any contaminated water from entering the drains;
- In case of a chemical or petroleum fire, run-off from the area should be contained as far as possible using the most appropriate measures e.g. spill absorbent cushions, sand or a physical barrier; and
- Contaminated run-off must be diverted into an oil sump, or cleaned up. Assmang Beeshoek Iron Ore Mine R385 Road Realignment EMP.

2.n.ii.2 Major Hydrocarbon Spill

Hydrocarbons such as diesel, petrol, and oil will be stored in containers within a bunded area, but there is the possibility that spillage may occur. Bitumen will either be stored in a truck or in drums in a bunded area.

In the event of a spillage, procedures must be put into place to ensure that there are minimal impacts to the surrounding environment.

Diesel, engine oil and hydraulic oil are the most likely hydrocarbons identified during impact assessments that can result in an emergency situation.

The following procedure applies to a major hydrocarbon spill:

- In the event of a small spillage, the soil should be treated in situ, using Hazmat clean up kits;
- Every precaution should be taken to prevent the spill from entering the surface water environment;
- In the event of a large spillage, adequate emergency equipment for spill containment or collection, such as additional supplies of booms and absorbent materials, will be available and if required, a specialised clean-up crew will be called in to decontaminate the area. The soil should be removed and treated at a special soil rehabilitation facility;
- Reasonable measures must be taken to stop the spread of hydrocarbons and secure the area to limit access;
- Dispatch necessary services;
- The incident must be reported to the Project Manager (PM) or Responsible Engineer (during construction) or the Site Supervisor (during the operational phase) (i.e. Responsible Person) immediately;
- The incident must be reported to the DWS and DMRE within 24 hours of occurring;
- The Responsible Person will assess the situation from the information provided, and set up an investigation team or relevant personnel. Included in this team could be the Contractor, SHERQ, the employee who reported the incident and any individual responsible for the incident;
- When investigating the incident, priority must be given to safety;
- Once the situation has been assessed, the Technical Services Manager must report back to the PM;
- The Responsible Person and the investigation team must make a decision on what measures can be taken to limit the damage caused by the incident, and if possible any remediation measures that can be taken; and
- The contractor, SHERQ, or person in charge should have a list of company contact details that will facilitate with the clean-up operations.

2.n.ii.3 Vegetation clearance outside footprint area

Should vegetation clearance take place outside of the demarcated footprint, the site must be included in the concurrent rehabilitation plan:

- The affected area must be ripped and loosened if compaction has already taken place;
- The areas must be reseeded with harvested seeds, or any rescued indigenous plants must be planted;
- If necessary, implement soil erosion structures until vegetation has successfully re-established; and
- The area should be irrigated should rehabilitation be deemed to be very slow or unsuccessful.

2.n.ii.4 Uncovering of archaeological finds

In the event that a site or artefact of potential cultural, historical or archaeological value is uncovered during construction, the following steps must be followed:

- Work at the site and in the immediate vicinity must be ceased;
- The SHERQ must be informed immediately of the find;
- The SHERQ must liaise with the Mine EO and an archaeologist;
- The SHERQ must also liaise with the regional SAHRA office;
- A Phase 1 Heritage Impact Assessment should be commissioned if this is recommended or requested by SAHRA; and
- The recommendations made the archaeologist undertake the assessment must be used to amend the EMP if necessary.

2.n.ii.5 Soil compaction outside footprint

If soil compaction is identified outside of the footprint area, the area must be included as part of the concurrent rehabilitation plan:

- Compacted areas must be ripped and loosened;
- The affected areas must be reseeded with harvested seeds;
- Where indigenous vegetation has been rescued prior to construction, this should be planted during concurrent rehabilitation; and
- Rehabilitation monitoring must be done to gauge the efficacy of vegetation reestablishment and implement mitigation measures where rehabilitation is considered too slow or unsuccessful.

2.n.ii.6 Discharge of dirty water to the environment

To stop spillage from the dirty water system the mine will:

- Redirect excess water to other dirty water facilities where possible;
- Pump dirty water to available containment in the clean water system, where there is no capacity in the dirty water system.
- Carry out an emergency discharge of clean water and redirect the spillage to the emptied facility;
- Apply for emergency discharge as a last resort; and
- A significant incident must be reported to the DWS and DMRE within 24 hours of occurring;

2.n.ii.7 Pollution of Water Resources

- Personnel discovering the incident must inform the Environment department of the location and contaminant source.
- Absorbent booms will be used to absorb surface plumes of hydrocarbon contaminants.
- Contamination entering the surface water drainage system should be redirected into the dirty water system.
- Remediate the areas of contamination.

2.n.ii.8 Groundwater contamination

- Use the groundwater monitoring boreholes as scavenger wells to pump out the polluted groundwater for re-use in the process water circuit (hence containing the contamination and preventing further migration).
- Investigate the source of contamination and implement control/mitigation measures.

2.n.ii.9 Flooding from failure of surface water control infrastructure

- Evacuate the area downstream of the failure.
- Using the emergency response team, rescue/recover and medically treat any injured personnel.
- Temporarily reinstate/repair storm water diversions during the storm event (e.g. emergency supply of sandbags).
- Close the roads affected by localised flooding or where a storm water surge has destroyed crossings/bridges.

2.n.ii.10 Risk of drowning from falling into water dams

- Attempt rescue of individuals from land by throwing lifeline/lifesaving ring.
- Get assistance of emergency response team whilst attempting rescue or to carry out rescue of animals and or people as relevant.
- Ensure medical assistance is available to recovered individual

2.o Specific information required by the Competent Authority

The Mine is required to make financial provision for final rehabilitation activities on the site. The Regulations for Financial Provision states in Regulation 8 the following:

8. (1) an applicant or holder of a right or permit must make financial provision by one or a combination of a—

(a) Financial guarantee from a bank registered in terms of the Banks Act, 1990 (Act No. 94 of 1990) or from a financial institution registered by the Financial Services Board as an insurer or underwriter;

(b) Deposit into an account administered by the Minister responsible for mineral resources; or

(c) Contribution to a trust fund established in terms of applicable legislation, on condition that—

(i) this may not be used for the financial provision required in terms of regulations 6(a) or (b) or regulation 11(1)(a) or (b); and

(ii) This may not be used by an applicant for, or holder of, a mining permit in terms of the Mineral and Petroleum Resources Development Act, 2002.

The mine, will provide for the closure liability either through a Bank Guarantee or as part of the current Assmang Trust as allowed by NEMA.

3 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

The EAP herewith confirms:

3.a The correctness of the Information provided in the Reports

3.b The inclusion of Comments and Inputs from Stakeholders and I&APs

3.c The inclusion of Inputs and Recommendations from the Specialist Reports where relevant

3.d That the Information provided by the EAP to I&APs and any Responses by the EAP to Comments and Inputs made by I&AP are correctly reflected herein

____
Signature of the Environmental Assessment Practitioner

EnviroGistics (Pty) Ltd
Name of company

____
Date

4 UNDERTAKING REGARDING LEVEL OF AGREEMENT

Undertaking by the client: (*the undertaking will be signed by the Applicant, once the EIA and EMPr has been reviewed and finalised*)

Herewith I, the person whose name and identity number is stated below, confirm that I am the person authorised to act as representative of the applicant, and confirm that the above report comprises EIA and EMP compiled in accordance with the guideline on the Departments official website and the directive in terms of sections 29 and 39 (5) in that regard, and the applicant undertakes to execute the Environmental management plan as proposed.

____
Full Names and Surname

____
Identity Number

____
Designation

____
Signature

____
Date

Annexures

Annexure 1: DMR Acknowledgment of Receipt

Annexure 2: EAP Curriculum Vitae

Annexure 3: Title Deeds

Annexure 4: Stakeholder Consultation Report

Advertisements

Background Information Document

Stakeholder Database

Comments received

Minutes of meetings

Annexure 5: Proof of submission to commenting authorities

Scoping Report

EIA

Annexure 6: Soils, Land Use and Land Capability

Annexure 7: Ecological Study

Annexure 8: Freshwater Ecosystems

Annexure 9: Hydrology

Annexure 10: Hydrogeology

Annexure 11: Air Quality

Annexure 12: Heritage and Palaeontological Study

Annexure 13: Visual

Annexure 14: Socio-Economic

Annexure 15: Designs

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Annexure 13: Visual

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Annexure 15: Designs