JINDAL MELMOTH IRON ORE PROJECT
EIA & EMPR

July 2023
For Public Review

Prepared for: Jindal Iron Ore (Pty) Ltd

Authority References: DMRE KZN 30/5/1/2/2/10108MR

SUBMITTED FOR ENVIRONMENTAL AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (NO. 107 OF 1998), AND THE NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (NO. 59 OF 2008) IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (NO. 28 OF 2002)

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EXECUTIVE SUMMARY

INTRODUCTION

Jindal Iron Ore (Pty) Ltd (Jindal), is owned by Jindal Steel and Power (Mauritius) Limited (74%) and a South African BBBEE partner, Mr. Thabang Khomo (Pty) Ltd (26%). Jindal holds two Prospecting Rights (PR) within the Mthonjaneni Local Municipality (LM) in KZN. The North Block (PR 10644) is 8 467 ha and the South Block (PR 10652) is 11 703 ha in extent. Jindal had previously prospected in these PR areas, but suspended the project in 2016. The recent recovery of the iron ore price has encouraged Jindal to relook at the development of the Jindal Melmoth Iron Ore Project (MIOP) and is currently undertaking a Bankable Feasibility Study (BFS).

The Jindal MIOP site is located 25 km southeast of Melmoth, within the Mthonjaneni LM in the Kwazulu-Natal (KZN) Province of South Africa (Figure 1). Jindal is proposing to develop an open pit iron ore mine and processing facility on the site to extract 32 million tonnes per annum (mtpa) of iron ore which would be processed on site to produce approximately 7 mtpa of iron ore concentrate. The Jindal MIOP is proposed to be developed in a phased approach and this Mining Right Application (MRA) only includes mining in the south-eastern section of the South Block (Fig 1). Through the MRA Jindal intends to consolidate their Prospecting Rights for the North and South Blocks into a single Mining Right.

Jindal has appointed SLR Consulting (South Africa) (Pty) Ltd as the independent Environmental Assessment Practitioner to undertake an Environmental Impact Assessment (EIA) process and the associated public participation process (PPP) to inform the MRA.

OPPORTUNITY TO COMMENT

This EIA and Environmental Management Programme (EMPr) Report is currently out for a 30-day public review period from 14 July to 14 August 2023 in order to provide Interested & Affected Parties (I&APs) an opportunity to comment on any aspect of the project and the findings of the EIA and EMPr process. Copies of the full report are available on the SLR website (at **https://slrconsulting.com/public-documents**) and can also be accessed from internet-capable mobile phones without data charges at https://slrpublicdocs.datafree.co/en/public-documents/JindalMIOP.

All comments received during the review process will be included in the EIA and Comments and Response Report for submission to the DMRE. For more information please contact the following:

ATTENTION: Ms Genie de Waal
Email: genie.dewaal@zutari.com

PROJECT DESCRIPTION

Jindal is proposing the following for the Jindal MIOP:

- An open pit mining operation in the south east section of the South Block (named the South East Pit). The final dimensions of the South East Pit after 25 years would be approximately 4 000 m east-west, 1 000 m north-south and 550 m in depth.
- Mining of >800 million tonnes of ore over approximately 25 years generating approximately 32 million tonnes per annum (mtpa) of iron ore.
- A waste rock dump (WRD) for disposal of waste rock. The WRD is designed to have a maximum height of 251 m and a footprint area of approximately 204 Ha. The WRD provides a storage capacity of 194 million m^3 over a deposition period of 25 years.
- A processing plant for milling and magnetic separation to produce approximately 7 mtpa of concentrate for export (there are limited local markets).
- Associated infrastructure to support the mine would include: a laboratory, rail loading facility, access and haul roads, electrical transmission line and sub-stations, water pipelines, stormwater management infrastructure, concentrate pipelines, offices, change house, workshops and perimeter fencing (amongst others).
- Make-up water requirements are calculated to be 1 500 m^3/h, based on average annual plant operations. This equates to a consumption of 11.56 Gl/a. The Mhlathuze catchment is, however, currently overallocated and as such various options need to be assessed as part of the Water Use Licence Application (WULA).
- Upgrade of the railway line between Nkwalini Siding and Richards Bay Port for iron ore concentrate transport (part of a separate application).
- Slurry generated from the processing plant would be disposed of to a tailings storage facility (TSF) (also part of a separate application).

The proposed Jindal MIOP layout can be seen in Figure 1.

POLICY AND LEGISLATIVE CONTEXT

Prior to the commencement of the proposed Jindal MIOP authorisations are required from the following competent authorities:

- Mining Right Application from the Department of Mineral Resources and Energy (DMRE) in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).
- Environmental Authorisation from the DMRE in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as amended.
- A Waste Management Licence (WML) from the DMRE in terms of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA).
- A Water Use Licence (WUL) from the Department of Water and Sanitation (DWS) in terms of the National Water Act, 1998 (No. 36 of 1998) (NWA).

A Scoping and EIA process, conducted in terms of the EIA Regulations, 2014, has been undertaken in order to inform the DMRE's decision making. This EIA and EMPr Report assesses the potential issues relating to the proposed Jindal MIOP and identifies issues which are potentially significant and identifies mitigation measures to minimise the impacts as far as possible.

NEED & DESIRABILITY OF THE PROJECT

The key components of the Need and Desirability Guideline are discussed in the following sections:

Ecological Sustainable Development and Use of Natural Resources

The proposed Jindal MIOP site is a ‘greenfield’ site and outcomes from biodiversity studies have indicated that the project area identified for the placement of the Jindal MIOP is associated with some species of conservation concern (SCC). The expansion of the South East Pit and WRD would result in the loss of Moist Coast Hinterland Grassland (Endangered) and Dry Coast Hinterland Grassland (Vulnerable). However, given the nature of the grazing across the sub-region these grasslands have to some extent already be degraded/ transformed.

A Terrestrial Ecology study has been undertaken to understand the potential impact to the grasslands and ongoing engagement with local stakeholders and the development of a sustainable grassland management programme will be critical in ensuring that remaining intact primary grassland is not further degraded. It will also be important to combat alien plant invasions associated with the edge effects created through both the mine development and overgrazing with the implementation of a comprehensive alien plant control programme.

The mining operations would require water for the processing plant, dust control, for vehicle wash down, for the change house, and office use. A water supply analysis has been undertaken and the potential abstraction of water from the Mhlathuze catchment has been explored. The Mhlathuze catchment is currently overallocated and as such the DWS may only consider new allocations if the applicants contribute to interventions, which would generate additional water in the catchment. These options will require further assessment should the Mining Right be approved and will be subject to authorisation by the DWS through a WULA. Water requirements are likely to reduce as the pit deepens due to the reuse of water that collects within the pit.

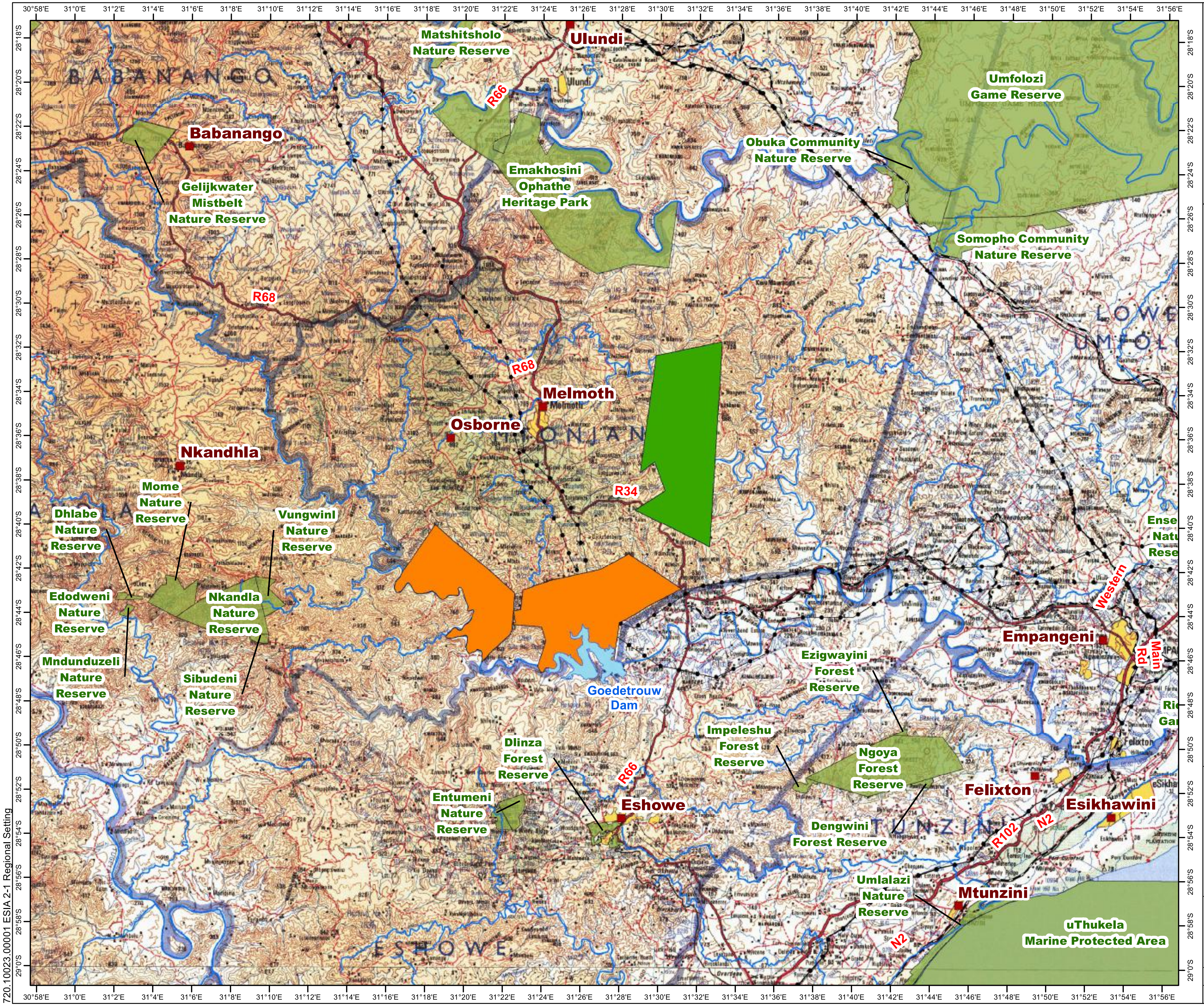
Promoting Justifiable Economic and Social Development

The Jindal MIOP will potentially be one the largest direct foreign investment projects in South Africa in recent years. The proposed mine will create direct job opportunities for approximately 800 people and indirect jobs for approximately 1 600 people. The South African Government, provincial and local municipalities would also gain additional income streams from mining royalties, taxes, permits and fees.

The Mining Charter, 2018, gazetted in September 2018, is envisaged as a tool for driving transformation of the mining and minerals industry. At its core, the Mining Charter is premised on the conviction that the mineral wealth of the country belongs to all citizens and that communities located close to the mineral resources should derive socio-economic benefit from extraction and processing. Jindal, as with all other mining companies in South Africa, are bound to comply with the requirements set out in the Mining Charter.

In addition, the South African National Development Plan aims to eliminate poverty and reduce inequality by 2030. The proposed Jindal MIOP will contribute towards the realisation of economic development and inclusive growth through revenue and tax generation and the creation of employment opportunities. Through the implementation of the Social and Labour Plan (SLP), the proposed project will positively contribute to projects identified through the Local Economic Development (LED) plan of the Mthonjaneni LM, which in turn will deliver benefit to the communities directly affected by the establishment of the project.

Importantly, the proposed Jindal MIOP must take measures to limit any negative impacts on agriculture and tourism development, as these are both considered vital sectors of the municipal economy.



Legend

- ■ Towns / Villages
- ― Roads
- ― Railway Lines
- ●―● Power Lines
- ― Rivers
- 🟦 Dams
- 🟩 South African Protected Areas
- 🟩 Proposed North Block Mining Right Area
- 🟧 Proposed South Block Mining Right Area

N

0 2 4
KM

Scale:1:300 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

JINDAL IRON ORE (PTY) LTD

FIGURE 1
REGIONAL SETTING

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Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 2-1	Date: 17/06/2023

PUBLIC PARTICIPATION UNDERTAKEN TO DATE

The following public participation has been undertaken so far:

- Pre-application meeting with the DMRE and approval of a Stakeholder Engagement Plan – 3 March 2021.
- Regular engagement with the Zulu-Entembeni Traditional Authority.
- Development and continuous update of an Interested and Affected Party (I&AP) database;
- Notification to I&APs, including landowners, government and traditional authorities – 17 June 2021;
- Distribution of a Background Information Document (BID), in English and isiZulu, since 17 June 2021;
- Publication of advertisements;
  - The Mercury, 15 June 2021, English;
  - Eyethu Baywatch – 16 June 2021, English;
  - Isolezwe – 18 June 2021, isiZulu; and
  - Zululand Observer – 21 June 2021, English
- Erection of site notices at various locations in Melmoth, Eshowe and the South Block;
- Public Information Meetings in Melmoth (18 August 2021) and on MS Teams (6 July 2021);
- 24 stakeholder meetings with traditional leaders and their communities, farmers, local business and authorities (held between June and August 2021);
- Radio advertisements:
  - Icora 100.40 fm – 15 to 19 June 2021; and
  - Izwi Lomzansi 98.0 fm – 21 to 23 June 2021;
- The Scoping Report went out for a 30 day public review period from 16 February to 18 March 2022; and
- The EIA and EMPr Report is now out for a 30 day public review period from 14 July to 14 August 2023.

ALTERNATIVES ANALYSIS

An assessment was undertaken to determine the viability of mining the North vs the South Block first. Due to difficulties with access to the North Block significantly more baseline work and detailed design has been done for the South Block. In addition, the South Block has better established access roads, has existing Eskom power lines adjacent to the preferred plant area and is the most accessible to the Nkwalini Rail Siding (proposed for concentrate transport to Richards Bay). The current plan is, therefore, to undertake Phase 1 of the Mine in the south-eastern section of the South Block.

Other alternatives that have been considered include:

- Open pit (preferred alternative) vs underground;
- Different scales of mining: 20, 24, 28 or 32 mtpa (preferred);
- Site layout alternatives in terms of the WRD, access roads and processing plant (although options are limited due to the mountainous terrain); and
- The “no-go” alternative, taking into account the likely social and environmental consequences that may arise should the development not proceed.

Through this process the preferred alternative was assessed and is included in Figure 1.

WHAT ARE THE KEY ENVIRONMENTAL AND SOCIAL SENSITIVITIES?

The physical, biological and social status of the potentially affected environment was investigated to identify and assess potential impacts. The EIA Report presents the findings of these investigations undertaken to date. A summary of these findings is presented in the following sections.

Physical Environment

The Mthonjaneni LM has a warm and humid subtropical climate, which is favourable for the extensive agricultural activity in the region. Mthonjaneni LM experiences average daily temperatures of between 16℃ and 20℃, and average rainfall of between 2 000 mm and 2 400 mm per annum.

In terms of topography Melmoth is 800 m above sea level and is surrounded by low sandstone mountains and mudstone valleys. The regional geology of the area has given rise to a considerable diversity of relief, from gently rolling slopes to hilly and severely incised slopes found along valleys. Both the North and South Blocks consist of hilly terrain. The land capability classification for both the North and South Blocks indicates that the land is best suited to livestock grazing with only small areas having higher land capability that is suitable for rainfed crop production.

Groundwater data from the DWS National Groundwater Archive within 5 km of the Jindal MIOP showed that groundwater levels range between 2.1 to 56.4 metres below ground level (mbgl). Groundwater levels measured by Golder (2016) during a hydrocensus in the South Block area showed an average groundwater level of 45 mbgl. In the proximity of the TSF, which is in a low-lying area near to the Mhlatuze river, groundwater is typically very shallow (< 5mbgl). The regional groundwater movement was found to be from west to east but locally the movement could vary. According to Golder (2016), water quality results obtained at that time were all well below the Domestic Use Guidelines, rendering the groundwater a potable water source. In terms of groundwater quality for this EIA process no access was granted in the pit area and consequently no new water chemistry data is available for this pit area. Samples collected at the TSF boreholes drilled in 2022 (by SLR) showed several exceedances relative to the SANS 241:2015 drinking water quality guidelines. The exceedances are typical of water quality in crop farming areas.

In terms of surface water the North Block falls between quaternary catchments (QC) W12B, W12C and W12D and is drained by the perennial Mfule River and its tributaries flowing in a southeast direction to join the Mhlatuze River.

The South Block spans over QC W12B and W12D and is drained by the perennial Mhlatuze, KwaMazula, Nyawushane and Mavungwini rivers. QC W12D is drained by the Mfule and Ntambanana rivers flowing in a south-east direction to join the Mhlatuze River. Surface water sampling was undertaken by SLR in May 2021 where six surface water quality monitoring stations located around the Project area were sampled. The water quality analysis results were compared against the DWS guidelines for irrigation, livestock watering and aquatic ecosystems including the SANS 241 guidelines for drinking water. The DWS guidelines are very stringent because they follow a conservative approach in terms of requirements for the most sensitive crops. The water quality results showed exceedances of aluminium, copper, mercury, pH and Total Cyanide concentrations at all six surface water monitoring points when compared to the Aquatic Ecosystems Guidelines.

Biological Environment

Melmoth falls within the Maputoland-Pondoland floristic region and is an important centre of plant endemism. Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) are present within both the North and South Blocks of the study area.

Following the initial site inspection five distinct terrestrial vegetation communities were identified in the South Block, including:

- Community 1: Ngongoni Veld/Eastern Valley Bushveld Open Savannah;
- Community 2: Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland;

- Community 3: Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah;
- Community 4: Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland; and
- Community 5: Secondary Open Savannah/Thicket/Closed Woodland.

An additional five vegetation communities were identified for the North Block, including:

- Community 6: Ngongoni Veld/Northern Zululand Sourveld Open Savannah;
- Community 7: Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland;
- Community 8: Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket;
- Community 9: Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah; and
- Community 10: Secondary Open Savannah/Thicket/Closed Woodland

Four of the ten vegetation communities mapped are considered to be in fair to natural condition and have a Very High Site Ecological Importance (SEI) rating (Communities 1, 2, 6 & 7). The remaining six vegetation communities on site range in SEI from Medium to Very Low. In addition to being in good to fair ecological condition the four largely intact vegetation communities are highly likely to support several floral SCC that are either red-listed, rare, or endemic. Following the initial site inspection, two SCC were confirmed to occur within open savannah/grassland vegetation on-site, namely Sensitive Species 191 (Vulnerable) and *Moraea graminicola* subsp. graminicola (Near Threatened, South African Endemic). In addition to the two threatened plant species occurring on site, which are protected under the National Environmental Management: Biodiversity Act (NEM:BA), there are a number of plant species that are protected under the Natal Conservation Ordinance and National Forest Act that will also require relevant plant permits from the appropriate competent authorities (i.e., Department of Forestry, Fisheries and the Environment (DFFE) and Ezemvelo KwaZulu-Natal Wildlife (EKZNW)).

Several faunal SCC have been flagged as potentially occurring within the study area and therefore further faunal surveys, by appropriately qualified specialists, will need to be undertaken to address any potential impacts associated with specific species.

In the South Block, a total of 599 river/ stream units and 22 wetland units were identified and classified in the study area. In the North Block a total of 331 river/ stream units and 63 wetland units were identified and classified.

A high level river and aquatic health assessment for the North Block indicates that the sub-quaternary reach of the Mfule River that runs through the Block is largely in a natural condition with Ecological Importance and Sensitivity (EIS) rated as high. The current activities highlighted as potentially impacting the health of the system are rural settlements, invasive alien plant encroachment and abandoned agricultural lands.

The baseline wetland and aquatic study for the South Block (PR 10652) revealed that most watercourses in this area are rivers and streams. The rivers and streams ranged from a D (Poor Condition) to A (Natural Condition) ecological category. Most were Low to Moderate EIS, with the exception being the assessed reach of the Mhlatuze River, which was assessed as being of High EIS. A total of 23 wetland units were mapped within the South Block. This consisted of 11 unchanneled valley bottom wetlands and 12 seeps. These ranged from a D (Poor Condition) to C (Fair Condition) ecological category and from Low to Moderate EIS.

Socio-economic Environment

The area surrounding the proposed MIOP is classified as fully rural/ non-urban, with approximately 70 % of the land under tribal/ traditional authority administration. The only urban development within the study area is Melmoth (central west of the study area), which is approximately 15 km to the north-west of the proposed Jindal MIOP.

Numerous communities inhabit the area proposed for the Jindal MIOP with most households comprising formal brick dwellings, and traditional housing.

There are three Traditional Authority areas within the Mthonjaneni LM:

- Biyela KwaYanguye Traditional Authority is located to the north-east of the municipality.
- Zulu-Entembeni Traditional Authority is located to the south-east of the municipality.
- Biyela-Obuka Traditional Authority is located towards the East of the municipality.

Both the Mthonjaneni and uMlalazi Local Municipalities have economies that are currently strongly dependent on agriculture, manufacturing, and mining sectors.

In these two municipalities, the majority of job seekers have a matric with employment rates being higher in the Mthonjaneni LM than in the uMlalazi LM. However, the average household income in the Mthonjaneni LM is classified as low, with an annual income of less than R40 000.

The agricultural production within the North and South Blocks is limited to subsistence farming with fields between 5 and 10 ha. Although higher potential agricultural areas surround the Jindal MIOP site, neither the North Block nor the South Block fall within High Potential Agricultural Areas (HPAA). The most prominent production area located southeast of the south-eastern boundary of the South Block, is the Nkwalini valley. In this area, a variety of horticultural crops are produced under irrigation that include citrus, macadamias, bananas, and passion fruit. Other areas consist of irrigated sugar cane, and to the north of the South Block, commercial forests and crops are also found.

Over the next 30 years both municipalities show a slight potential decrease in population, which is likely due to people leaving the area in search of job opportunities in nearby urban areas, such as Empangeni and Richards Bay. There is also evidence that the improving education levels has resulted in young professionals leaving their family homes to find work elsewhere.

Even though the bulk of the population, in both LMs, fall within the working age of 15 and 64,a significant dependency burden exists in the area. It is important that job opportunities are available to support households with a single breadwinner and many dependents given that the average household size is more than 4 people per house.

Within the two LMs, less than half of the households have access to municipal water. Access to basic levels of sanitation is also poor in both municipalities with almost half of the households not having access to flushing toilets. The high dependency on pit latrines is a concern as poor sanitation can be a vector for disease. Just over one third of households has access to refuse removal services supplied by the municipalities. Less than 20% of the population has access to electricity within their households. The remaining households rely on paraffin for cooking and lighting.

For Some 200 years the Zulu people have occupied the Melmoth region , as such traditional culture is observed by many residents and community social structures remain strong. Homesteads have remained within families for many generations and many residents have strong ties to the land where grave sites, artefacts and cultural heritage resources are present. As part of the EIA a Heritage Study is required to identify and map cultural assets. Due to community sensitivities regarding cultural assets access to the area was restricted . During onsite interviews held by the Heritage Specialist, it was confirmed that burials are conducted under traditional rites and that graves are mostly located at family homesteads. Further surveys are required to identify all potential cultural or heritage resources that fall within the proposed Jindal MIOP footprint area.

EIA FINDINGS AND RECOMMENDATIONS FOR THE JINDAL MIOP

An impact assessment was undertaken to determine the potential impacts associated with the proposed construction, operational and decommissioning phases of the Jindal MIOP. The following specialist studies were undertaken to inform the impact assessment:

- Groundwater Study;
- Surface Water Study;
- Terrestrial Biodiversity Study;
- Wetland & Aquatic Ecology Study;
- Air Quality Study;
- Noise Study;
- Soils, Land Capability & Land Use Study;
- Visual Study;
- Greenhouse Gas & Climate Change Study;
- Blasting & Vibration Study;
- Palaeontology Study;
- Community Health Study;
- Cultural Heritage Study;
- Traffic Study;
- Socio-economic Study; and
- Closure and Financial Liability.

The findings of these assessments are included in Table 1, Table 2 and Table 3.

Construction Phase

During the construction phase there are a number of both biophysical and socio-economic impacts that could potentially occur once development of the project site is initiated.

Some of the positive socio-economic impacts associated with the MIOP include job creation, skills development, and procurement opportunities for local businesses. Another positive impact includes community development programmes implemented by the mine as part of their Social Labour Plan.

Most of the potential impacts can be reduced to between medium and insignificant, however, there are a number of impacts that even with mitigation implemented will still remain of a high significance. These high significance impacts are largely related to the impacts on sensitive biodiversity in the footprint and surrounding areas of the Jindal MIOP (Table 1). The most significant impacts are associated with the initial direct loss of habitat, loss of species of conservation concern and impacts on ecological processes. Based on best-practice guidelines, a biodiversity offset would therefore be required to compensate for these impacts should the application be approved. It is recommended that the residual impacts to both terrestrial and freshwater habitat be investigated and addressed as part of an overall biodiversity offset investigation. Protected plant permits would also need to be obtained from the relevant competent authorities. The impact on the visual environment is also very hard to mitigate with a project of this size and also remains of high significance.

In order to proceed with the mine development, the relocation of communities was also identified as an impact of high significance. It is estimated that more than 350 homesteads will need to be physically displaced as a result of the proposed project. This would include the requirement for the relocation of graves. If the mine is to be developed, the relocation of households will be undertaken in accordance with International Best Practice guidelines. As part of this process a Resettlement Action Plan (RAP) will be developed in consultation with affected communities. This includes the establishment of a Resettlement Advisory Committee comprising community leaders and affected household members who will work closely with the mine to determine fair and equitable compensation measures that aim to ensure households are not left worse off as a result of resettlement. . The RAP will assist with mitigating and managing the impacts associated with resettlement, and will ensure that resettled households are provided with the opportunity to inform the resettlement process.

Table 1 Summary of Construction Phase Impacts Identified and their Pre and Post Mitigation Rating

Potential Impact	Unmitigated	Mitigated
Biophysical		
Impact on groundwater quantity	**Very low -**	**Insignificant -**
Impact on groundwater quality	**Low -**	**Insignificant**
Reduced surface water quality	**Medium -**	**Low -**
Alteration of natural drainage patterns and flow	**Medium -**	**Low -**
Impact of flooding (of infrastructure)	**Medium -**	**Low -**
Direct - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	**Very high -**	**High -**
Indirect - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	**High -**	**Medium -**
Direct - Impacts to species and threatened species conservation	**High -**	**Medium -**
Indirect - Impacts to species and threatened species conservation	**Medium -**	**Medium -**
Direct - Impacts to local and regional ecological processes	**High -**	**High -**
Indirect - Impacts to local and regional ecological processes	**Medium -**	**Medium -**
Physical loss or modification of freshwater habitat	**Medium**	**Medium**
Alteration of hydrological and geomorphological processes	**Medium**	**Low -**
Impacts to wetlands and aquatic ecosystems due to reduced water quality	**Medium**	**Low -**
Impacts to ecological connectivity and/or ecological disturbance impacts	**Moderate-Low**	**Low -**
Impact on ambient air quality	**Medium**	**Low -**
Impact on ambient noise levels	**Low -**	**Very low -**
Impact of change of land use from subsistence farming to mining	**Medium -**	**Low -**
Impact of loss and/or reduction of current land capability	**High -**	**Low -**
Impact of increased soil erosion	**High -**	**Medium -**
Impact of soil compaction	**High -**	**Medium -**
Impact of soil pollution	**High -**	**Low -**
Impact on landscape and visual aspects	**High -**	**High -**
Impact of the project on climate change	**Low -**	**Low -**
Socio-economic		
Loss of palaeontological resources	**Insignificant**	**Insignificant**
Impact of changing farming practices, market options and sources of nutrition	**Very high -**	**Medium -**
Exposure to vector-borne and zoonotic disease	**Medium -**	**Low -**

Changes in access to healthcare	**Very high -**	**Very high +**
Loss of cultural heritage resources	**Very high -**	**Medium -**
Relocation of graves	**Very high -**	**High -**
Impact on road users and traffic safety	**Low -**	**Low -**
Labour influx / in-migration of jobseekers	**Low -**	**Very Low -**
Resettlement and relocation	**High -**	**Medium -**
Improved access to social infrastructure and infrastructure and lifestyle	**Medium -**	**Low -**
Business and enterprise - impacts - on the agricultural sector	**High -**	**Medium -**
Business and enterprise - impacts on tourism	**High -**	**Medium -**
Impact on the local and regional economy	**High +**	**High +**

Operational Phase

During operations (Table 2) there are two potential impacts that have been the subject of a lot of stakeholders concerns; air quality (dust), and water supply. Air quality modelling indicates that levels of dust to surrounding farming areas are likely to be within manageable levels. It is going to be important, however, should the Jindal MIOP be approved that ongoing monitoring be undertaken to understand whether the model outcomes are correct as well as to ensure that additional mitigation measures are implemented should levels be higher than assessed.

In terms of water supply, the potential abstraction of water from the Mhlathuze catchment has been explored, however, the Mhlathuze catchment is currently overallocated and as such the DWS may only consider new allocations if the applicants contribute to interventions which would generate additional water in the catchment. These interventions will be assessed through a WULA.

Other potentially significant impacts post mitigation associated with the operational phase include reduced groundwater levels due to dewatering of the open pit, additional loss or modification of freshwater habitat as the open pit and the WRD footprints expand, and ongoing visual impacts. There is also the possibility of significant positive impacts in terms of job creation, economic stimulation, and potential positive impacts due to road improvements. One of the major positive impacts during the operational phase is the positive impact due to the use of iron, and subsequent steel, in the renewable energy sector. The global economy would not be able to move to a lower GHG emissions scenario without a substantial increase in renewable energy infrastructure development, which requires steel.

In term of positive impacts, the mine is predicted to result in approximately 800 full time equivalent (FTE) job opportunities during operations which would include skilled, semi-skilled and unskilled jobs. It is predicted that the impact on the productivity of the commercial farms, as a result of the mine, will be low and hence limited job losses should result from mining.

Table 2 Summary of Operational Phase Impacts Identified and their Pre and Post Mitigation Rating

Potential Impact	Unmitigated	Mitigated
Biophysical		
Impact on groundwater quantity	**Very high -**	**High -**
Impact on groundwater quality	**Insignificant**	**Insignificant**
Reduced surface water quality	**High -**	**Medium -**

Alteration of natural drainage patterns and flow	**Medium -**	**Low -**
Impact of flooding	**Medium -**	**Low -**
Direct - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	**High -**	**Medium**
Indirect - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	**High -**	**Medium -**
Direct - Impacts to species and threatened species conservation	**High -**	**Medium -**
Indirect - Impacts to species and threatened species conservation	**Medium -**	**Medium -**
Direct - Impacts to local and regional ecological processes	**Medium -**	**Medium -**
Indirect - Impacts to local and regional ecological processes	**Medium -**	**Medium -**
Physical loss or modification of freshwater habitat	**High**	**High**
Alteration of hydrological and geomorphological processes	**High**	**Medium**
Impacts to wetlands and aquatic ecosystems due to reduced water quality	**High**	**Medium**
Impacts to ecological connectivity and/or ecological disturbance impacts	**Medium -**	Low -
Impact on ambient air quality - community health	**High - to Medium**	**Medium - to Low -**
Impact on ambient air quality - commercial crops	**Low -**	**Very Low -**
Impact on ambient air quality - blasting	**Medium -**	**Low -**
Impact on ambient noise levels	**High -**	**Medium -**
Impact of change of land use from subsistence farming to mining	**High -**	**Low -**
Impact of loss and/or reduction of current land capability	**Medium -**	**Low -**
Impact of increased soil erosion	**Medium -**	**Very Low -**
Impact of soil compaction	**High -**	**Medium -**
Impact of soil pollution	**High -**	**Low -**
Impact on landscape and visual aspects	**Very high -**	**High -**
Impact of the project on climate change	**High +**	**High +**
Impact of ground vibration, air blast and fly rock due to blasting activities	**High -**	**Low -**
Socio-economic		
Impact of changing farming practices, market options and sources of nutrition	**Very high -**	**Medium -**
Exposure to vector-borne and zoonotic disease	**Medium -**	**Low -**
Changes in access to healthcare	**Very high -**	**Very high +**
Loss of cultural heritage resources	**Very high -**	**Medium -**
Relocation of graves	**Very high -**	**High -**
Impact on road users and traffic safety	**High to Medium -**	**Medium to High +**
Labour influx / in-migration of jobseekers	**Medium -**	**Low -**
Community development and lifestyle	**Medium +**	**High +**
Business and enterprise - impacts on tourism	**Medium -**	**Medium -**
Impact on the local and regional economy	**High +**	**High +**

Decommissioning Phase

At decommissioning and closure (Table 3) of the Jindal MIOP the bulk of the impacts would cease, and the levels of impact would largely rate as low to insignificant (with a few of medium significance) provided that the infrastructure is decommissioned and rehabilitated according to the approved Closure Plan and associated Rehabilitation Plan. The visual impact related to the Jindal MIOP would remain in the landscape permanently but can be minimised to some extent with rehabilitation. An important impact at decommissioning would be the potential negative impact on the local area as a result of the loss of employment and the associated benefits linked to the spend of the Jindal MIOP in the local economy. However, if properly managed and planned for well in advance, through a well-structured and implemented mine Closure Plan, the negative impacts on the local communities and surrounding towns can be significantly reduced.

Table 3 Summary of Decommissioning and Closure Phase Impacts Identified and their Pre and Post Mitigation Rating

Potential Impact	Unmitigated	Mitigated
Biophysical		
Impact on groundwater quantity	**Low -**	**Insignificant -**
Impact on groundwater quality	**Insignificant**	**Insignificant**
Reduced surface water quality	**Medium -**	**Low -**
Alteration of natural drainage patterns and flow	**Medium -**	**Low -**
Impact of flooding	**Medium -**	**Low -**
Direct - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	**Medium -**	**Low -**
Indirect - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	**High -**	**Medium -**
Direct - Impacts to species and threatened species conservation	**Medium -**	**Low -**
Indirect - Impacts to species and threatened species conservation	**Medium -**	**Low -**
Direct - Impacts to local and regional ecological processes	**Medium -**	**Medium -**
Indirect - Impacts to local and regional ecological processes	**Medium -**	**Low -**
Physical loss or modification of freshwater habitat	**Medium -**	**Medium -**
Alteration of hydrological and geomorphological processes	**Medium -**	**Low -**
Impacts to wetlands and aquatic ecosystems due to reduced water quality	**Medium -**	**Low -**
Impacts to ecological connectivity and/or ecological disturbance impacts	**Moderate-Low -**	**Low -**
Impact on ambient air quality	**Medium -**	**Low -**
Impact on ambient noise levels	**Low -**	**Very low -**
Impact of change of land use from subsistence farming to mining	**High -**	**Low -**
Impact of loss and/or reduction of current land capability	**Medium -**	**Low -**
Impact of increased soil erosion	**High -**	**Medium -**
Impact of soil compaction	**High -**	**Medium -**
Impact of soil pollution	**High -**	**Low -**
Impact on landscape and visual aspects	**High -**	**Medium -**

Impact of the project on climate change	Not assessed	
Socio-economic		
Impact of changing farming practices, market options and sources of nutrition	**Very high -**	**Medium -**
Impact on road users and traffic safety	**Low -**	**Low -**
Labour influx / in-migration of jobseekers	**Low -**	**Very Low -**
Community development and lifestyle	**Medium -**	**Low -**
Business and enterprise - impacts on tourism	**High -**	**Medium -**
Impact on the local and regional economy	**Medium -**	**Low -**

ENVIRONMENTAL MANAGEMENT PROGRAMME

Based on the outcome of the Impact Assessment and where applicable the recommendations from specialists the proposed management objectives and outcomes specific to the proposed Jindal MIOP are included into the EMPr. Specific environmental objectives and actions to control, remedy or prevent potential impacts are specified to either mitigate negative impacts or enhance positive impacts throughout the planning and design, construction, operational and decommissioning phases.

CONCLUSION AND RECOMMENDATIONS

The full Scoping and EIA process has been undertaken by the independent consultant, SLR Consulting (South Africa) (Pty) Ltd with input from the specialists as previously defined.

The findings indicate that while there are both negative impacts and benefits of the Jindal MIOP, careful consideration needs to be given to several key areas including management of impacts on biodiversity (and associated offset planning), impacts of air quality and water quality (particularly with reference to the nearby commercial farming areas), water quantity in terms of groundwater drawdown, water supply issues, the enhancement of local benefits, and proactive closure planning.

It follows therefore, that the findings of the impact assessment undertaken show that there is the potential for significant impacts throughout all phases of the project, however, with the effective implementation of the EMPr, careful planning and ongoing engagement with all stakeholders and potentially affected parties there is no biophysical, social, or economic reason why the project should not proceed.

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APPENDICES

ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
A	Aluminium
ABET	Adult Basic Education and Training
ABGM	A&B Global Mining
AOI	Area of Interest
ASTM	American Society for Testing Materials
BA	Basic Assessment
BBBEE	Broad Based Black Economic Empowerment
BFS	Bankable Feasibility Study
BID	Background Information Document
BIF	Banded Iron Formation
CA	Competent Authority
CARA	Conservation of Agricultural Resources Act (No. 43 of 1983)
CCIA	Climate Change Impact Assessment
CMA	Catchment Management Agency
CN	Cyanide
CO	Carbon Monoxide
COGTA	Department Co-operative Governance & Traditional Affairs
CRR	Comments and Response Report
Cu	Copper
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and Environment
DMRE	Department of Mineral Resources and Energy (Previously DMR)
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EASASA	Environmental Assessment Practitioner Association of South Africa
ECO	Environmental Control Officer
EDTEA	Department of Economic Development, Tourism and Environmental Affairs
EIA	Environmental Impact Assessment
EIS	Ecological Importance & Sensitivity
EKZNW	Ezemvelo KZN Wildlife
EMF	Environmental Management Frameworks
EMPA	Environmental Management Planning and Approvals
EMPr	Environmental Management Programme
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
GN/GNR	Government Notice
GRDP	Gross Regional Domestic Product
GVA	Gross Value Added
HDSAs	Historically Disadvantaged South Africans
Hg	Mercury

HPGR	High Pressure Grinding Roll
HSA	Hazardous Substances Act, 1973 (Act No. 15 of 1973)
I&AP	Interested and Affected Party
IAP	Invasive Alien Plants
IDP	Integrated Development Plan
IFC	International Finance Corporation
Iron	Fe
ISO	International; Organisation for Standardisation
IUCN	International Union for Conservation of Nature
KZN	Kwazulu-Natal
LC	Least Concern
LED	Local Economic Development
LM	Local Municipality
LOM	Life of Mine
LoS	Level of Service
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
MCD	Mine Community Development
MHSA	Mine Health and Safety Act, 1996 (Act No. 29 of 1996)
MIOP	Melmoth Iron Ore Project
Mn	Manganese
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MRA	Mining Right Application
MSU	Most Sensitive User
MTS	Main Transmission Substation
Mtpa	Million tonnes per annum
NAAQS	National Ambient Air Quality Standards
NDCR	Dust Control Regulations
NDP	National Development Plan
NEM: AQA	National Environmental Management: Air Quality Act, 2004 (Act No 34 of 2004)
NEM: PAA	National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEM:WA	National Environmental Management: Waste Act, 2008
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NFA	National Forest Act, 1998 (Act No. 84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resource Act, 1999 (Act No. 25 of 1999)
NIP	National Infrastructure Plan (2012)
NO2	Nitrogen Dioxide
NSDP	National Spatial Development Plan
NSSD	National Strategy for Sustainable Development and Action Plan
NTS	Non-technical Summary
NWA	National Water Act, 1998 (Act No. 36 of 1998)
O3	Ozone
Pb	Lead
PES	Present Ecological State
PGDP	Provincial Gross Domestic Product

PGDS	Provincial Growth Development Strategy
POC	Potential Occurrence
PSDF	KZN Provincial Draft Spatial Development Framework (2021)
QC	Quaternary Catchments
ROM	Run of Mine
SADC	Southern African Development Community
S&EIA	Scoping & Environmental Impact Assessment
SAHRA	South African Heritage Resources Agency
SAMRAD	South African Mineral Resources Administration System
SANAS	South African National Accreditation System
SANS	South African National Standard
SAWQG	South African Water Quality Guidelines
SCC	Species of Conservation Concern
SEI	Sites of Ecological Importance
SLP	Social Labour Plan
SO2	Sulphur Dioxide
SPLUMA	Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)
TSF	Tailings Storage Facility
TSP	Total Suspended Particles
TWQR	Targeted Water Quality Range
USBM	United States Bureau of Mines
WMA	Water Management Area
WML	Waste Management Licence
WRD	Waste Rock Dump
WRS	Water Resources Study
WWTP	Waste Water Treatment Plant
WUL	Water Use Licence
WULA	Water Use Licence Application
Zn	Zinc

JINDAL MELMOTH IRON ORE PROJECT EIA & EMPR

INTRODUCTION

OVERVIEW OF PROPOSED PROJECT

Jindal Iron Ore (Pty) Ltd (Jindal), owned by Jindal Steel and Power (Mauritius) Limited (74%) and South African Broad Based Black Economic Empowerment (BBBEE) partner Mr. Thabang Khomo (Pty) Ltd (26%), currently holds two Prospecting Rights over the project site, known as the Jindal Melmoth Iron Ore Project (MIOP). The prospecting rights are referred to as the North (PR 10644), which is 8 467 ha, and South (PR 10652), which is 11 703 ha, Blocks and have a total combined area of 20 170 ha. The Jindal MIOP site is located 25 km southeast of Melmoth, within the Mthonjaneni Local Municipality (LM) in the Kwazulu-Natal (KZN) Province of South Africa (Figure 1-2). Jindal is proposing to develop an iron ore mine on the site to extract 32 million tonnes per annum (mtpa) of iron ore which would be processed on site to produce approximately 7 mtpa of iron ore concentrate.

SLR Consulting (South Africa) (Pty) Ltd (SLR) was appointed as the Environmental Assessment Practitioner (EAP) to undertake the regulatory Environmental Impact Assessment (EIA) and associated Environmental Management Programme (EMPr) process for the proposed Jindal MIOP. Jindal is in the process of applying for a Mining Right in terms of Section 22 of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA) in order to convert and consolidate the Prospecting Rights for the North and South Blocks and thereby develop the Jindal MIOP. In addition, the proposed project triggers listed activities under the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA) and the associated EIA Regulations, 2014, and an Environmental Authorisation (EA) is therefore also required. The Scoping Report was approved by the Department of Mineral Resources and Energy (DMRE) in July 2022 and the EIA phase then commenced.

SUMMARY OF AUTHORISATION REQUIREMENTS

As discussed, the proposed Jindal MIOP requires a Mining Right and an EA as the project includes activities listed under the EIA Regulations, 2014. Under NEMA, listed activities are prohibited from commencing until written authorisation is obtained from the Competent Authority (CA), which in this case is the KZN office of the DMRE. Jindal also requires a Waste management Licence (WML) in terms of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) from the DMRE.

The MPRDA, NEMA and NEM:WA require that an applicant submit the relevant environmental reports required in terms of NEMA. The EIA Regulations, 2014 promulgated in terms of NEMA set out the assessment process and reporting requirements where authorisation is required. Prior to the commencement of the proposed Project, the following is required:

- An EA in terms of the NEMA for activities in EIA Regulation Listing Notice 1, 2 and 3 (GNR 983, 984 and 985 of 2014) from the KZN DMRE. Listed activities triggered as a result of the proposed Project are outlined in Section 3.1.
- A Mining Right Application (MRA) in terms of Section 22 of the MPRDA from the KZN DMRE.
- A WML in terms of NEM:WA and the associated regulations. Listed waste management activities are included in GNR 921 of November 2013.

A **Scoping and Environmental Impact Assessment (S&EIA) Process** is required to apply for the above listed authorisations in terms of the EIA Regulations, 2014. Other legislation that is pertinent to this application includes the following:

- National Water Act (No. 36 of 1998) (NWA); and
- National Environmental Management: Biodiversity Act (No. 10 of 2004).

Figure 1-1 Shows the environmental authorisation process followed for the Jindal MIOP.

TERMS OF REFERENCE AND OBJECTIVES OF ENVIRONMENTAL AUTHORISATION PROCESS

The Terms of Reference for this EA and EMPr process are:

- Submit a MRA to the KZN DMRE. Accepted by the DMRE 24 May 2022.
- Submit an EA Application for the Listed Activities triggered by the proposed Jindal MIOP in terms of the EIA Regulations, 2014 promulgated under NEMA. Accepted by the DMRE 10 February 2022.
- Ensure that an EIA process for the proposed Project is undertaken in an open, participatory manner that ensures all potential issues of concern and their associated impacts are identified.
- Undertake a formal public participation process (PPP), which includes the distribution of information to Interested and Affected Parties (I&APs) and provides an opportunity for I&APs to raise any issues/concerns arising from the proposed project, as well as an opportunity to comment on all documentation arising from the EIA process.
- Submit a Scoping Report of 30 day public review and obtain approval from the DMRE. Accepted by the DMRE 14 July 2022.
- Integrate all information into an EIA Report to allow for an informed decision to be taken on the proposed Project by the CA.

PURPOSE OF THE REPORT

This Environmental Impact Assessment (EIA) Report has been compiled and will be distributed for review and comment as part of the S&EIA process that is being undertaken for the Jindal MIOP. The S&EIA process is prescribed in the EIA Regulations (GNR 982 of 2014), as amended in terms of the NEMA.

The purpose of this EIA Report is to:

- Determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- 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;

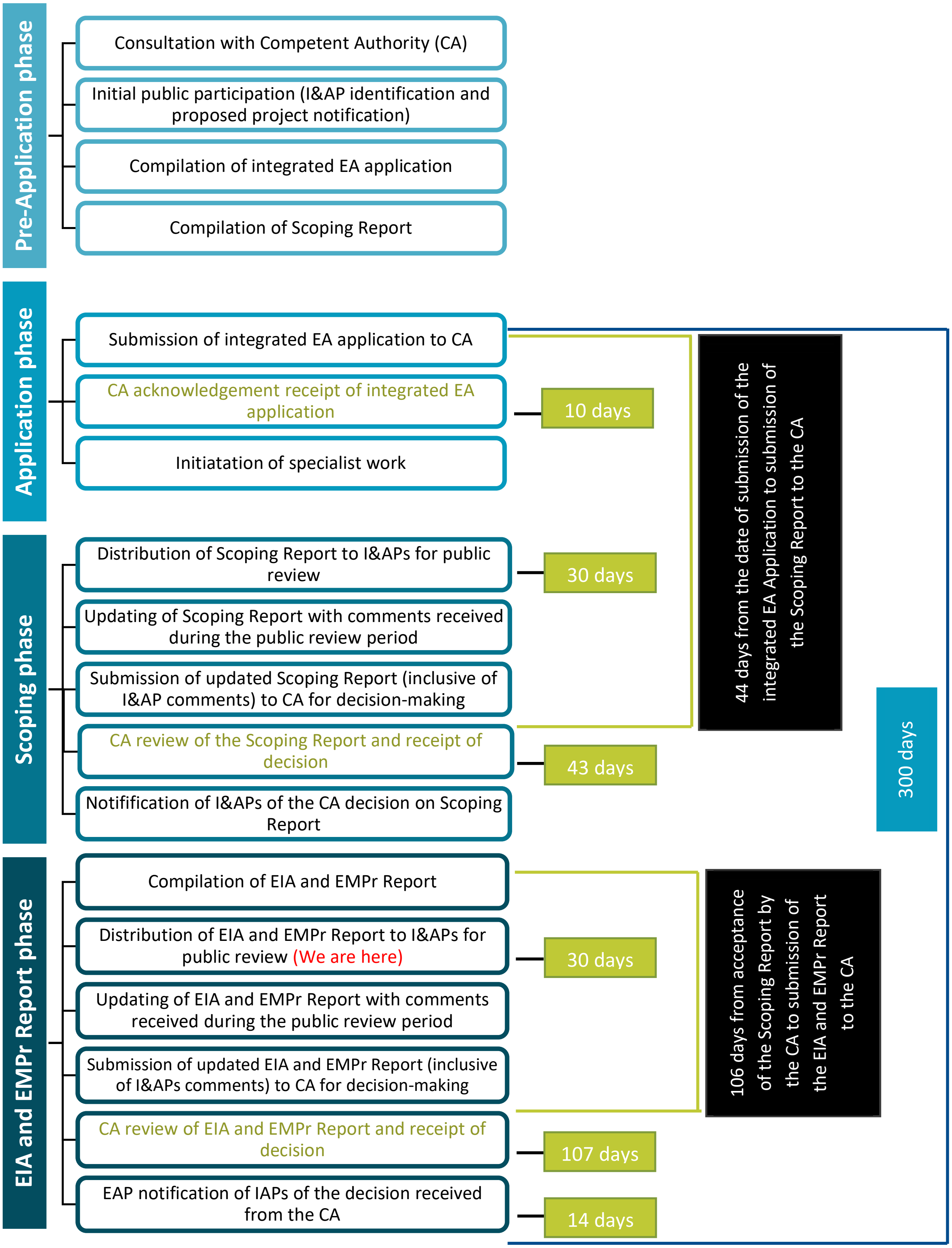

Figure 1-1: Overview of the EIA Process [1]

- Determine:
  - the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
  - the degree to which these impacts:
    - can be reversed;
    - may cause irreplaceable loss of resources; and
    - can be avoided, managed or mitigated.
- Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- Identify, assess and rank the impacts the activity would impose on the preferred location through the life of the activity;
- identify suitable measures to avoid, manage or mitigate identified impacts; and
- identify residual risks that need to be managed and monitored.

Interested and Affected Parties (I&APs) are asked to comment on the EIA and EMPr Report. The EIA and EMPr Report will be updated, giving due consideration to the comments received, and will be submitted to the DMRE for consideration as part of the application for the Mining Right and EA made in terms of NEMA.

STRUCTURE OF THIS REPORT

This EIA has been prepared in accordance with the DMRE EIA template format and Appendix 6 of the NEMA EIA Regulations, 2014, the contents of which are outlined in Table 1-4.

Table 1-4: Structure of the EIA and EMPr

EMPr report requirement as per the DMRE template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
Part A of DMRE report template	**Appendix 3 of the NEMA regulations**	**Section/Appendix**
The EAP who prepared the report	Details of the EAP who prepared the report	Section 1.1
Expertise of the EAP	Details of the expertise of the EAP, including curriculum vitae	Section 1.2
Description of the property	The location of the activity, including - the 21 digit Surveyor General code of each cadastral land parcel. Where available the physical address and farm name. Where the required information is not available, the coordinates of the boundary of the property or properties	Section 2
Locality plan	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken or on land where the property has	Section 2.1

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[1] Timelines are in calendar days

EMPr report requirement as per the DMRE template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
	not been defined, the coordinates within which the activity is to be undertaken	
Description of the scope of the proposed overall activity	A description of the scope of the proposed activity, including all listed and specified activities triggered	Section 3.1.2
Description of the activities to be undertaken	A description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for and a description of the associated structure and infrastructure related to the development	Section 3.1
Policy and legislative context	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context	Section 4
Need and desirability of the proposed activity	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location	Section 5
Motivation for the preferred development footprint within the approved site including	A motivation of the preferred development footprint within the approved site including	Section 6
A full description of the process followed to reach the proposed development footprint within the approved site	A full description of the process followed to reach the proposed development footprint within the approved site	Section 7
Details of the development footprint alternatives considered	Details of all the alternatives considered	Section 7.1.2
Details of the public participation process followed	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs	Section 7.2
Summary of issues raised by I&APs	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them	Section 7.3
Environmental attributes associated with the development footprint alternatives	The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Section 7.4
Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts including the degree of the impacts	The 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 reversed, may cause irreplaceable loss of resources and can be avoided, managed and mitigated	Section 7.11

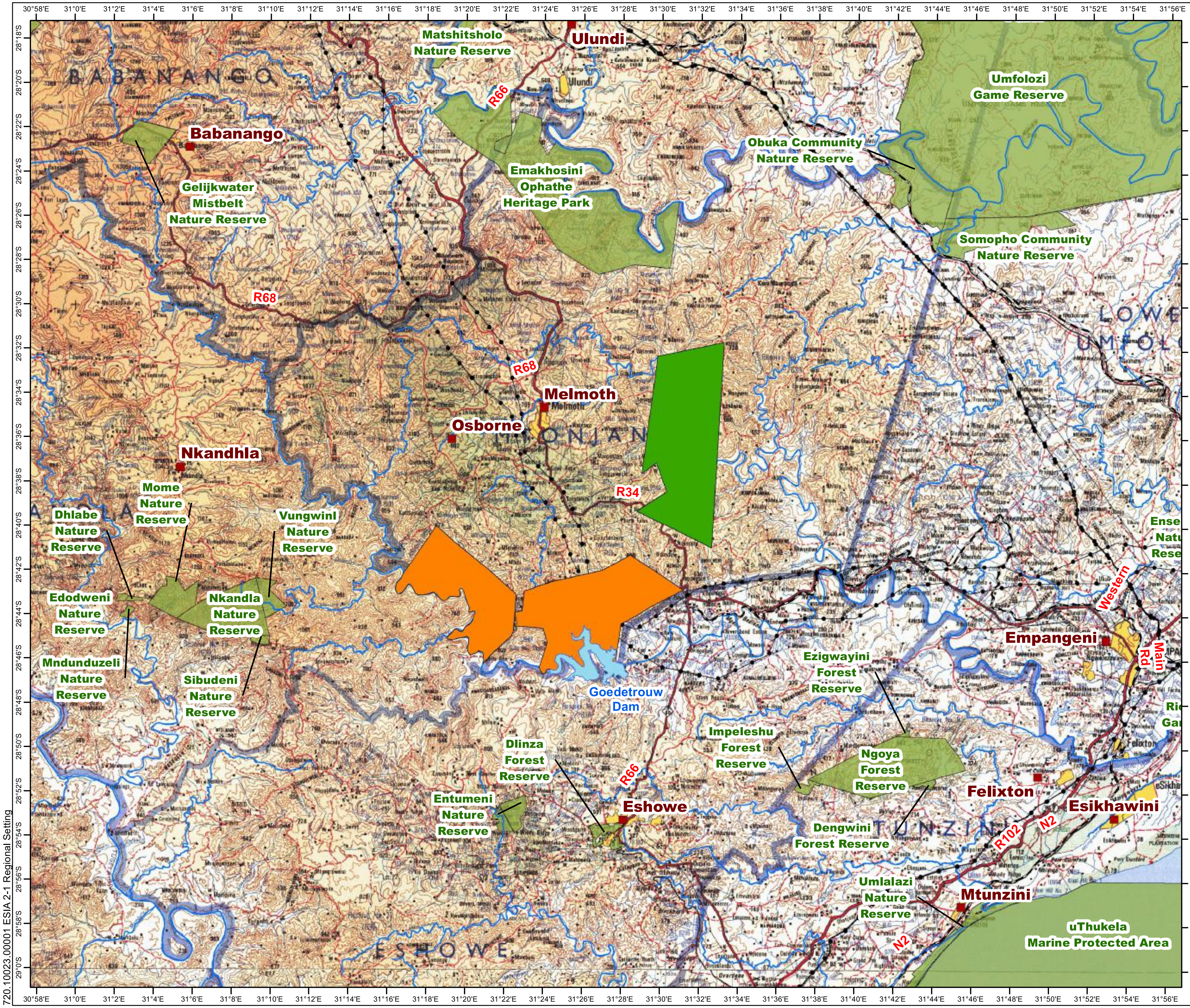
EMPr report requirement as per the DMRE template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
Methodology used in determining the nature, significance, consequence, extent, duration and probability of potential environmental impacts and risks	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks	Section 7.9
The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternative will have on the environment and the community that may be affected	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Section 7.10
The possible management actions that could be applied and the level of risk	The possible management actions that could be applied and level of residual risk	Section 7.12
Motivation where no alternative sites were considered	If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such	Section 7.13
Statement motivating the alternative development location within the overall site	A concluding statement indicating the preferred alternatives, including preferred location within the approved site	Section 0
Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (in respect of the final site layout) through the life of the activity	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structure and infrastructure will impose on the preferred location through the life of the activity including a description of all environmental issues and risks that were identified during the environmental impact assessment process and an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of management actions	Section 8
Assessment of each identified potentially significant impact and risk	An assessment of each identified potentially significant impact and risk including cumulative impacts, the nature, significant and consequence of the impact and risk, the extent and duration of the impact and risk, the probability of the impact and risk occurring, the degree to which the impact can be reversed, the degree to which the impact and risk may cause irreplaceable loss of a resources and the degree to which the impact and risk can be mitigated.	Section 9
Summary of specialist reports	Where applicable the summary of the findings and recommendations of any specialist report complying with Appendix 6 of these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report	Section 10

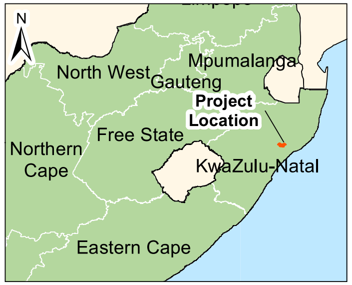
EMPr report requirement as per the DMRE template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
Environmental impact statement	An environmental impact statement which contains a summary of the key findings of the environmental impact assessment, a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers and a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives	Section 11
Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation	Section 12
Final proposed alternatives	The final proposed alternatives which respond to the impact management actions, avoidance, and management actions identified through the assessment	Section 13
Aspects for inclusion as conditions of authorisation	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	Section 14
Description of any assumptions, uncertainties and gaps in knowledge	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and management actions proposed	Section 15
Reasoned opinion as to whether the proposed activity should or should not be authorised	Reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	Section 16
Period for which environmental authorisation is required	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised	Section 17
Undertaking	An undertaking under oath or affirmation by the EAP in relation to the correctness of the information provided in the reports, the inclusion of comments and inputs from stakeholders and I&APs, the inclusion of inputs and recommendations from the specialist	Section 34

EMPr report requirement as per the DMRE template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
	reports where relevant and any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties	
Financial provision	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	Section 18
Deviation from the approved scoping report and plan of study	An indication of any deviation from the approved scoping report, including the plan of study, including any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and a motivation for the deviation	Section 19
Other information required by the competent authority	Any specific information required by the competent authority.	Section 20
Other matter required in terms of section 24(4)(a) and (b) of the Act	Any other matter required in terms of section 24(4)(a) and (b) of the Act	Section 21
Part B of DMRE report template	**Appendix 4 of the NEMA regulations**	**Section/Appendix**
Details of EAP	Details of the EAP who prepared the EMPr and the expertise of that EAP to prepare the EMPr, including a curriculum vitae	Section 22
Description of the aspects of the activity	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description	Section 23
Composite map	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers	Section 24
Description of impact management objectives including management statements	A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including planning and design, pre-construction activities, construction activities, rehabilitation of the environment after construction and where applicable post closure; and where relevant, operation activities	Section 25
The determination of closure objectives		Section 25.1
The process for managing any environmental damage, pollution, pumping and treatment of	-	Section 25.2

EMPr report requirement as per the DMRE template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
extraneous water or ecological degradation as a result of undertaking a listed activity		
Potential acid mine drainage	-	Section 25.3
Steps taken to investigate, assess and evaluate the impact of acid mine drainage	-	Section 25.4
Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage	-	Section 25.5
Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage	-	Section 25.6
Volumes and rate of water use required for the mining	-	Section 25.7
Has a water use licence been applied for?	-	Section 25.8
Impacts to be mitigated in their respective phases	-	Section 26
Impact management outcomes	A description and identification of impact management outcomes required for the aspects contemplated in paragraph	Section 27
Impact management actions	A description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes be achieved, and must, where applicable, include actions to avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; comply with any prescribed environmental management standards or practices; comply with any applicable provisions of the Act regarding closure, where applicable comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable	Section 28
Financial provision		Section 29
Mechanism for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon	The method of monitoring the implementation of the impact management actions	Section 30
	The frequency of monitoring the implementation of the impact management actions	
	An indication of the persons who will be responsible for the implementation of the impact management actions	
	The time periods within which the impact management actions must be implemented	
	The mechanism for monitoring compliance with the impact management actions	

EMPr report requirement as per the DMRE template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations	
Frequency of performance assessment	How regularly compliance of the EMPr needs to be undertaken.	Section 31
Environmental Awareness Plan	An environmental awareness plan describing the manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work; and risks must be dealt with in order to avoid pollution or the degradation of the environment	Section 32
Specific information required by the competent authority	Any specific information that may be required by the competent authority	Section 33
Undertaking	-	Section 34





Legend

- 🟥 Towns / Villages
- Roads
- Railway Lines
- Power Lines
- Rivers
- Dams
- South African Protected Areas
- Proposed North Block Mining Right Area
- Proposed South Block Mining Right Area

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Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 1-2
REGIONAL SETTING

SLR

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Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 2-1	Date: 17/06/2023

720.10023.00001 ESIA 2-1 Regional Setting

PART A - SCOPE OF THE ASSESSMENT

1. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

1.1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

SLR Consulting South Africa (Pty) Ltd (SLR) has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA process for the proposed Jindal Melmoth Iron Ore Project (MIOP). The details of the EAP project team that were involved in the preparation of this EIA Report are provided in Table 1-1. The qualifications and experience (curricula vitae) of the project team are included in Appendix B.

Table 1-1 Details of the Environmental Assessment Practitioner

General			
Organisation	SLR Consulting (South Africa) (Pty) Ltd		
Postal address	PO Box 1596, Cramerview, 2060		
Tel No.	(011) 467 0945		
Name	**Role and Tasks**	**Registration**	**Email**
Kate Hamilton	Project Manager and Author	Registered EAP (EAPASA[2])	khamilton@slrconsulting.com
Edward Perry	Project Director	Registered EAP (EAPASA)	eperry@slrconsulting.com
Rob Hounsome	Technical Review		rhounsome@slrconsulting.com

SLR has no vested interest in the proposed Project other than contractually agreed payment for consulting services rendered as part of the EIA process. An undertaking by SLR declaring its independence, as required by the EIA Regulations, 2014, is provided in Chapter 34.

1.2 QUALIFICATIONS AND EXPERIENCE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Rob Hounsome is the Managing Director of the SLR Group of Companies in Africa. He has 28 years of wide-ranging experience in Environmental and Social advisory and consulting in 41 countries across the globe. Rob has a particular interest in advising on complex environmental and social issues in developing countries and in assessing, monitoring, and managing the impacts of development directly, indirectly, and cumulatively on the natural environment and people. His experience has ranged from supporting National Government and International Agencies with the development and application of customised environmental planning and assessment tools through to completing Environmental and Social Due Diligence (ESDD) and EIAs in accordance with requirements of national governments, industry associations, and various funding agencies including major international finance institutes, equator principle banks, and/or PE and Legal Firms. In addition, he has completed many research and consultancy technical assignments in the fields of climate change and pollution and waste. Rob has worked extensively in the mining, oil and gas, manufacturing/ industrial and infrastructure sectors and with finance clients.

Edward Perry is the Operations Manager for the Environmental Management Planning and Approvals (EMPA) team in Africa for SLR. He has worked in environmental consultancy for over twenty years for a wide range of public and private sector clients. Ed is registered as an EAP with the Environmental Assessment Practitioner Association of South Africa no. 2019/1210 and a registered Environmental Auditor with the Institute for Environmental Management and Assessment and a Lead Auditor with the International Cyanide Management

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[2] Environmental Assessment Practitioners Association of South Africa

Institute. Ed has been involved with EIAs and Environmental Authorisations throughout Africa. Ed has been Project Manager of Environmental Impact Assessments (EIAs) for a wide range of facilities including renewable energy facilities; metal extractive industries; large water storage schemes; and new mines and extensions to mines.

Kate Hamilton is an Associate Environmental Consultant based in Johannesburg and a registered EAP (Ref: 2019/836). As a specialist environmental project manager, she has over 16 years of private sector experience in environmental consulting. Kate has worked as a project manager in the environmental field where she has developed core competencies in environmental impact assessments and management programmes, project management and coordination and environmental monitoring, with a focus in the mining sector. Kate has worked on projects throughout the project lifecycle from exploration/ site identification through pre-feasibility to feasibility, to operation and closure for the mining, power, infrastructure and oil and gas sectors. This includes conducting site identification, screening and scoping studies, baseline studies and specialist management, impact assessments, monitoring, management planning and implementation, as well as public consultation processes; for local regulatory permitting processes. Kate has worked extensively in the SADC region as well as in West Africa and has experience in managing large scale environmental projects with large integrated teams in challenging locations across the continent. Kate has also worked in the APAC region in both the Philippines and Papua New Guinea.

Proof of EAPASA Registration and Curriculum Vitaes are included in Appendix B.

2. DESCRIPTION AND LOCATION OF ACTIVITY

A description of the property on which the proposed Project is located is provided in Table 2-1 and Table 2-2. The site locality is depicted in Figure 2-1.

Table 2-1: Description of the Property

Description	Details
Magisterial district	King Cetshwayo Magisterial District
Local Municipality	Mthonjaneni LM
Distance and direction from the nearest town	The proposed Project area is located approximately 16 km south and east of the town of Melmoth.
Application area (ha)	20 170 ha (both North and South Blocks)
Location of the proposed activity/activities	See Table 2-2.

Table 2-2 Location of the Proposed Project and/or Activities

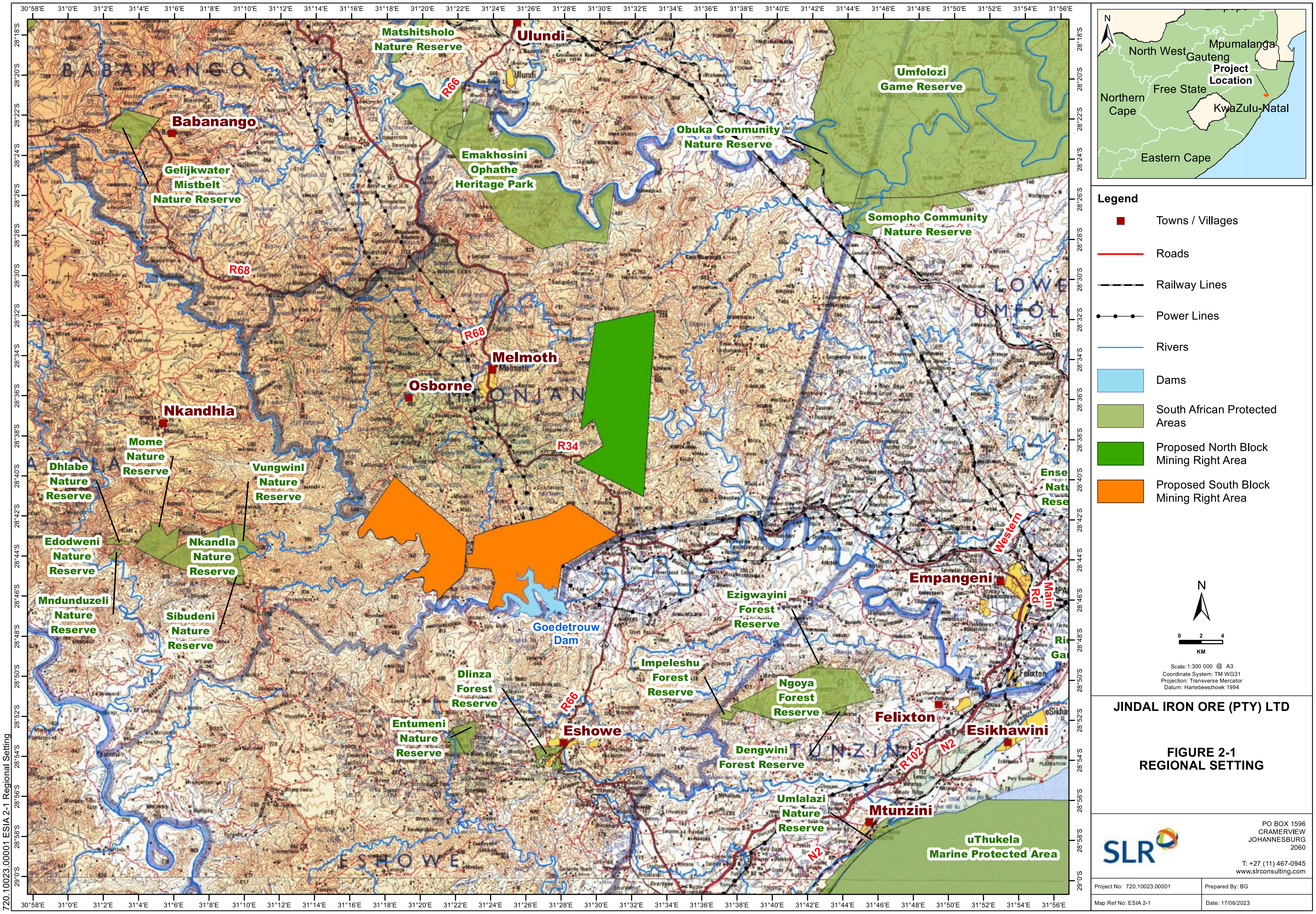
Farm name	Project component	Relevant farm and portion	21- Surveyor code
Ntembeni 16921	North Block	Part of the Remaining Extent	N0GU00000001692100000
Reserve No 11 15831	North Block	Portion 3	N0GU00000001583100003 N0GU00000001583100004
		Portion 4	
Kromdraai 6110	South Block	Remaining Extent	N0GU00000000611000000
Black Eyes 13385	South Block	Portion 1	N0GU00000001338500001 N0GU00000001338500002 N0GU00000001338500003 N0GU00000001338500004 N0GU00000001338500000
		Portion 2	
		Portion 3	
		Portion 4	
		Remaining Extent	
Wilderness 6107	South Block	Portion 3	N0GU00000000610700003 N0GU00000000610700004 N0GU00000000610700005 N0GU00000000610700006 N0GU00000000610700007 N0GU00000000610700008 N0GU00000000610700012 N0GU00000000610700013 N0GU00000000610700014 N0GU00000000610700015 N0GU00000000610700016
		Portion 4	
		Portion 5	
		Portion 6	
		Portion 7	
		Portion 8	
		Portion 12	
		Portion 13	
		Portion 14	
		Portion 15	
		Portion 16	

Farm name	Project component	Relevant farm and portion	21- Surveyor code
Goedgeloof 6106	South Block	Portion 1 Portion 2 Portion 3 Remaining Extent	N0GU00000000610600001 N0GU00000000610600002 N0GU00000000610600003 N0GU00000000610600000
Goedertrow 89 No. 7806 (currently known as a portion of the farm Ntembeni No. 16921)	South Block	-	N0GU00000001692100000
Reserve No.11 15831	South Block	Part of the Remaining Extent	N0GU00000001583100000
Vergelegen 6104	South Block	-	N0GU00000000610400000 N0GU00000000610400000

The Regulation 2.2 property map is included in Appendix V.

2.1 LOCALITY SETTING

The Jindal MIOP site is located 25 km southeast of Melmoth, within the Mthonjaneni Local Municipality (LM) in the Kwazulu-Natal (KZN) Province of South Africa. The regional and local setting of the Jindal MIOP are illustrated in Figure 2-1 and Figure 2-2.



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Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 2-1
REGIONAL SETTING

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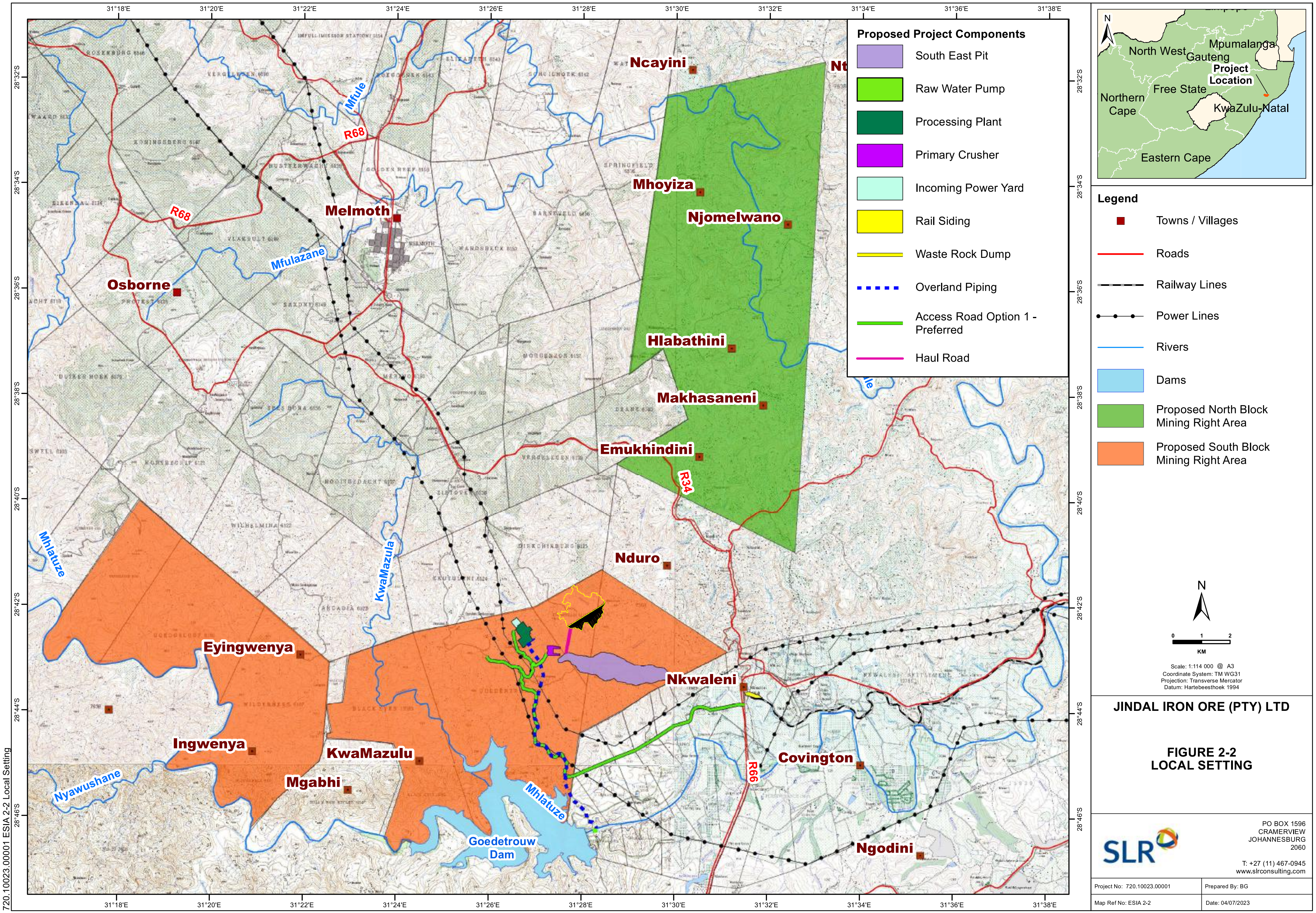
Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 2-1	Date: 17/06/2023

720.10023.00001 ESIA 2-1 Regional Setting



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Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 2-2
LOCAL SETTING

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Project No: 720.10023.00001
Prepared By: BG
Map Ref No: ESIA 2-2
Date: 04/07/2023

720.10023.00001 ESIA 2-2 Local Setting

3. DESCRIPTION OF THE SCOPE OF THE ACTIVITY

3.1 LISTED AND SPECIFIED ACTIVITIES

The EIA Regulations, 2014 (as amended) promulgated under NEMA and published in Government Notice (GN) No. R982 (as amended by GN No. 517 of 11 June 2021) controls certain Listed Activities. These activities are listed in GN No. R983 (Listing Notice 1; as amended by GN No. 517 of 11 June 2021), GN No. R984 (Listing Notice 2; as amended by GN No. 517 of 11 June 2021) and GN No. R985 (Listing Notice 3; as amended by GN No. 517 of 11 June 2021) and are prohibited until an Environmental Authorisation (EA) has been obtained from the competent authority (CA). Such EA, which may be granted subject to conditions, will only be considered once there has been compliance with GN No. R982 (as amended). GN No. R 982 (as amended) sets out the procedures and documentation that need to be complied with when applying for an EA.

The proposed project activities are outlined in Table 3-1. The proposed project would trigger a number of listed activities in terms of the 2014 EIA Regulations (as amended by GN No. 517 of 11 June 2021) promulgated under NEMA. These activities require authorisation in the form of an EA from the DMRE prior to commencement. Listed Activities in GN No. 984 of 2014 require authorisation through a Scoping and EIA (S&EIA) process, whilst those listed in GN No. 983 and GN No. 985 of 2014 require a Basic Assessment (unless they are being assessed under a S& EIA process). In addition, the list of waste management activities published in terms of NEM:WA in Government Notice 921 of 29 November 2013 (as amended) are included. The listed activities applicable to this project and being applied for in this S&EIA process are listed in Table 3-2, Table 3-3, Table 3-4 and Table 3-5.

The proposed project triggers listed activities contained in Listing Notice 1, Listing Notice 2 and Listing Notice 3; therefore, a S&EIA process must be undertaken in accordance with the procedures as prescribed in regulations 21 to 24 of the EIA Regulations (2014) in order for the DMRE to consider the application in terms of NEMA and NEM:WA and make a decision to grant the EA or not.

Table 3-1 Activities Associated with the Jindal MIOP (in terms of the NEMA EIA Regulations, NEM:WA and NWA

Description of Activity	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
Site preparation and construction activities			
Selective clearing of vegetation (in line with a biodiversity management plan to be developed for the project).	Total approximately 1000 Ha.	X	*NEMA EIA Regulations* NEMA GNR 983 (30) NEMA GNR 984 (15) NEMA GNR 985 (12)
Establishing a contractor's area.		X	
Stripping, handling, and stockpiling of topsoil (in line with a soil management plan to be developed for the project).		X	
Cleaning, grubbing and bulldozing activities.		X	*NEMA EIA Regulations* NEMA GNR 984 (15)
Establishing storm water controls (in line with a Regulation 704 compliant storm water management plan to be developed for the project).		X	*NEMA EIA Regulations* NEMA GNR 983 (13) *NWA Section 21* 21(g)
Excavations and establishing reservoir and stormwater controls.		X	
Excavations for plant and WRD.		X	*NEMA EIA Regulations* NEMA GNR 983 (19); NEMA GNR 983 (24); NEMA GNR 983 (56); NEMA GNR 984 (6); NEMA GNR 985 (4); NEMA GNR 985 (14); NEMA GNR 985 (18) *NEM:WA* NEM:WA GNR 921 A (9) *NWA Section 21* NWA 21(c) and 21(i)
Bulk earthworks including foundations, trenches, berms.		X	
Establishing road networks.		X	
Plant Area			

Description of Activity	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
General building activities, erection of structures and concrete and steel work associated with infrastructure complexes and the related support facilities (including Eskom transformer yard, water reservoir, construction laydown, assembly and staging areas, administration offices, laboratory, and stores).	Approximately 80 Ha. 60 Ha	X	*NEMA EIA Regulations* NEMA GNR 983 (19); NEMA GNR 985 (14) *NEM:WA* NEM:WA GNR 921 A (9)
Vehicle and machinery maintenance areas.	20 Ha		*NEM:WA* NEM:WA GNR 921 C (2)
Establishment of a salvage yard.	5 Ha	X	*NEM:WA* NEM:WA GNR 921 A (12) NEM:WA GNR 921 C (1)
Storage of fuel and/ or other hazardous substances.	1 Ha	X	*NEMA EIA Regulations* NEMA GNR 983 (14); NEMA GNR 984 (4)
Mining Operations			
• Drilling and blasting • Establishing storm water controls (in line with a GN704 compliant storm water management plan to be developed for the project) ahead of mining • Clearing of vegetation (in line with a biodiversity management plan to be developed for the project) ahead of mining • Stripping, handling, and stockpiling of topsoil (in line with a soil management plan to be developed for the project) ahead of mining • Establishing access and internal haul roads ahead of mining • Excavating waste rock • Excavating mineral resource • Stockpiling of run-of-mine (RoM) • Crushing • Loading RoM onto tipper trucks • Dewatering • Explosives store	Approximately 350 Ha.	X	*NEMA EIA Regulations* NEMA GNR 984 (6); NEMA GNR 984 (15); NEMA GNR 984 (17); NEMA GNR 984 (19); NEMA GNR 985 (12); NEMA GNR 985 (14) *NWA Section 21* NWA 21(c), 21(i) and 21 (j)

Description of Activity	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
Waste Rock Management			
Storage of waste rock on WRD.	204 Ha	X	*NEMA EIA Regulations* NEMA GNR 984 (19); NEMA GNR 985 (14) *NEM:WA* NEM:WA GNR 921 B (11) *NWA Section 21* NWA 21(g)
Transportation			
Vehicle, machinery and/or material movement within the site boundary.	Within 36 Ha of new roads		Not applicable
Use of access road and public roads for transporting staff, consumables, and general/industrial waste.	Within 36 Ha of new roads		
Water Supply and Management			
Potable water supply pipelines from Goedertrouw Dam. Concentrate pipeline to Nkwalini Siding (will follow the access road route).	8 Ha	X	*NEMA EIA Regulations* NEMA GNR 983 (9); NEMA GNR 984 (6) NWA 21(a)
Pipelines for sewage, process water etc.	8 Ha	X	NWA 21(c) and 21(i)
Treatment and storage of sewage and wastewater.	Within plant footprint – 60 Ha	X	*NEMA EIA Regulations* NEMA GNR 983 (25); NEMA GNR 984 (6)
Clean water storage in a new reservoir up to 100 000 m^3.	Within plant footprint – 60 Ha	X	*NEMA EIA Regulations*

Description of Activity	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
			NEMA GNR 983 (13); NEMA GNR 984 (6); NEMA GNR 984 (16); NEMA GNR 985 (2); NEMA GNR 985 (14) NWA 21(b)
Raw water storage, pollution control dams	Within plant footprint –60 Ha		NWA 21(b)
Dirty water storage and management.	Within plant footprint – 60 Ha	X	*NEMA EIA Regulations* NEMA GNR 984 (6) NWA 21(b)
Storm water management.	To be determined	X	*NEMA EIA Regulations* NEMA GNR 984 (6)
Dust suppression.	Volumes to be determined.	X	*NEMA EIA Regulations* NEMA GNR 984 (6)
Power Supply			
The construction and operation of a new substation (including transformer yard) and transmission lines with a capacity of up to 33 kV.	6.5 ha	X	*NEMA EIA Regulations* NEMA GNR 983 (11).
Emergency generators.	Within plant footprint – 60 Ha	X	Not applicable
General and Hazardous Waste Management			
Temporary storage and sorting of general and hazardous waste at a waste/salvage yard for re-use or recycling. Hazardous wastes removed by a licensed contractor.	Within plant footprint –60 Ha	X	NEM:WA NEM:WA GNR 921 A (12) NEM:WA GNR 921 C (1) NEM:WA GNR 921 C (2)

Description of Activity	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
Removal of waste by contractor for recycling, re-use or final disposal at permitted waste disposal facilities.	N/A	X	Not applicable
Expansion of Nkwalini Siding			
Expansion of the Nkwalini siding	7.5 ha	X	*NEMA EIA Regulations* NEMA GNR 983 (64)

Table 3-2 NEMA Listed Activities Applicable to the Proposed Project in term of GN No. 983 of 2014 (as amended by GN No. 517 of 11 June 2021)

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
9	"The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water—"	40 Ha	X	The proposed activity would need new pipelines for water supply.
10	"The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes –“	Certain pipes will be up to 10 km length with a 0.36 m internal diameter.	X	New sewage, return recycle water and process and potable water pipelines network servicing the mine, plant, laboratory, offices, workshop facilities. An additional pipeline will also be required for the transfer of concentrate to the Nkwalini Siding which would follow the access road alignment.
11	"The development of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is - (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development."	6.5 ha	X	Construction and operation of a new substation (including transformer yard) and transmission lines with a capacity of up to 33 kV to provide electricity to infrastructure within the footprint of the mine, i.e., processing plant, offices, etc.
13	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with	100 000 m^3	X	The construction of a reservoir with a capacity of up to 100 000 m^3 within the mining right area.

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
	a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.			
14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	Approximately 500 m^3.	X	Storage and handling of dangerous goods, i.e., diesel, oil, and other lubricants, etc.
19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving - (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies	Within the proposed footprint of 1000 Ha.	X	Construction of site infrastructure
24	"The development of a road –	36 ha	X	Construction of on-site haul and access roads.

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
	(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) with a reserve wider than 13.5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road - (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; (b) where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter."			
25	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres.	Within plant footprint – 60 Ha	X	Construction and operation of a Sewage and Water Treatment Plant.
30	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	Total clearance of approximately 1000 Ha.	X	Clearing of vegetation for the construction of on-site infrastructure and operation of the South East Pit.
56	"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre - (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas."	36 Ha	X	Widening and lengthening of existing road

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
64	The expansion of railway lines, stations, or shunting yards where there will be an increased development footprint, excluding - (i) railway lines, shunting yards and railway stations in industrial complexes or zones; (ii) underground railway lines in mines; or (iii) additional railway lines within the railway line reserve."	7.5 Ha	X	Potential expansion of railway lines, shunting yards etc.

Table 3-3 Listing Activities Applicable to the Proposed Project in Terms of GN No. 984 of 2014 (as amended by GN No. 517 of 11 June 2021)

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
4	The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	10 Ha	X	Storage and handling of dangerous goods, i.e., diesel, oil, and other lubricants, etc
6	"The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding - (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or (iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day."	Not Applicable.	X	A Water Use License Application will be required for the proposed project.
15	"The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for – (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan."	Total clearance of approximately 1 100 Ha.	X	The clearance of indigenous vegetation for the placement of infrastructure.

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
16	The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the highwater mark of the dam covers an area of 10 hectares or more.	Within plant footprint –60 Ha	X	Water storage of up to 100 000 m^3 will be required which would require a wall of 5 m or higher.
17	"Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including – (a) associated infrastructure, structures, and earthworks, directly related to the extraction of a mineral resource; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening, or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies."	Total area of approximately 1000 Ha.	X	The project requires a mining right for the extraction and processing of ore.
19	"The removal and disposal of minerals contemplated in terms of section 20 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including – (a) associated infrastructure, structures, and earthworks, directly related to prospecting of a mineral resource; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies."	Total area of approximately 1000 Ha.	X	The Jindal MIOP will require the construction and operation of an open pit area, waste rock dump, and a processing plant.

Table 3-4 Listing Activities Applicable to the Proposed Project in Terms of GN No. 985 of 2014 (as amended by GN No. 517 of 11 June 2021)

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
2	"The development of reservoirs, excluding dams, with a capacity of more than 250 cubic metres. d. KZN i. Trans-frontier protected areas managed under international conventions; ii. Community Conservation Areas; iii. Biodiversity Stewardship Programme Biodiversity Agreement areas; iv. World Heritage Sites; v. In an estuarine functional zone; vi. In a protected area identified in terms of NEMPAA, excluding conservancies; vii. Sites or areas identified in terms of an international convention; viii. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; ix. Core areas in biosphere reserves; x. Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, or zoned for a conservation purpose; xi. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; xii. Outside urban areas: (aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any terrestrial protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or	Up to 100 000 m^3, 3 ha	X	The Jindal MIOP will require the construction and operation of a reservoir in excess of 250 m^3 in capacity within a critical biodiversity area.

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
	(bb) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or xiii. Inside urban areas: (aa) Areas zoned for use as public open space; (bb) Areas seawards of the development setback line or within 100 metres from the high-water mark of the sea if no such development setback line is determined; or (cc) Within urban protected areas."			
4	"The development of a road wider than 4 metres with a reserve less than 13,5 metres. KZN i. In an estuarine functional zone; ii. Trans-frontier protected areas managed under international conventions; iii. Community Conservation Areas; iv. Biodiversity Stewardship Programme Biodiversity Agreement areas; v. World Heritage Sites; vi. A protected area identified in terms of NEMPAA; vii. Sites or areas identified in terms of an international convention; viii. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; ix. Core areas in biosphere reserves; x. Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose;	Within total area of approximately 1000 Ha.	X	The construction of haul and access roads

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
	xi. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; xii. Outside urban areas: (aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any terrestrial protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve; or (bb) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or xiii. Inside urban areas: (aa) Areas zoned for use as public open space; (bb) Seawards of the development setback line or within 100 metres from the high-water mark of the sea if no such development setback line is determined; or (cc) Within urban protected areas."			
12	"The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. d. KZN i. Trans-frontier protected areas managed under international conventions; ii. Community Conservation Areas; iii. Biodiversity Stewardship Programme Biodiversity Agreement areas; iv. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEM:BA or prior to the publication of such a	Total area of approximately 1000 Ha.	X	The clearance of indigenous vegetation for the placement of infrastructure and related mining activities.

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
	list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; v. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; vi. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas; vii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; viii. A protected area identified in terms of NEMPAA, excluding conservancies; ix. World Heritage Sites; x. Sites or areas identified in terms of an international convention; xi. Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; xii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; or xiii. In an estuarine functional zone."			
14	"The development of - (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs -	Up to 100 000 m^3, 3 Ha	X	Some infrastructure (plant, pit, WRDS, roads etc) developed for the Jindal MIOP would be within 32 m of a watercourse.

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
	(a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour." "d. KZN i. In an estuarine functional zone; ii. Community Conservation Areas; iii. Biodiversity Stewardship Programme Biodiversity Agreement areas; iv. A protected area identified in terms of NEMPAA, excluding conservancies; v. World Heritage Sites; vi. Sites or areas identified in terms of an international convention; vii. Critical biodiversity areas or ecological support areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; viii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; ix. Core areas in biosphere reserves; x. Outside urban areas: (aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any terrestrial protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or			

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
	(bb) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or xi. Inside urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose; or (cc) Areas seawards of the development setback line or within 100 metres from the high-water mark of the sea if no such development setback line is determined."			
18	"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. d. KZN i. Trans-frontier protected areas managed under international conventions; ii. Community Conservation Areas; iii. Biodiversity Stewardship Programme Biodiversity Agreement areas; iv. World Heritage Sites; v. In an estuarine functional zone; vi. A protected area identified in terms of NEMPAA; vii. Sites or areas identified in terms of an international convention; viii. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; ix. Core areas in biosphere reserves;	Within total area of approximately 1000 Ha.	X	Widening of existing roads will be required within an area considered to have a high ecological importance, due to the presence and potential occurrence of threatened and protected plant species.

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
	x. Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; xi. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; xii. Outside urban areas: (aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any terrestrial protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve; or (bb) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or xiii. Inside urban areas: (aa) Areas zoned for use as public open space; (bb) Seawards of the development setback line or within 100 metres from the high-water mark of the sea if no such development setback line is determined; or (cc) Within urban protected areas."			

Table 3-5 Listed Activities - National Environmental Management: Waste Act (No. 59 of 2008) R 921 of November 2013

No.	Listed activity Description	Aerial extent of the activity (ha)	Listed Activity (Mark with an X where applicable)	Relevance of listing activity
Category A (Basic Assessment)				
9	The disposal of inert waste to land in excess of 25 tonnes but not exceeding 25 000 tonnes, excluding the disposal of such waste for the purposes of levelling, and building which has been authorised by or under other legislation.	Approximately 400 Ha.	X	The Jindal MIOP will require the disposal of inert waste generated during the construction phase. Will be used for site levelling.
12	The construction of a facility for a waste management activity listed in Category A of this Schedule (not in isolation to associated waste management activity).		X	The Jindal MIOP will require a salvage yard and a temporary waste storage area, etc.
Category B (Scoping and EIA)				
11	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002	460 Ha	X	The Jindal MIOP will require the establishment of a WRD.
Category C (Norms and Standards)				
1	The storage of general waste at a facility that has the capacity to store in excess of 100m^3 of general waste at any one time, excluding the storage of waste in lagoons or temporary storage of such waste.	Approximately 1 Ha	X	Waste storage facility for temporary storage prior to removal from site and disposal at a licensed facility.
2	The storage of hazardous waste at a facility that has the capacity to store in excess of 80m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste.	Approximately 1 Ha	X	Storage of used oils or other hazardous waste at a waste storage yard on a temporary basis before removal from site for disposal at a licensed facility.

Table 3-6 National Water Act, 1998 (Act No. 36 of 1998) Section 21 Listed Activities

No.	Listed activity Description	Relevance of listing activity
21 (a)	Taking water from a water resource.	Water supply to be ascertained but water will be required from a local resource.
21 (b)	Storing water.	Earthen dams required for raw water storage, pollution control dams etc.
21 (c)	Impeding or diverting the flow of water in a watercourse.	Currently the WRD position will impede flow as could the other surface infrastructure. There will also be road and pipeline crossings required and may well require diversion.
21 (f)	Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit.	Discharge from WWTP or STP into a water resource.
21 (g)	Disposing of waste in a manner which may detrimentally impact on a water resource.	The waste rock dump has the potential to impact on both underground and surface water resources. Also, RoM stockpiles and other product stockpiles will be required.
21 (i)	Altering the bed, banks, course, or characteristics of a watercourse.	Currently the WRD position will impede flow as could the other surface infrastructure. There will also be road and pipeline crossings required and may well require diversion. The processing plant would also require to be licenced.
21 (j)	Removing, discharging, or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.	Pit dewatering would be required as mining progresses.

3.1.1 Project Background

The Jindal MIOP site is located 25 km southeast of Melmoth, within the Mthonjaneni LM in the KZN Province. Jindal Iron Ore (Pty) Ltd (Jindal), is owned by Jindal Steel and Power (Mauritius) Limited (74%) and South African BBBEE partner Mr. Thabang Khomo (Pty) Ltd (26%). Jindal holds two Prospecting Rights over the project site which referred to as the North Block (PR 10644) and the South Block (PR 10652) and have a total combined area of 20 170 ha.

The area of interest contains banded iron formations (BIF) and were investigated by Premier Zululand Zinc in 1908 followed by Union Carbide Prospecting SA in 1969 and Iscor (Pty) Ltd in the 1980's. The investigations indicated that iron ore was present as magnetite, a magnetically recoverable mineral of high iron content, and as amphibole grunerite, a mineral of low iron content that is not recoverable. These early investigations did not result in project development because the magnetite content was too low to compete with the more attractive hematite iron mineralisation in the Northern Cape and the prevailing iron ore price could not support feasible mining of the magnetite BIF.

The iron ore price started increasing in 2007 generating renewed interest in iron ore in the Melmoth district. In 2011 Sungu Sungu (Pty) Ltd, (later renamed to Jindal Iron Ore (Pty) Ltd.) was issued Prospecting Rights for the two concessions which are now the subject of this Mining Right Application (MRA). In 2012 Jindal commenced with prospecting activities.

In 2013 Jindal appointed Golder Associates Africa (Pty) Ltd. (Golder) as the independent EAP responsible for managing the EIA and the supporting Public Participation Process (PPP). Golder submitted a Final Scoping Report to the Department of Economic Development, Tourism and Environmental Affairs (EDTEA) under both Jindal Iron Ore (for the mining EIA) and Jindal Processing KZN (for the Processing Plant EIA) in March 2015.

In June 2015 both Scoping Reports (mining and processing) were returned to Jindal with comments from the EDTEA requesting more clarity on various aspects of the project, company structure and further engagement with Interested and Affected Parties (I&APs).

In the interim the iron ore price declined from a high of $130 per tonne in January 2014 to a low of $47 per tonne in December 2015. The decline in the iron ore and steel prices worldwide resulted in reduced funding from Jindal for the project and it was not possible to undertake the envisioned tasks from the EDTEA and complete an amended Scoping Report.

In 2019 through 2020 the iron ore price steadily recovered and as at the first quarter of 2021 averaged $160 per tonne. The improved iron ore price has encouraged Jindal to increase the rate of development of the Jindal MIOP.

In January 2021 Jindal appointed SLR as the independent EAP to undertake a new EIA and associated PPP and prepare all documentation for a Mining Right Application (MRA). Jindal also appointed consultants to produce a Bankable Feasibility Study (BFS) for the Jindal MIOP.

3.1.2 Proposed Activities for the Jindal MIOP

Jindal's intent with this MRA is to consolidate the Prospecting Rights for the North and South Blocks (Figure 2-1) into a single Mining Right. However, development of the mine and mining infrastructure would be undertaken in a phased approach with mining currently only proposed to be undertaken in the south-eastern section of the South Block (Figure 2-2), where the iron ore resource has been defined. Infrastructure would be developed to support this mining operation. The MRA and EIA consider the entire extent of the North and South Blocks, but with a specific focus on Phase 1 of the Jindal MIOP as described in this section. The tailings storage facility (TSF) is proposed to be off-site under a separate application which is currently in the initial stage of development.

As part of phase 1, an open pit mining operation is proposed to be developed in the south-east section of the South Block known as the South East Pit. Approximately 800 million tonnes of ore is expected to be mined from the pit over the Life of Mine (LOM) (approximately 25 to 30 years). Waste rock would be stripped from the pit at a ratio of approximately 0.5 tonnes of waste rock per one tonne of ore. The waste rock would be disposed of on a waste rock dump (WRD) within the mining right area (Figure 2-2). Drilling and blasting techniques would be used to excavate the iron ore (proposed to be 32 million mtpa) which would then be loaded onto trucks and transported to the Run-of-Mine (ROM) ore stockpile area where it would be stored and subsequently transferred to the processing plant for milling and magnetic separation. The milling and magnetic separation processes are wet processes so that iron ore slurry can be easily handled by means of pumps, pipes and machinery designed for slurry processing. The concentrated iron ore now contains 67% iron compared to 30% iron in the mined ore. The concentrate is thickened and filtered to remove water which is recycled within the process. The processing plant would produce iron ore concentrate and a tailings slurry. The approximately 7 mtpa of iron ore concentrate would be transported 80 km to the Richards Bay Port by rail using the Nkwalini rail siding situated 4 km from the proposed Jindal MIOP (part of a separate application). The concentrate would be exported as there are limited local markets. The tailings would be disposed of to a TSF (separate application as discussed previously). Associated infrastructure to support the mine would include:

- a milling and processing plant;
- analytical laboratory;
- rail loading facility;
- access and haul roads;
- electrical transmission line and sub-stations;
- raw water abstraction and pipelines;
- stormwater management infrastructure;
- tailings pipelines;
- concentrate pipelines;
- offices;
- change house;
- workshops and perimeter fencing (amongst others).

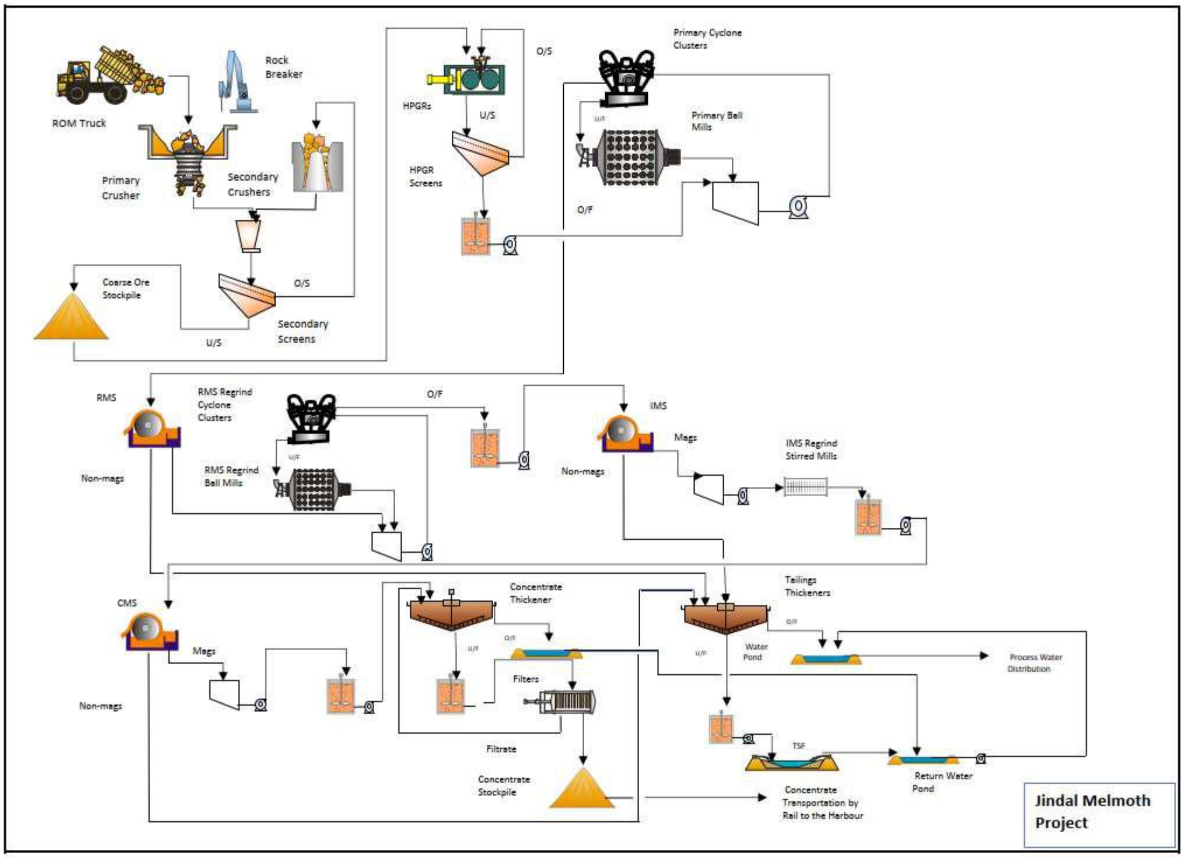


Figure 3-1 Conceptual Design of the Process

Some of the infrastructure required for the mine (e.g., pipelines and TSF) may be located outside of the Mining Right area. This infrastructure would be subject to separate application, assessment, and approval processes, as required by applicable legislation (See Section 4). The major infrastructure is described in more detail in the following sections and the high level process is depicted in Figure 3-1. The full proposed Jindal MIOP process is included in Figure 3-6.

3.1.2.1 South East Pit

The proposed project would make use of opencast (surface) mining techniques. Opencast mining involves the removal of overburden, to provide access to the iron ore body located beneath. Drilling and blasting techniques would be used to excavate the iron ore which would then be loaded onto trucks and transported to the run of mine (ROM) ore stockpile area for storage prior to processing. The final dimensions of the South East Pit would be approximately 4 000 m east-west, 1 000 m north-south and 550 m in depth (Figure 3-3). The explosives proposed for the blasting of the pit are proposed to be an emulsion type explosive . Blast holes would be spaced at approximately 5 m apart and approximately 11 m in depth. There would be an estimated 2 blasts per week pending final detailed design.

The following activities would be undertaken as part of this process:

- Pre-stripping of vegetation, topsoil and subsoil to allow for mining activities. Site preparation activities include the preparation of access and haul roads, ROM stockpiles, the WRD, and other construction areas. Topsoil would be removed from designated areas and stockpiled for use in future rehabilitation activities.

- Removal of overburden - Due to the nature of the site the excavation of overburden would require drilling and blasting. Overburden would be excavated and trucked to the WRD.
- Loading and Hauling - Loading and hauling of ore and waste rock would be done using the most appropriately sized equipment to suit the prevailing conditions. Electric-powered or hydraulic operated back hoes and front-loading shovels would be used to excavate and load materials. A 231-ton haul truck fleet has been selected and would be expected to operate at an average velocity of around 32km/h. The haulers will be operating on a twelve-hour continues shift-system. An example of the loading and hauling machinery is included in Figure 3-2.

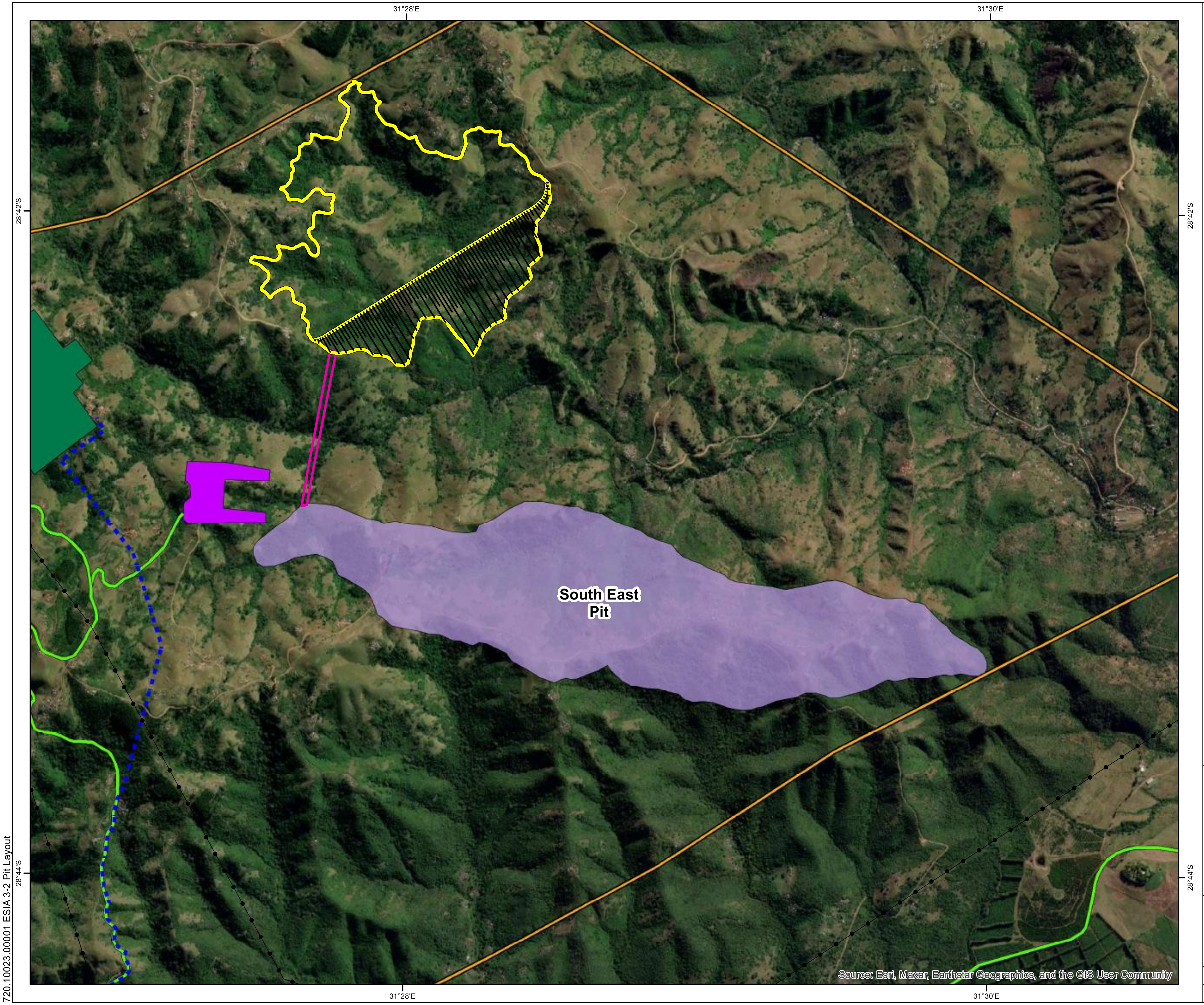
Figure 3-2 CAT 6060 Hydraulic Mining Shovel

3.1.2.2 Waste Rock Dump

A WRD is required to accommodate overburden and waste rock excavated as part of the mining process. The WRD is designed to fit into the existing contours to the extent practical for stability and ultimate closure and rehabilitation. The WRD is designed to have a maximum height of 251 m and a footprint area of approximately 204 Ha (Figure 3-5). The designed outer profile comprises an overall outer slope of 1V:3H. The WRD provides a storage capacity of 194 000 000 m^3 over a deposition period of 25 years (target deposition rate of 1 273 333 tpm with a maximum rate of rise of 4.13 m/year.

Clean and dirty water must be kept separate according to legislation and the WRD has therefore been designed to ensure conveyance of the 1:10 000-year peak flow. Stormwater diversion trenches would be required to divert clean water away from the dirty areas. The designed trenches would have sufficient freeboard to cater for a 1:10 000 year storm and allow for variations in the expected peak flows.

An interim stormwater diversion trench is required during the WRD development. This has been positioned across the WRD. The diversion trench size is 4.5 m base width, 2m depth and has side slopes of 1V:1.5H.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Power Lines
- Rivers

Proposed Project Components

- South Block Mining Right Area
- South East Pit
- Processing Plant
- Primary Crusher
- Haul Road
- Access Road Option 1 - Preferred
- Overland Piping
- Waste Rock Dump

Scale: 1:20 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 3-2
PROPOSED PIT LAYOUT

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Project No: 720.10023.00001
Prepared By: BG
Map Ref No: ESIA 3-2
Date: 04/07/2023

720.10023.00001 ESIA 3-2 Pit Layout

3.1.2.3Crushing and Screening

ROM ore would be transported via haul truck to a primary crusher located between the pit and the plant (Figure 3-4). A fixed hydraulic rock breaker would be positioned at the crushing station to break oversize feed material which would then feed into the crusher. The primary crusher will reduce rock size to less than 300 mm for ease of conveying to plant.

The primary crusher product would be discharged onto a transfer conveyor via an apron feeder and transferred to the secondary screening feed bin which is located at the processing plant. Four screens with an upper deck size of 100 mm and lower deck size of 50 mm are used for secondary screening to produce an undersize product (-50 mm) which feeds to the crushed ore stockpile.

The oversize material (+50mm) is conveyed to the secondary crushing feed bin. The feed from the secondary crushing feed bin is distributed to four parallel cone crushers, which operate in closed circuit with the secondary screens. The particle size of the final product from the crushing circuit is P80 35 mm and P100 50 mm.

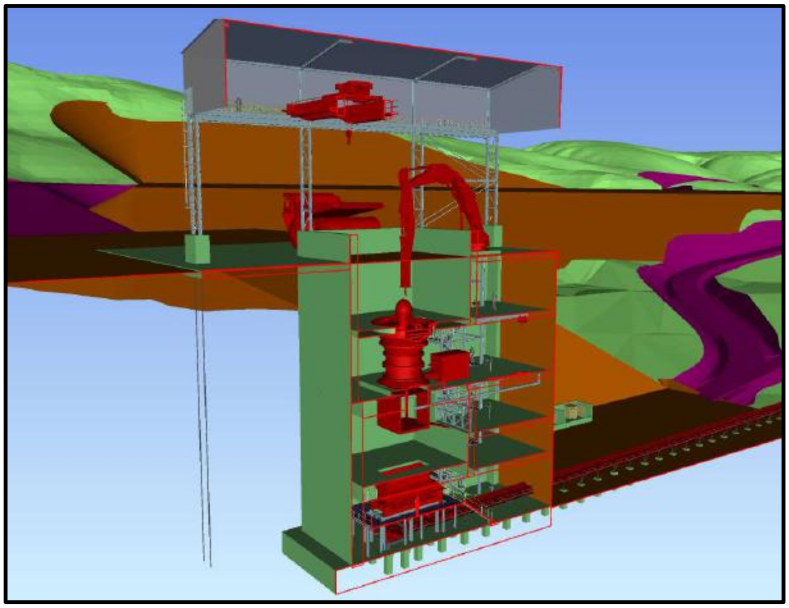
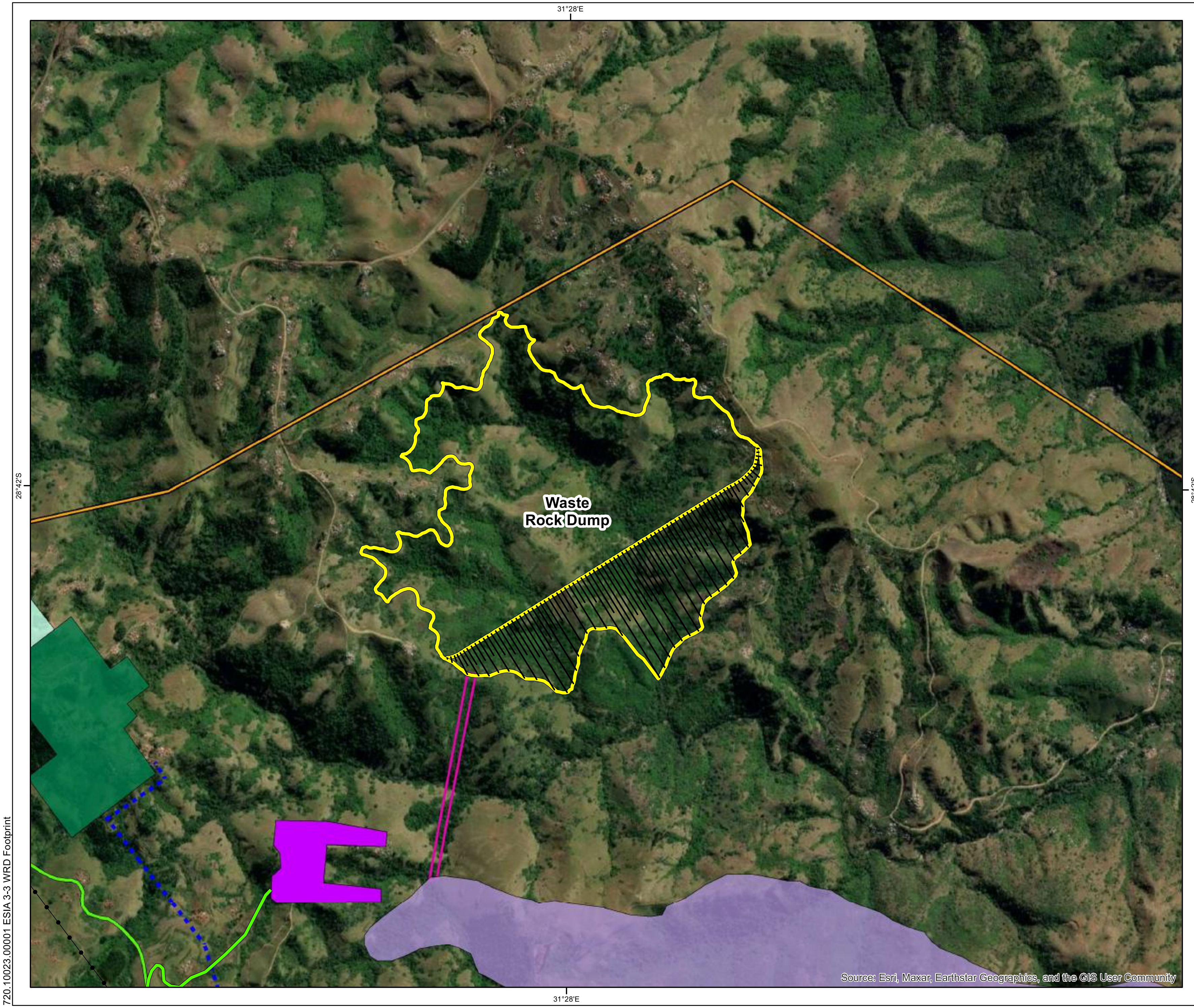


Figure 3-4 Primary in Pit Crusher

The undersize from the secondary screens is conveyed to a conical stockpile that consists of four extraction streams each equipped with a belt felt feeder that conveys the crushed ore onto a common conveyor and is transferred to the High Pressure Grinding Roll (HPGR) circuit which is also within the footprint of the processing plant (Figure 3-7).



Legend

- Power Lines

Proposed Project Components

- ▭ South Block Mining Right Area
- 🟪 South East Pit
- 🟪 Primary Crusher
- 🟩 Processing Plant
- 🟩 Incoming Power Yard
- — Haul Road
- — Access Road Option 1 - Preferred
- ▪▪▪ Overland Piping
- — Waste Rock Dump

N

0 300 600
Meters

Scale: 1:15 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 3-3
PROPOSED WRD FOOTPRINT

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Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 3-3	Date: 04/07/2023

3.1.2.4 Processing Plant

The processing plant includes the following areas:

- ROM receiving and preparation;
    - including primary crushing, secondary crushing and screening and coarse ore stockpile;
- HPGR crushing and screening;
- Primary ball milling;
- Magnetic separation;
    - rougher magnetic separation (RMS);
    - RMS regrind ball milling;
    - intermediate magnetic separation (IMS);
    - IMS regrind milling;
    - cleaner magnetic separation (CMS);
- Concentrate handling;
    - including concentrate thickening, concentrate filtration and concentrate storage;
- Tailings handling;
    - tailings thickeners;
- Processing plant utilities;
    - Compressed air; and
    - Water supply.

The ore processing route is illustrated in Figure 3-7. The plant layout is illustrated in Figure 3-7.

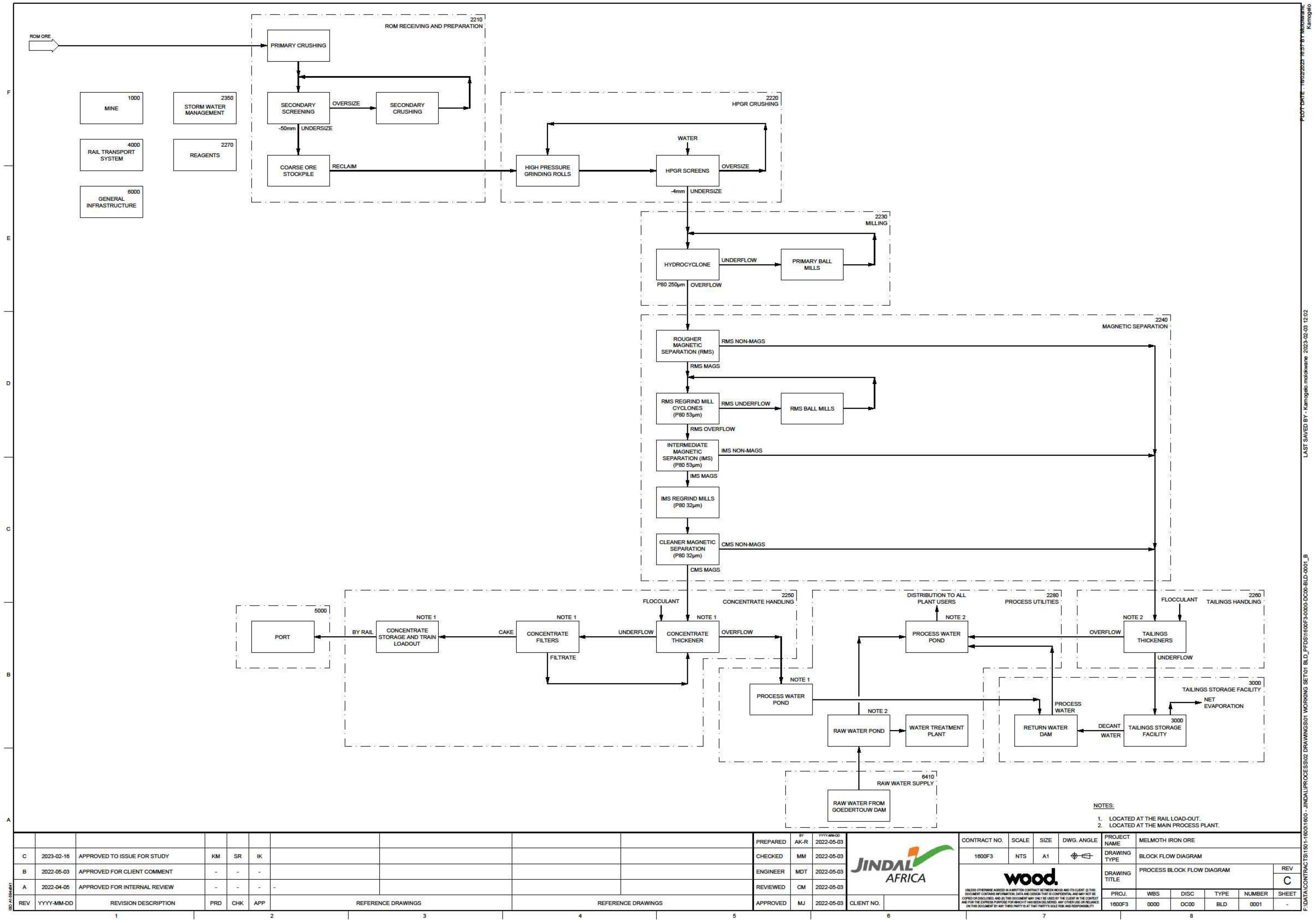
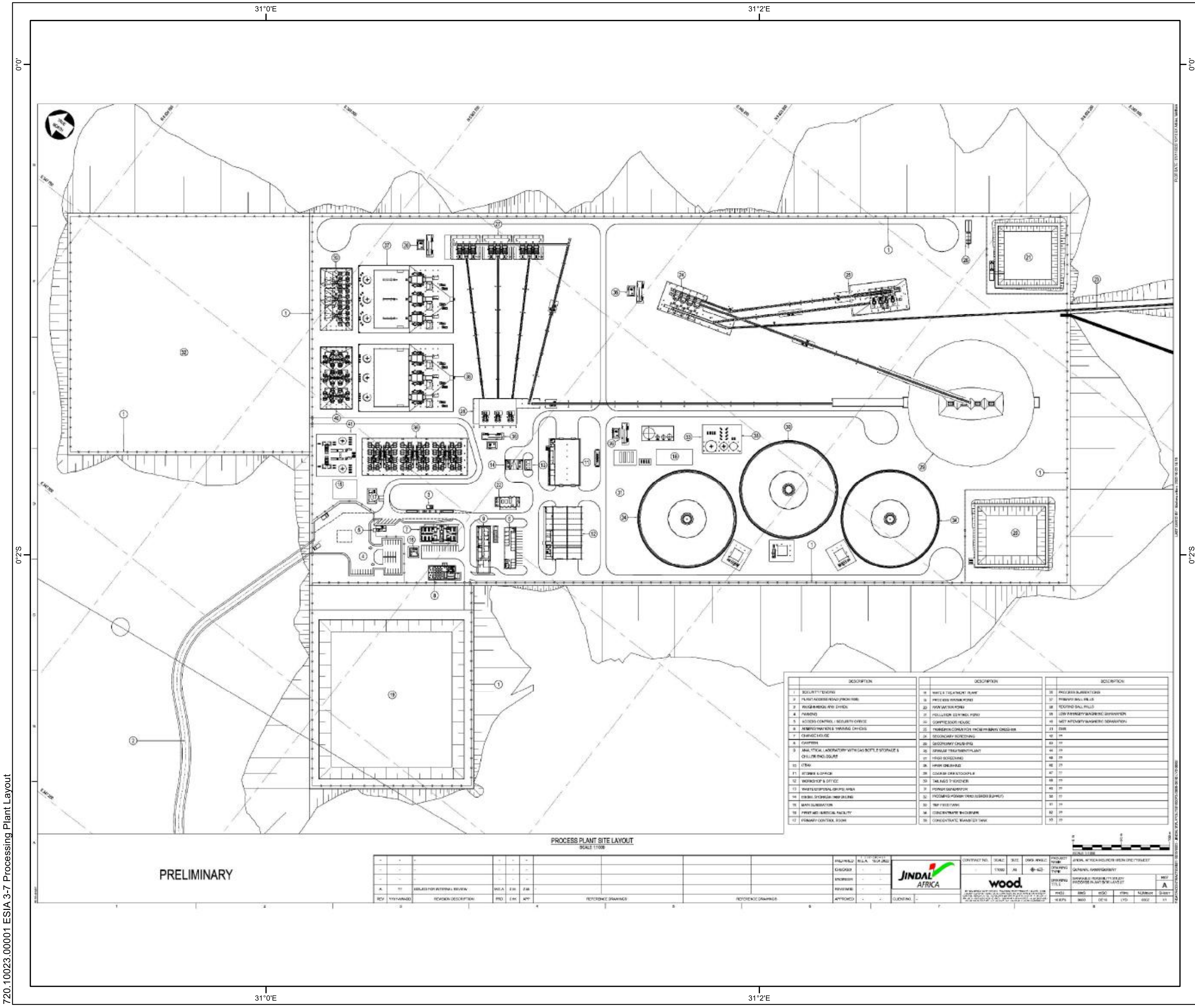


Figure 3-6 Process Flow Diagram



	DESCRIPTION
1	SECURITY FENCING
2	PLANT ACCESS ROAD (FROM [illegible])
3	WEIGHBRIDGE AND OFFICE
4	PARKING
5	ACCESS CONTROL / SECURITY OFFICE
6	ADMINISTRATION & TRAINING OFFICES
7	CHANGE HOUSE
8	CANTEEN
9	ANALYTICAL LABORATORY WITH GAS BOTTLE STORAGE & CHILLER ENCLOSURE
10	(TBA)
11	STORES & OFFICE
12	WORKSHOP & OFFICE
13	WASTE DISPOSAL (SKIPS) AREA
14	DIESEL STORAGE / REFUELING
15	MAIN SUBSTATION
16	FIRST AID / MEDICAL FACILITY
17	PRIMARY CONTROL ROOM

	DESCRIPTION
18	WATER TREATMENT PLANT
19	PROCESS WATER POND
20	RAW WATER POND
21	POLLUTION CONTROL POND
22	COMPRESSOR HOUSE
23	TRANSFER CONVEYOR FROM PRIMARY CRUSHER
24	SECONDARY SCREENING
25	SECONDARY CRUSHING
26	SEWAGE TREATMENT PLANT
27	HPGR SCREENING
28	HPGR CRUSHING
29	COARSE ORE STOCKPILE
30	TAILINGS THICKENER
31	POWER GENERATOR
32	INCOMING POWER YARD (ESKOM SUPPLY)
33	TSF FEED TANK
34	CONCENTRATE THICKENER
35	CONCENTRATE TRANSFER TANK

	DESCRIPTION
36	PROCESS SUBSTATIONS
37	PRIMARY BALL MILLS
38	REGRIND BALL MILLS
39	LOW INTENSITY MAGNETIC SEPARATION
40	WET INTENSITY MAGNETIC SEPARATION
41	DMS
42	??
43	??
44	??
45	??
46	??
47	??
48	??
49	??
50	??
51	??
52	??
53	??

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FIGURE 3-7
PROCESSING PLANT LAYOUT

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Project No: 720.10023.00001
Prepared By: BG
Map Ref No: ESIA 3-7
Date: 17/06/2023

720.10023.00001 ESIA 3-7 Processing Plant Layout

HIGH PRESSURE GRINDING ROLL

The HPGR circuit consists of three HPGR units, which operate in a closed-circuit configuration with the HPGR screens. The feed to the HPGR is made up of fresh feed from the crushed ore stockpile and the recycled oversize material from the HPGR screens (Figure 3-8).

The crushed product from each HPGR unit is conveyed and distributed to three parallel double deck wet screens via a screen feed bin. Each screen is fed by a dedicated vibrating pan feeder. Spray water is added onto the screens and the oversize material (+4mm) from the screens is collected onto a conveyor and is recycled to the HPGR feed bin where it is combined with fresh feed from the crushed ore stockpile. The undersize from the bottom decks of the three screens which service one HPGR unit is combined into a common sump and is pumped to the milling circuit.

Dust suppression systems with water sprays would be allocated at transfer points.

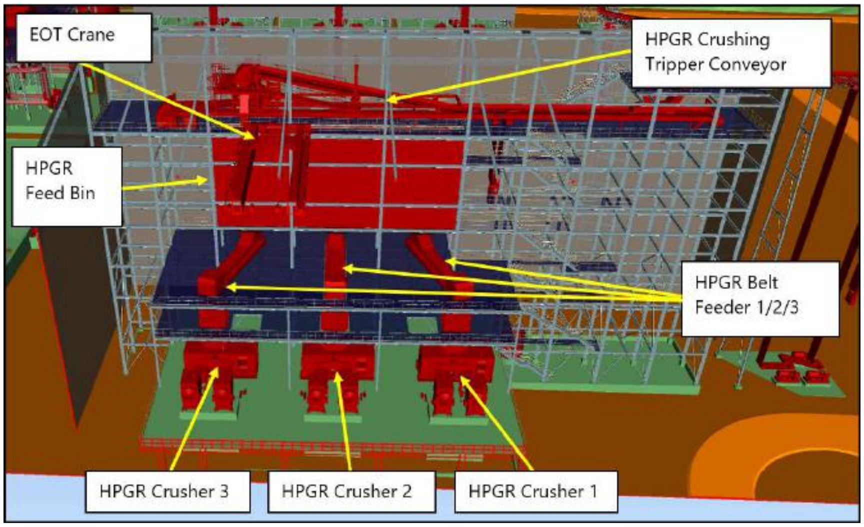


Figure 3-8 HPGR Building

PRIMARY MILLING

The primary milling circuit consists of three parallel ball mills, each operating in closed-circuit with a primary cyclone cluster. The primary milling circuit further reduces the particle size of the ore thus liberating the magnetite mineral and providing optimal conditions for magnetics recovery in the rougher Low and Wet Intensity Magnetic Separation (LIWMS) units.

MAGNETIC SEPARATION

The ROM would be delivered to the processing plant for iron recovery and the production of an iron ore concentrate. The processing plant is designed to process 32 mtpa to produce 7 mtpa of iron concentrate.

CONCENTRATE HANDLING

The rougher magnetic separation process produces two products; rougher magnetic concentrate and rougher non-magnetic tailings. The concentrate and tailings from each train are collected into their respective sumps. The magnetics from each train would be pumped to a dedicated rougher regrind milling circuit with the tailings being pumped to the dedicated tailings thickener.

The RMS and IMS regrind milling circuits reduce the particle size of the ore thus providing incrementally increased liberation of the magnetite. From the CMS circuit the cleaner magnetic concentrate is pumped for a total distance of 12 km from the processing plant to the concentrate thickener that would be located at the rail load-out area. The concentrate pipeline would follow the main access road and pass under the R66 to the rail siding.

PROCESSING PLANT BUILDINGS

The buildings that are proposed within the processing plant footprint include the following:

- Main Security Building – Approximately 67 m^2, security gate house with office, search room, induction room, kitchen area, female and male toilets.
- Administration Facility – Approximately 504 m^2, office space for technical management and staff, human resources, health safety and environmental, training, and general administration, allowance to be made for training facilities. Building with ablution facilities to accommodate approximately 40-50 personnel.
- Change House – Approximately 514 m^{2,} building to cater for 184 people, 1/3 Female, 2/3 Male. Dirty area, search area and clean area, must include showers, toilets, and lockers and laundry.
- Workshop and Offices – Approximately 2 039 m^2, building with offices and workshop area and ablution facilities.
- Laboratory – Approximately 595 m^2, building to including kitchen and ablution facilities, including the gas bottle storage and chiller enclosure.
- Canteen – Approximately 475 m^2, building to cater for 100 persons, building must have a cooking area as well as dining area and ablution facilities.
- Stores and Office – Approximately 1 454 m^2, storage of tools and equipment.
- Medical Facility – Approximately 73 m^2, brick building, male and female ablution facilities.
- Compressor House – Approximately 288 m^2, Situated close to the medical facility.
- Central Control Room – Approximately 80 m^2, brick building, each floor with ablution facilities.
- Waste Storage area – Approximately 42 m^2, temporary storage for waste disposal (Immediate storage). Area must be fenced with authorised access.
- Weighbridge Office – Approximately 26 m^2, brick building, each floor with ablution facilities.

The Rail Siding area buildings are as follows:

- Control Room – Approximately 20 m^2, brick building with ablution facilities.
- Amenities Building – Approximately 26 m^2, brick building with canteen or lunch area, kitchen and ablution facilities.

WATER

Make-up water requirements are calculated to be 1 500 m^3/h, based on average annual plant operations. This equates to a consumption of 11.56 Gl/a. This figure includes loss of water in final concentrate and evaporation estimated at 1% of the total water feed in the TSF, but excludes rainfall, and pit de-watering and can thus be taken as the maximum rate required by the processing plant.

Once the source of raw water has been finalised, raw water would be pumped to the Jindal MIOP for storage in a raw water pond with a capacity of 6 000 m^3 from where make-up water to the processing plant would be provided, without further treatment. Water from the raw water pond shall be pumped to the water treatment plant for other uses. The expected nature of the raw water requires the use of a direct flocculation filtration, UV sterilisation and chlorination. The raw water would be distributed to the fire water tank, water treatment plant (WTP) and to the process water pond as make-up water by three fire water pumps.

Raw water would be fed to a WTP to produce potable water for the main processing plant. The proposed WTP shall be the packaged type of plant. The potable water plant has been sized to supply an operational work force of 594 personnel for the processing plant. The potable water plant should produce 200 m^3/day and would treat water to South African National Standards (SANS) and/or World Health Organisation (WHO) standards inclusive of chlorination. After treatment, the water would be used for safety showers and for human consumption. Potable water would be delivered in a tanker to the rail load-out area. A 5 000 m^3 potable water tank would also be required at the rail siding area to provide potable water to all the buildings and ablution facilities in that area.

The process water for the main processing plant would be stored in the process water pond and be distributed to the processing plant. The process water pond would receive water from the three tailings thickener overflows, storm water pond, rail load-out and TSF return water. Filtered raw water would be used as gland seal water, dust suppression water and for flocculant make-up.

All new infrastructure components such as electrical works and raw water storage pond shall be fenced to protect these works.

Effluent from these treatment plants, from regeneration and backwash, would be recycled to the process water pond.

SOLID WASTE DISPOSAL

General household waste would be collected periodically from the mine, processing plant and rail siding areas using a truck or tractor trailer system.

Domestic waste would be sorted, with organic waste to be composted, and cans and glass aggregated for storage at the industrial waste site for eventual disposal to recycling facilities.

Domestic waste generated would be removed from site and disposed of at a licensed landfill site. Hazardous waste would also be removed from site by a licensed operator and disposed of at a registered hazardous waste facility.

DIESEL STORAGE FACILITY AND REFUELLING BAY

In the processing plant area two diesel storage tanks of 20 m^3 each would be used for refuelling mobile equipment and plant vehicles.

Diesel Storage for the mine vehicles would be within the mining area.

AIR DISTRIBUTION

Duty and standby air compressors supply instrument and plant air requirements of the main processing plant. The instrument air system includes filters and dryers ahead of the main instrument air receiver. Each receiver would be fitted with a pressure relief valve, pressure indicator and automatic water drain valves.

3.1.2.5 Additional Infrastructure

Infrastructure design includes proposed new infrastructure and the upgrade of the existing infrastructure to meet the Jindal MIOP requirements.

The proposed infrastructure includes the following,

- Roads and Earthworks:
  - Upgrade of the existing access road from the R66 national road to the processing plant and mining areas;
  - New proposed access roads to the mining facilities, primary crusher and laydown area;
  - Processing plant internal roads and parking areas;
  - Service roads for conveyors and pipe routes;
  - Bulk earthworks terraces;
    - Processing plant area;
    - Contractor's laydown area;
    - Primary crusher including reinforce earth retaining wall;
    - Melmoth rail siding area;
    - Mining contractor's yard; and
    - Mining offices.
  - Reinforced earth retaining wall for the primary crusher area;
  - Contractor's laydown area;
- Electrical reticulation for the processing plant and rail siding areas;
- Water supply and reticulation;
  - Bulk water supply pump station including the required civil works for the pipeline;
  - Potable water reticulation including water treatment facility;
  - Sewer reticulation system, including wastewater treatment works;
  - Storm water drainage, silt management, clean and dirty water separation, and erosion protection;
- Water ponds, raw water pond and pollution control ponds;
- WRD;
  - Process diesel storage and refuelling bay;

  - Utility buildings in the processing plant and rail sidinging areas;
  - Security fencing; and
  - Waste storage area.

ACCESS ROADS

The following access roads are required for the processing plant and mining area, internal roads and service or maintenance roads:

- R66 road intersection:
  - Access from the R66 / R34 national road is along the south side of the proposed South East Pit. The road is accessed from the main national road via an established junction and there are no major river crossings.
- Main access road to processing plant and mining areas:
  - There is an existing road that is used by local farm traffic for part of its route, and thereafter goes through private land. The existing road is a two-way road, approximately 6m wide (each lane is 3m wide). Considering the anticipated traffic volumes to the processing plant and mining areas during the construction and operational phases, the road would have to be upgraded. The proposed road width is 10.4 m.
  - The horizontal alignment of the road has been kept as is for most parts of the road, however, to achieve the required geometric design parameters, the route would be adjusted to the processing plant area. The total length of the main access road to the processing plant is approximately 15 km and is proposed to be a tarred road.
  - The overland concentrate, tailings, tailings return water and raw water pipelines would be routed along this main access road for maintenance purposes.
- Internal roads are planned to be 6.0 m wide and constructed with a gravel surface.

POWER

The primary incoming power supply to the Jindal MIOP would be derived from a loop in and loop out of the Umfolozi–Invubu 400 kV overhead transmission line into a Main Transmission Substation (MTS). This MTS would also consist of a 400/132 kV transformer bay with a 250 MVA transformer connected to a new 132 kV busbar. A new 132kV feeder would also be installed to feed the new Jindal Distribution Substation. Eskom has confirmed that there has been an allocation of 140 MVA of power available to the Jindal MIOP. The Local Utility Grid is currently deemed to be stable to supply the 140 MVA load. The current design has estimated the power required 192.75 MVA which would therefore require a new application for this maximum power demand.

WATER

Proposed Water Supply

The proposed development includes processes that would require raw water. The provision of water for the potential mining development has therefore been explored and the detailed report on the assessment is included in Appendix F.

The Mhlathuze catchment is currently overallocated and as such the regulators may only consider new allocations if the applicants contribute to interventions, which would generate additional water in the catchment.

The following are possible interventions that could be undertaken:

1. The Tugela Transfer Phase 2 was initiated because of the 2014 drought. After allowing for the current deficit, the requirement for the proposed mining development would take up over one third of this new supply.
2. The Mhlathuze weir ultimately provides water to Lake Nsezi. Spills from the Mhlathuze weir, during local rainstorms, have been in excess of what is required by Lake/Estuary, these spills may therefore be captured for use by Jindal.
3. Mhlathuze Water has already looked at duplicating the pipeline from the weir to the water treatment plant, which could provide an additional 24 Mm3 per annum.
4. In addition, Jindal could appoint a professional service provider to develop operating rules to maximize the yield of the dam and minimize losses/spills during the wet seasons, and to convey these directly to the Dam operator. This could provide an additional 18 Mm3 per annum.

Should an Environmental Authorisation be granted for the Jindal MIOP these options would need to be explored in terms of the proposed water supply and would have to be done in consultation with the DWS and included as part of the Water Use Licence Application (WULA) for the project.

Storm Water

It is expected that storm water runoff at the processing plant, mine yard, mine offices and at the rail siding areas could be contaminated, and so this storm water runoff would be captured in pollution control dams (PCD) at all sites. All PCDs would be sized for a 1:50 year return period with a 24-hour storm event. Water from the PCDs at the processing plant and the rail siding would be returned to the process water reticulation.

Polluted storm water/ mine water would be passed through a silt trap to remove sediment. Floor washings that are potentially contaminated with mineral oils (workshops, refuelling and lube and diesel storage areas) would be passed through oil skimmers and drained via oily water traps to the storm water pond.

Domestic Wastewater Treatment

Sewage volumes expected to be generated from the various infrastructure installations are approximately 90 m^3/day at the processing plant and 1.5 m^3/day from the rail siding. Sewage would be collected by means of a gravity structured pipeline reticulation network. The Sewage Treatment Plant would be a vendor package and would be designed with the best available technology and within best practice guidelines.

Wastewater Treatment Plant

Wastewater treatment would be done within a containerised wastewater treatment plant (WWTP) for the processing plant area.

The clear water effluent from the WWTP would be recycled to the process water system. This is to be developed further in the detailed engineering phase.

A similar WWTP would be located at the mining area and would cater for contractor’s yard and mine office area.

Dams

Ponds have been designed to retain volumes corresponding to the water balance and environmental legislation. The following dams have been designed for the Jindal MIOP (Table 3-7):

Table 3-7 Earth Ponds

Earth Pond	Area (m)	Volume (m^3)	Cut (m^3)	Fill (m^3)
Process Water Pond	Processing plant	68 966	194 438	424 062
Raw Water Pond	Processing plant	6 083	3 688	3 275
Pollution Control Pond	Processing plant	14 624	10 158	5 118
Pollution Control Pond	Mining Yard	4 457	4 598	1 058
Pollution Control Pond	Mining Offices	4 457	4 144	1 322
Process Water Pond	Rail Siding Area	1 172	1 620	339
Pollution Control Pond	Rail Siding Area	2000	2 578	317

All Ponds would not be more than 5m in height and would have a freeboard of 0.8 m. The external bank slopes are 1:2.0 and the internal bank slopes 1:3.0. All dams would be lined with a 1.5 mm thick high-density polyethylene (HDPE) geomembrane. For safety purposes heavy polypropylene ropes have been allowed and all dams would be fenced with security fencing.

All proposed water uses would have to be separately authorised by the DWS.

NKWALINI SIDING

Upgrade of the Nkwalini siding is required as discussed throughout this chapter to include a covered area for storage of filtered iron ore concentrate which would have a low moisture content of 9%. Concentrate would be pumped approximately 12 km from the plant located at the Jindal MIOP to the Nkwalini rail terminal and stockpiled before being transported 80 km by rail to Richards Bay.

3.1.3 Project Phases and Scheduling

3.1.3.1 Pre-Construction Phase

Recommended early works to reduce the construction duration and provide access to site includes:

- Upgrade of the bridge on the R66;
- Access and internal roads;
- Laydown areas;
- Incoming power; and
- Raw water extraction pump station (subject to DWS Water Use Licence).

3.1.3.2 Construction Phase

The construction phase is expected to involve up to 700 contractors at peak with an average of 350 employees. No on-site construction camp is proposed and non-local construction contractors would be accommodated in surrounding towns and communities. The construction contractors' offices, locker and washroom facilities and dining facilities would be within a fenced off area adjacent to the plant construction site. A laydown area and staging area would be located mostly within and adjacent to the plant footprint. Construction facilities such as yards and buildings as well as power, water and fuel infrastructure will become part of the plant operating facilities when construction is complete. Licenced waste contractor companies would provide waste management services form the commencement of construction. Safety, health, environment and community engagement officers will be appointed to monitor and control performance in these areas during the construction period. Construction site preparation would commence with provision of upgraded road access, and water and power services as discussed in Section 3.1.3.1. Construction contractors would be on site for up to five years.

3.1.3.3 Scheduling

The following high level schedule is proposed:

- 2022 MR application
- 2023 - EIA submission. BFS to be completed by August 2023.
- 2023 - MR and EIA licences submitted. Decision making by the DMRE end 2023.
- 2023/2024 – Finalise and submit WULA to DWS. Submission of other required permits.
- 2025 – Early works engineering (provided all permitting in place).
- 2025/2027 - Onboarding and site establishment.
- 2025-2028 – Bulk earth works.
- 2028-2030 – Construction.
- 2031 – Commissioning of processing plant and mining commencement.

3.1.3.4 Possible Future Phases

Prospecting, to be undertaken in parallel with the Phase 1 mining, would generate additional information on the iron ore resource in the North and South blocks. This would be used to inform planning of possible future mining phases.

The likely concept for future phases of the Jindal MIOP would be to increase the LOM and production rate by accessing iron ore from additional mine pits and/or increasing the capacity of the primary processing plant.

Any future development phases of the Jindal MIOP would need to be subject to the requisite regulatory application, assessment, and approval processes.

3.1.3.5 Proposed Activities to be Undertaken Separately

There are a few processes/ infrastructure that are integral to a mining operation and would have to be approved through an EA process before any development can take place. These are discussed in the following sections.

TAILINGS STORAGE FACILITY

As discussed in Section 3.1.2.4 the processing plant would produce iron ore concentrate and a tailings slurry. Approximately 24 mtpa of tailings would be produced when the mine is at full production and is required to be disposed of on a TSF. The tailings slurry would be transferred to the TSF via a pipeline.

The EIA process for the TSF is currently in progress.

No development of the TSF would go ahead until an EA has been issued by the relevant Competent Authority.

TRANSPORT OF CONCENTRATE TO RICHARD'S BAY FOR EXPORT

The final mode of transportation of the concentrate from the processing plant to the Richards Bay Port for export would be by rail 80 km to Richards Bay. Port upgrades would also be required.

A separate EIA process is also required for this.

4. POLICY AND LEGISLATIVE CONTEXT

4.1 LEGISLATION CONSIDERED IN THE PREPARATION OF THE EIA

This Section describes the key legislative requirements applicable to the proposed Jindal MIOP. In accordance with the EIA Regulations, 2014 all legislation and guidelines that have been considered in the EIA process are documented. A summary of the applicable legalisation that has been considered in the assessment process is outlined in Table 4-1.

Table 4-1 Legal Framework Considered for the Jindal MIOP

Applicable legislation and guidelines used to compile the report	How does this development comply with and respond to the policy and legislative context	Reference where applied
The South African Constitution, 1996	The proposed Jindal MIOP must comply with South African constitutional and common law by conducting its construction and operational activities with due diligence and care for the rights of others. Section 24 (a) of the South African Constitution states that everyone has the right to an environment that is not harmful to their health and well-being. This provision supersedes all other legislation.	N/A
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) and Regulations, as amended.	An application for a Mining Right in terms of Section 22 of the MPRDA has been applied for and submitted to the DMRE. This EIA is part of the application process.	Section 4.2 and 4.2.1
Mine Health and Safety Act, 1996 (Act No. 29 of 1996)(MHSA) and Regulations.	The operations of the mine and the associated infrastructure are governed by the MHSA and associated Regulations.	
National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as amended	A separate application for Environmental Authorisation has been submitted to the DMRE for consideration. The EA consists of an integrated NEMA and NEM:WA application submitted to the DMRE for the Jindal MIOP and associated infrastructure.	Section 4.3 and 4.3.1
Environmental Impact Assessment Regulations, 2014 (EIA Regulations 2014) and Environmental Impact Assessment Regulations Listing notices 1, 2 and 3 published in terms of NEMA in Government Notices 982, 983, 984 and 985 of 4 December 2014 (as amended by GN No. 517 of 11 June 2021)		
Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations, published in terms of NEMA in Government Notice 1147 of 2015 (as amended)	These regulations inform the financial provisioning for the project.	Section 4.3.2

Applicable legislation and guidelines used to compile the report	How does this development comply with and respond to the policy and legislative context	Reference where applied
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA)	The WRD requires a Waste Management Licence in terms of the NEM:WA. An integrated application for Environmental Authorisation and a Waste Management License has be submitted to the DMRE and is part of this EIA process.	Section 4.4 and 4.4.1 and 4.4.2
List of Waste Management Activities published in terms of NEM:WA in Government Notice 921 of 29 November 2013 (as amended)		
Waste Classification and Management Regulations published in terms of NEM:WA in Government Notice 634 of 2013	As from 8 December 2014 Government implemented the One Environmental System. As a result, residue stockpiles and residue deposits are no longer excluded from the ambit of the NEM:WA. Accordingly, the aforesaid Regulations find application to all waste types to be generated at the Jindal Iron Ore Mine Project including residue to be generated as part of the processing plant and mine operations.	
Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits from a Prospecting, Mining, Exploration, or Production Operation (GNR 632 of 2015)	Waste rock is a defined waste in terms of NEM:WA.	Section 4.4.2
National Water Act, 1998 (Act No. 36 of 1998) (NWA)	A new WULA will be submitted to DWS and will cover Section 21 (a) (b) (c) (f) (g) (i) and (j). water uses prior to the commencement of construction and operation activities within the project site.	Section 4.5 and 4.5.1
The regulations in terms of section 26 read in conjunction with section 12a of the water act, 1956 (Act No. 54 of 1956)		
National Ambient Air Quality Standards, published in terms of NEM:AQA in Government Notice 1210 of 2009	National Ambient Air Quality Standards (NAAQS) are available for inhalable particulate matter less than 2.5 µm in diameter (PM2.5) as gazetted on 29 June 2012 (no. 35463), inhalable particulate matter less than 10 µm in diameter (PM10), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), lead (Pb) and benzene as gazetted on 24 December 2009.	Section 4.6 and 4.6.1
National Dust Control Regulations, published in terms of NEM:AQA in Government Notice 827 of 2013	South Africa's Draft National Dust Control Regulations were published on 27 May 2011 with the dust fallout standards passed and subsequently published on the 1st of November 2013 (Government Gazette No. 36974). These are called the National Dust Control Regulations (NDCR). The purpose of the regulations is to prescribe general measures for the control of dust in all areas including residential and light commercial areas. The regulation also specifies that the method to be used for measuring dust fall and the guideline for locating sampling points shall be American Society for Testing Materials (ASTM)	

Applicable legislation and guidelines used to compile the report	How does this development comply with and respond to the policy and legislative context	Reference where applied
	D1739 (1970), or equivalent method approved by any internationally recognized body. It is important to note that dust fall is assessed for nuisance impact and not inhalation health impact.	
Regulations regarding Air Dispersion Modelling	The regulations have been applied during the development of the Air Quality Impact Assessment for the Jindal MIOP.	
Hazardous Substances Act, 1973 (Act No. 15 of 1973) (HSA)	This Act will inform the planning, assessment and management of hazardous substances associated with the project.	Section 28
National Forest Act, 1998 (Act No. 84 of 1998) (NFA)	Should any NFA-listed plant species be identified within the footprint of the mine, WRD, processing plant and associated infrastructure, Jindal Mining (Pty) Ltd will have to obtain a licence from the Minister responsible for Forestry, Fisheries, and the Environment.	Section 4.7, 4.7.1 and 4.7.2
National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM:PAA)	There are no protected areas in terms of the NEM:PAA within a 20 km radius of the project area. The closest protected areas include the Nkandla, Sibudeni, Enthumeni and Vungwini nature reserves which are located to the east and south of the project area. According to Mucina and Rutherford, the study area under investigation for the development of the Jindal MIOP is located within the Ngongoni Veld vegetation type. The Ngongoni Veld vegetation type is considered a vulnerable ecosystem. In addition, the town Melmoth falls within the Maputoland-Pondoland floristic region which is considered one of the floristic regions in Southern Africa, second to Fynbos in the Western Cape Province. Red-listed plant species present within the Maputoland-Pondoland floristic region include *Alberta magna*, *Alepidea amatymbica*, Aloe *saundersiae*, and *Asclepias schlechteri*. A permit will be required if the removal of listed threatened or protected species is required for Red-listed species present within the study area.	
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) and Regulations on Threatened or Protected Species and on Alien Invader Plants		
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	This Act will inform the planning, assessment and management of weeds and invasive plant species associated with the project.	Section 4.8
National Heritage Resource Act, 1999 (Act No. 25 of 1999) (NHRA)	A Heritage Impact Assessment (including palaeontology) has been undertaken determine the presence of archaeological and palaeontological resources within the project area. Further surveys are, however, required in order to assess the impact to the full extent.	Section 4.9
National Health Act, 2003 (Act No. 61 of 2003) (NHA)	A Health Impact Assessment has been undertaken to determine the presence the potential for the impact on community health due to the Jindal MIOP.	Section 4.10

4.2 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (NO. 28 OF 2002)

The MPRDA governs the acquisition, use and disposal of mineral and petroleum resources in South Africa. The MRPDA promotes equitable access to the nation's mineral and petroleum resources. The objectives of the Act, amongst others, are to promote economic growth and mineral and petroleum resources development in the Republic, particularly development of downstream industries through provision of feedstock and development of mining and petroleum inputs industries and also to promote employment and advance the social and economic welfare of all South Africans.

Chapter 4 of the Act provides a framework to regulate the application for mining, prospecting, and closure rights. Section 24(4) of NEMA provides the minimum requirements for procedures for the investigation, assessment, management, and communication of the potential impacts. With the establishment of the "One Environmental System" in 2014, the DMRE must apply the range of environmental principles included in Chapter 2 of NEMA when taking decisions that significantly affect the environment. To give effect to the general objectives of Integrated Environmental Management (IEM), the potential impacts on the environment of listed or specified activities must be considered, investigated, assessed, and reported on to the CA.

In addition, Section 22 of the MPRDA governs the application for a Prospecting Right, Mining Right or Mining Permit. In terms of the Act, these rights may only be granted by the Minister.

The proposed Project requires a Mining Right Application (MRA) by Jindal Iron Ore in order to convert and consolidate the Prospecting Rights for the North and South Blocks and in order to be able to develop the Jindal MIOP within the proposed Mining Right area. The Mining Right Application in terms of Section 22 of the MPRDA was accepted by the KZN DMRE in May 2022.

4.2.1 Mineral and Petroleum Resources Development Regulations, 2004 (GNR 527 of 2004)

These Regulations, promulgated in terms of Section 107 of the MPRDA, provide for a range of matters relating to the administration of the Act. Part 1 details regulations for the lodgement of applications, Part 2 deals with Social and Labour Plans while Part 3 sets out environmental regulations for mineral development. The recent amendment in March 2020 removed the vast majority of the environmental provisions from the Regulations. These Regulations had not been practicably implementable since the December 2014 introduction of the "One Environmental System" and the amendment of the overriding legislation (e.g. MPRDA and NEMA).

4.3 NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (NO. 107 OF 1998)

The NEMA establishes principles and provides a regulatory framework for decision-making on matters affecting the environment. All organs of state must apply the range of environmental principles included in Section 2 of NEMA when taking decisions that significantly affect the environment. Included amongst the key principles is that all development must be socially, economically, and environmentally sustainable and that environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural, and social interests equitably. The participation of I&APs is stipulated, as is that decisions must consider the interests, needs and values of all I&APs.

Chapter 5 of NEMA provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals. Section 24 provides a framework for granting of Environmental Authorisations (EAs). To give effect to the general objectives of Integrated Environmental Management, the potential impacts on the environment of listed or specified activities must be considered, investigated, assessed, and reported on to the competent authority. Section 24(4) provides the minimum requirements for procedures for the investigation, assessment, management, and communication of the potential impacts. In terms of the management of impacts on the environment, Section 24N details the requirements for an EMPr.

The Jindal MIOP would require an EA issued by the DMRE for the Project to be able to commence.

4.3.1 Environmental Impact Assessment Regulations, 2014 (GNR 982 of 2014)

The EIA Regulations, 2014 promulgated in terms of Chapter 5 of NEMA, provide for the control over certain listed activities. These listed activities are detailed in LN 1, 2014, LN 2, 2014 and LN 3, 2014. The undertaking of activities specified in the Listing Notices is prohibited until an EA has been obtained from the competent authority. Such EA, which may be granted subject to conditions, will only be considered once there has been compliance with the EIA Regulations, 2014.

The EIA Regulations, 2014, set out the procedures and documentation that need to be complied with when applying for EA. A Basic Assessment (BA) process must be applied to an application if the authorisation applied for is in respect of an activity or activities listed in LN 1 and LN 3, 2014 and a S&EIA process must be applied to an application if the authorisation applied for is in respect of an activity or activities listed in LN 2, 2014.

The proposed Project triggers listed activities under LN 1, LN 2 and LN 3 (Section 3.1) and therefore and S&EIA process has been followed. The Scoping Report was approved by the DMRE in July 2022.

4.3.2 Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining, or Production Operations, 2015 (GNR 1147 of 2015)

The purpose of the Financial Provision Regulations, 2015 is to regulate the determination and making of financial provision as contemplated in the Act for the costs associated with the undertaking of management, rehabilitation, and remediation of environmental impacts from prospecting, exploration, mining, or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future.

The compilation of a Financial Provision Report in support of the proposed Project is summarised in Section 29 and included in Appendix .

4.4 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (NO. 59 OF 2008)

The National Environmental Management: Waste Act (NEM:WA) regulates all aspects of waste management and has an emphasis on waste avoidance and minimisation. NEM:WA creates a system for listing and licensing waste management activities which may have a detrimental effect on the environment. A waste management activity identified in terms of the NEM:WA may not commence, be undertaken or conducted except in accordance with published standards or a Waste Management Licence (WML).

The proposed Jindal MIOP will require a WML.

4.4.1 List of Waste Management Activities that have, or are likely to have, a Detrimental Effect on the Environment, 2013 (GNR 921 of 2013)

Listed waste management activities are included in GNR 921 of November 2013. Category A and Category B listed waste management activities above certain thresholds are subject to a process of impact assessment and licensing. Category C listed waste management activities do not require a waste management license but are subject to the provisions of National Norms and Standards (GNR 926, November 2013). The assessment and reporting process in support of a Waste Management Licence application must be undertaken in accordance with the EIA Regulations, 2014. These Regulations define the requirements for the submission; processing, consideration, and decision of applications authorisation of listed activities. Activities listed in Category A require a BA process, while activities listed in Category B require a S&EIA process in order for authorities to consider an application in terms of NEM:WA.

The proposed Jindal MIOP triggers waste management activities listed in Category A, B and C (Table 3-5).

4.4.2 Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits from a Prospecting, Mining, Exploration, or Production Operation (GNR 632 of 2015)

The purpose of these Regulations is to regulate the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration, or production operation. The identification and assessment of environmental impacts arising from the establishment of residue stockpiles and residue deposits must be done as part of the environmental impact assessment conducted in terms of the NEMA.

The proposed Jindal MIOP requires the WRD to be authorised.

4.5 NATIONAL WATER ACT, 1998 (NO. 36 OF 1998)

The NWA provides a legal framework for the effective and sustainable management of water resources in South Africa. It serves to protect, use, develop, conserve, manage and control water resources, promoting the integrated management of water resources with the participation of all stakeholders. This Act also provides national norms and standards, and the requirement for authorisation (either a Water Use Licence [WUL] or General Authorisation [GA]) of water uses listed in Section 21 of the Act.

4.5.1 Regulations on the Use of Water for Mining and Related Activities aimed at the Protection of Water Resources, 704 (GNR 704 of 1999)

GNR. 704 of June 1999, was established to provide regulations on the use of water for mining and related activities aimed at the protection of water resources. The main principle conditions of GNR. 704 of June 1999 applicable to this proposed Project are:

- **Condition 4** indicates that no person in control of a mine or activity may locate or place any residue deposit, dam, reservoir, together with any structure of other facility within the 1:100-year flood line or within a horizontal distance of 100 metre from any watercourse.
- **Condition 5** indicates that no residue or substance which causes or is likely to cause pollution of a water resource may be used in the construction of any dams, impoundments or embankments or any other infrastructure which may cause pollution of a water resource.
- **Condition 6** describes the capacity requirements of clean and dirty water systems. Clean and dirty water systems must be kept separate and must be designed, constructed, maintained, and operated to ensure conveyance of the flow of a 1:50-year recurrence interval storm event. Clean and dirty water systems should therefore not spill into each other more frequently than once in 50 years. Any dirty water dams should also have a minimum freeboard of 0.8m above full supply level.
- **Condition 7** describes the measures which must be taken to protect water resources. All dirty water or substances which may cause pollution should be prevented from entering a clean water resource (by spillage, seepage, erosion etc.) and it should be ensured that water used in any process is recycled as far as practicable.

In addition to GN 704, the Department of Water and Sanitation (previously Department of Water Affairs and Forestry) has developed several Best Practice Guidelines (BPGs) for the mining industry. These include:

- BPG A4 for Pollution Control Dams (PCDs) defines the allowable PCDs spillage frequency as being one spill in every 50 years on average. This is equivalent to stating that an RWD or PCD should be designed with an annual spillage probability of 1:50 (2%) or less. In addition to this, BPG A4 recommends that the final design criteria should be determined through the use of a long term continuous simulation water balance model, modelled at an appropriate time step (preferably daily)
- BPG G1 Storm water Management, which defines a methodology of planning, designing and implementing storm water management measures to ensure separation of clean and dirty water and provides guidelines to ensure sustainability over the mine's life cycle.
- BPG G2: Water and Salt Balances, which defines a methodology of planning, designing and implementing water balance objectives to ensure suitable water management strategies and provides guidelines to ensure sustainability over the mine's life cycle.
- BPG G3: Water Monitoring Systems. Water monitoring is a legal requirement and can be used in negotiations with authorities for permits and authorizations.

Monitoring on a mine consists of various components. The successful development and implementation of an appropriate, accurate and reliable monitoring programme requires that a defined structured procedure be followed. Furthermore, it is important that this is done by a suitably qualified person.

The following water quality standards are used to guide the water quality assessment:

- South African National Standard (SANS). Drinking Water Standard SANS 241: 2015.
- Targeted Water Quality Range (TWQR) (DWA, 1996).

4.6 NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT, 2004 (NO. 34 OF 2004)

The National Environmental Management: Air Quality Act (NEM:AQA) regulates all aspects of air quality, including: prevention of pollution and environmental degradation; providing for national norms and standards (through a National Framework for Air Quality Management) regulating air quality monitoring, management, and control; and licencing of activities that result in atmospheric emissions and have or may have a significant detrimental effect on the environment.

4.6.1 National Dust Control Regulations, 2013 (GNR 827 of 2013)

The National Dust Control Regulations (NDCR) were gazetted on 1 November 2013. The purpose of the regulations is to prescribe general measures for the control of dust in all areas including residential and light commercial areas. The regulations provide a guideline for monitoring and measuring dust fall. Dust fall is assessed for nuisance impact and not an inhalation health impact.

4.7 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (NO. 10 OF 2004)

The NEM:BA provides for the management and conservation of South Africa's biodiversity and the protection of species and ecosystems that warrant national protection. NEM:BA regulates the carrying out of restricted activities, without a permit, that may harm listed threatened or protected species or activities that encourage the spread of alien or invasive species and makes provision for the publication of bioregional plans and the listing of ecosystems and species that are threatened or in need of protection. Bioregional plans should be considered by competent authorities in their decision-making regarding an application for EA.

4.7.1 Alien and Invasive Species Regulations, 2020 (GNR 1020 of 2020)

Alien and Invasive Species Regulations (GNR 1020 of 2020) as well as the Alien and Invasive Species List (GNR 864 of 2016) have been published to regulate the monitoring, control, and eradication of listed invasive species. All landowners on whose land alien and invasive species occur must make the necessary arrangements to be compliant with these Regulations.

The proposed Jindal MIOP has the potential for alien and invasive species which need to be closely monitored and controlled.

4.7.2 National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM:PAA)

To provide for the protection and conservation of ecologically viable areas representative of South Africa’s biological diversity and its natural landscapes and seascapes and for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards.

There are no protected areas in terms of the NEM:PAA within a 20 km radius of the project area. The closest protected areas include the Nkandla, Sibudeni, Enthumeni and Vungwini nature reserves which are located to the east and south of the project area.

4.8 CONSERVATION OF AGRICULTURAL RESOURCES ACT, 1983 (NO. 43 OF 1983)

The objectives of this Act are to provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants.

4.9 NATIONAL HERITAGE RESOURCES ACT, 1999 (NO. 25 OF 1999)

The NHRA provides for the identification, assessment, and management of the heritage resources of South Africa. The Act lists development activities that would require authorisation by the responsible heritage resources authority. The Act requires that a person who intends to undertake a listed activity notify the relevant provincial heritage authority at the earliest stages of initiating such a development. The relevant provincial heritage authority would then in turn, notify the person whether a Heritage Impact Assessment should be submitted. However, according to Section 38(8) of the NHRA, a separate report would not be necessary if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (No. 73 of 1989) (now replaced by NEMA) or any other applicable legislation. The decision-making authority should, however, ensure that the heritage evaluation fulfils the requirements of the NHRA and consider in its decision-making any comments and recommendations made by the relevant heritage resources authority.

The proposed Project would result in impacts on both cultural heritage and grave sites and would therefore require authorisation and input from the KZN Amafa.

4.10 THE NATIONAL HEALTH ACT, ACT 61 OF 2003

The National Health Act, Act No 61 of 2003 (NHA) provides a framework for a structured and equitable health system in South Africa, taking into account the obligations with regard to health services imposed on the national, provincial and local governments by the Constitution. Section 20 gives legal effect to the functions of environmental health management. The Director General (DG) is tasked to promulgate, and promote adherence to, norms and standards on health matters, including conditions that constitute a health hazard and facilitate the provision of indoor and outdoor environmental pollution control services.

Section 88 of the Act provides legal effect to environmental health investigations. Any activity that gives rise to offensive/injurious conditions or is dangerous to health (e.g. accumulation of refuse) may have a negative impact on health and thus warrants being assessed in an Health Impact Assessment.

4.11 INTERNATIONAL LAW AND GUIDANCE

South Africa is a signatory to international conventions that may be applicable to the Project and these may be seen to provide additional direction in the absence or limitation of local legislation or policy. Various international bodies also provide relevant guidelines for health assessment. Those of relevance include:

- The United Nations Declaration on Rights of the Indigenous Peoples.
- Stockholm Convention on Persistent Organic Pollutants.
- Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal.
- United Nations Development Program. Global and Inclusive Agreement.
- United Nations Environmental Program.
- International Health Regulations as promulgated by the World Health Organization.
- International Finance Corporation's (IFC) Performance Standards and Equator Principles.

4.12 GUIDELINES, POLICIES, PLANS AND FRAMEWORKS

The guidelines, policies and plans that have been considered during the S&EIA process are listed in Table 4-2.

Table 4-2: Guideline and Policy Framework

Applicable legislation and guidelines used to compile the report	How does this development comply with and respond to the policy and legislative context	Reference where applied
National Norms and Standards for the Storage of Waste, published in terms of NEM:WA in Government Notice 926 of 2013	These regulations have informed project planning and have been taken into account in the assessment and management of waste for the project.	Table 3-5
National Waste Information Regulations published in terms of NEM:WA in Government Notice 625 of 2012		
National Norms and Standards for the Assessment of Waste for Landfill Disposal, published in terms of the NEM:WA in Government Notice 635 of August 2013		
Guideline on the Need and Desirability, Department of Environmental Affairs, 2017	This guideline has been taken into account as part of project planning.	Section 5

Applicable legislation and guidelines used to compile the report	How does this development comply with and respond to the policy and legislative context	Reference where applied
Public Participation guideline in terms of NEMA EIA Regulations, Department of Environmental Affairs, 2017	This guideline has informed the public participation process for the project.	Section 7.2
National Guideline on minimum information requirements for preparing Environmental Impact Assessments for mining activities that require environmental authorisation, published in terms of NEMA in Government Notice 86 of 2018	This guideline has been taken into account as part of project planning.	Section 4.3
National Greenhouse Gas Emission Reporting Regulations, published in terms of NEM:AQA in Government Notice of July 2017	Climate Change and Air Quality impact assessments have been undertaken to assess the carbon footprint from the mine and associated infrastructure.	Section 28
National Pollution Prevention Plans Regulations, published in terms of NEM:AQA in Government Notice of July 2017		
Alien and Invasive Species List, Government Notice 864 of 2016	The Act, regulation and guideline have informed project planning and will be taken into account in the assessment and mitigation of impacts. Depending on residual impacts after mitigation within critical biodiversity areas or highly sensitive biodiversity features, biodiversity offsets may need to be specified.	Section 4.7
Mining and Biodiversity Guideline (2013)		
Draft National Biodiversity Offset Policy, 2017		
Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013) (SPLUMA)	The Act, development plans, development frameworks and by-laws have informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts during the EIA phase.	Section 5
National Development Plan 2030		
National Spatial Development Plan (NSDP)	The principles of the NSDP state that spatial development should, if appropriate, accommodate and promote private economic ventures, which could support sustainable economic growth, relieve poverty, increase social investment, and improve service delivery.	
National Infrastructure Plan (NIP) (2012)	The South African Government adopted a National Infrastructure Plan in 2012. The primary objective of the Plan is to transform the country's economic landscape, while simultaneously creating significant numbers of new jobs, strengthening the delivery of basic services, and promoting integration with other African economies.	
KZN Provincial Draft Spatial Development Framework (PSDF) (2021)	The KZN Draft PSDF (2021) vision is to utilise physical and environmental resources towards greater spatial integration and sustainability. The envisaged provincial spatial development outcomes include an integrated and inclusive,	

Applicable legislation and guidelines used to compile the report	How does this development comply with and respond to the policy and legislative context	Reference where applied
	sustainable, resilient, productive, efficient, and well-managed province.	
Mthonjaneni Local Municipality Integrated Development Plan (IDP)	The Mthonjaneni LM IDP states that the vision of the municipality is to excel in service delivery and good governance to call their communities, building the trust between communities and the municipality. The proposed Jindal MIOP can help some of the challenges that the municipality is currently facing by creating employment opportunities for the resident population.	
Mthonjaneni Local Municipality Local Economic Development (LED) Strategy Review	The Mthonjaneni LM LED Strategy Review aims to achieve a reduction in income leakage; to increase investment (local and external); to promote local business development and business interaction; and to increase entrepreneurial opportunities and development within the municipal area. The proposed Jindal MIOP has a responsibility to respond or to align itself with the objectives of the municipality by implementing the following: • Promoting local business development and business interaction by supporting local businesses; • Giving priority to existing businesses for the procurement of goods and services; and • Through capacity building and training interventions	
uMlalazi Municipality Integrated Development Plan	The uMlalazi Municipality IDP aims for community empowerment and provision of services by a transformed institution where everyone lives in harmony by 2035. The municipality considers mining as a competitive advantage, with various types of mining activities possible throughout the municipal area. Mining is also seen as a mechanism that can expand employment opportunities through direct employment and the development of small, medium, and micro-enterprises (SMMEs).	
International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability	The IFC General EHS Guidelines on noise address impacts of noise beyond the property boundary of the facility under consideration and provides noise level guidelines.	Appendix D

5. NEED AND DESIRABILITY

The Department of Forestry, Fisheries and Environment (DFFE) (formerly DEA) Guideline on Need and Desirability (GNR 891, 20 October 2014) notes that while addressing the growth of the national economy through the implementation of various national policies and strategies, it is also essential that these policies take cognisance of strategic concerns such as climate change, food security, as well as the sustainability in supply of natural resources and the status of our ecosystem services. In 2017, the DEA published an updated guideline, although this is yet to be formally gazetted. The 2017 guideline on 'need and desirability' provides that addressing the need and desirability of a development is a way of ensuring sustainable development – in other words, that a development is ecologically sustainable and socially and economically justifiable – ensuring the simultaneous achievement of the triple bottom-line.

When considering how the development may affect or promote justifiable economic and social development, the relevant spatial plans must be considered, including Municipal Integrated Development Plans (IDP), Spatial Development Frameworks (SDF) and Environmental Management Frameworks (EMF). The assessment reports need to provide information as to how the development will address the socio-economic impacts of the development, and whether there would be any socio-economic impact resulting from the development on people's environmental rights. Considering the need and desirability of a development entails the balancing of these factors. Consistent with the aim and purpose of the EIA, the concept of "need and desirability" relates to, amongst others, the nature, scale, and location of the development being proposed, as well as the wise use of land and natural resources.

The National Strategy for Sustainable Development and Action Plan 2011 - 2014 (NSSD 1) (2011) states the following:

- In the first instance, it recognises that the maintenance of healthy ecosystems and natural resources are preconditions for human wellbeing. In the second instance, it recognises that there are limits to the goods and services that can be provided. In other words, ecological sustainability acknowledges that human beings are part of nature and not a separate entity.
- What is needed and desired for a specific area should primarily be strategically and democratically determined beyond the spatial extent of individual EIAs. The strategic context for informing need and desirability may therefore firstly be addressed and determined during the formulation of the sustainable development vision, goals, and objectives of Municipal IDPs and SDFs during which collaborative and participative processes play an integral part, and are given effect to, in the democratic processes at local government level.
- When formulating project proposals and when evaluating project specific applications, the strategic context of such applications and the broader societal needs and the public interest should be considered. In an effort to better address these considerations and their associated cumulative impacts, the NEMA also provides for the compilation of information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship, and significance of such attributes which must be taken into account. Whether a proposed activity will be in line with or deviate from the plan, framework, or strategy per se is not the issue, but rather the ecological, social, and economic impacts that will result because of the alignment or deviation. As such, the EIA must specifically provide information on these impacts in order to be able to consider the merits of the specific application. Where a proposed activity deviates from a plan, framework or strategy, the burden of proof

> falls on the proponent (and the EAP) to show why the impacts associated with the deviation might be justifiable. The need and desirability of the development must be measured against the abovementioned contents of the IDP, SDF and EMF for the area, and the sustainable development vision, goals and objectives formulated in, and the desired spatial form and pattern of land use reflected in, the area's IDP and SDF. While project-level EIA decision-making therefore must help us stay on course by finding the alternative that will take us closer to the desired aim/goal, it is through integrated development planning (and the SDF process) that the desired destination is firstly to be considered and the map drawn of how to get there.

The key components of the Need and Desirability Guideline are listed below and discussed in this section:

- Securing ecological sustainable development and use of natural resources; and
- Promoting justifiable economic and social development.

5.1 ENSURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES

The proposed Jindal MIOP site is a ‘greenfield’ site and outcomes from biodiversity studies have indicated that the project area identified for the placement of the Jindal MIOP is associated with some species of conservation concern (SCC) (Section 0). The expansion of the South East Pit and WRD could result in the loss of Moist Coast Hinterland Grassland (Endangered) and Dry Coast Hinterland Grassland (Vulnerable).

However, given the nature of the grazing across the sub-region these grasslands are likely to some extent already be degraded/ transformed. A detailed assessment delineating the grasslands and determining their current status will need to be undertaken. In addition, comment on the issues of veld management to maintain the grasslands is required. Ongoing engagement with local stakeholders and the development of a sustainable grassland management programme will be critical in ensuring that remaining intact primary grassland is not further degraded through increased anthropogenic pressures such as grazing and too frequent burning. It will also be important to combat alien plant invasions associated with the edge effects created through both the mine development and overgrazing with the implementation of a comprehensive alien plant control programme.

In their current proposed locations, the processing plant and the primary crusher coincide with open savannah/grassland areas rated as being of very high sites of ecological importance (SEI). In accordance with the mitigation hierarchy, it will be necessary to explore all options to avoid direct loss of terrestrial habitat of very high and high SEI, and to effectively mitigate potential indirect impacts through the implementation of sustainable design principles. The current proposed infrastructure footprint also coincides with a number of surface water resources, including wetlands, which stand to be directly or indirectly impacted and also need to be considered in terms of the mitigation hierarchy.

Biodiversity offsets are typically required in certain situations to compensate for residual impacts to ecosystems and biodiversity once all other forms of mitigation have been considered. Offsets will, however, only be considered as a last resort once all other options in the mitigation hierarchy have been considered/applied.

The mining operations will also require water for; the processing plant, dust control, vehicle wash down, the change house, and office use. It is currently anticipated that makeup water would be acquired from the KZN bulk water supply authority. A water supply analysis will be undertaken as part of the Jindal MIOP and EIA process which will determine water demand and where water would come from. Water requirements are likely to reduce as the pit deepens due to the reuse of water that collects within the pit.

5.2 PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT

According to DMRE (2011) "South Africa has been a resource economy for in excess of a century. An independent evaluation of South Africa's non-energy in-situ mineral wealth is estimated at US$2.5 trillion (Citibank Report, May 2010), making the country the wealthiest mining jurisdiction. However, a considerable amount of South Africa' s mineral resources is exported as raw ores or only partially processed. Although South Africa has steadily improved its ratio of beneficiated to primary products exported since the 1970s, these ratios are still well below the potential suggested by the quality and quantity of its mineral resource's endowment. The Government's industrialisation policy calls for a paradigm shift in mineral development, strategic investment in assets to maximise long-term growth beneficiation projects, enhance value of exports, increase sources for consumption of local content, and create opportunities for sustainable jobs. Minerals are a vital input to an industrialisation programme, which is intended to accelerate manufacturing in South Africa (for local consumption and export). Competitive access to minerals for local beneficiation is one of the key success factors for the country's industrialisation initiative."

Mining is a necessary activity in order to extract the natural resources that are necessary for manufacturing and, ultimately, development. Iron is primarily used to manufacture steel as well as alloy steel with additives such as nickel, chromium, vanadium, tungsten, and manganese. Iron / steel products are used in civil engineering projects as reinforced concrete and girders for the construction of bridges, electricity pylons, etc. As such, iron is in high demand globally.

According to the 'South Africa Iron Ore Industry Developments, 2004 – 2014 Report', South Africa's iron reserves (the parts of a mineral resource that can, at present, be economically mined) amount to 650 Mt – the 10th largest globally, whereas the resources (the concentration of material of economic interest in the ground) are ranked 9th with 5 370 Mt. The principal deposits present in South Africa are referred to as the superior-type banded iron ore formations of the Transvaal Supergroup located primarily in the Northern Cape Province. Other high-grade haematite deposits occur on the northern rim of the Bushveld Complex in the North West Province, notably in the town of Thabazimbi. According to Statista, at least 77 million metric tonnes of iron was produced from South Africa in 2020. The mining of iron ore results in the production of ore for sale, creates sustainable jobs in affected communities and supports economic activity and the export of the ore generates foreign income.

The Jindal MIOP will potentially be one the largest direct foreign investment projects in South Africa in recent years with the estimated direct and indirect capital cost in the order of R15 billion. The mine will create direct job opportunities for approximately 800 people per year during operations and indirect jobs for 1 600 people using a multiplier effect of 2 (ref. Chamber of Mines 2016). The South African Government, provincial and local municipalities will gain an additional income stream from mining royalties, taxes, permits and fees.

Indirect economic benefits will be derived from the procurement of goods and services, as well as through the spending power of employees. Further to this, through employment, employees of the Jindal MIOP will be afforded the opportunity to further their education through a skills development plan which will form part of the mine's Social and Labour Plan (SLP). Supplementary plans to enhance socio-economic benefits for employees and members of the surrounding communities will also be put in place and these will include career progression and mentorship plans, internships, and bursaries. In addition, the Jindal MIOP will implement an Employment Equity Plan which will include targets aimed at Historically Disadvantaged South Africans (HDSAs). The implementation of the social development plans by the Jindal MIOP will contribute towards positive socio-economic benefits at a local, provincial, and national level.

In addition, the Mining Charter, 2018, was gazetted in September 2018, after lengthy consultation and collaboration between stakeholders across the mining industry. The Mining Charter III is envisaged as a tool for driving transformation of the mining and minerals industry while providing policy certainty.

Community/society priorities are officially expressed through public documents such as the provincial spatial development framework and municipal IDPs. In this regard, the priorities of local government within the project area are focused on the creation of employment and business opportunities and creating a skilled, motivated and committed workforce.

Taking the above into consideration the development of the Jindal MIOP would lead to economic and social development within the affected area. The socio-economic impacts and benefits associated with the Jindal MIOP are assessed in Appendix S. Measures to enhance positive socio-economic impacts and mitigate against the negative socio-economic impacts are included in Section 28.

5.3 THE BROAD-BASED SOCIO-ECONOMIC EMPOWERMENT CHARTER FOR THE MINING AND MINERALS INDUSTRY

The Mining Charter, 2018, was gazetted in September 2018, after lengthy consultation and collaboration between stakeholders across the mining industry. The Mining Charter III is envisaged as a tool for driving transformation of the mining and minerals industry while providing policy certainty. At its core, the Mining Charter is premised on the conviction that the mineral wealth of the country belongs to all citizens and those that are located close to the mineral resources should derive socio-economic benefit from extraction and processing. The Mining Charter's vision is to "facilitate sustainable transformation, growth and development of the mining industry" (Republic of South Africa, 2018).

The Mining Charter III uses a scorecard to support transformation while providing policy certainty. The scorecard includes six elements, with Ownership and Mine Community Development (MCD) considered as 'ring-fenced' elements that require 100% compliance. Jindal, as with all other mining companies in South Africa, will be bound to compliance with this Mining Charter. Jindal currently has a BBBEE partner, Mr Thabang Khomo, who holds 26% of Jindal Iron Ore (Pty) Ltd.

5.4 THE NATIONAL DEVELOPMENT PLAN

The National Development Plan (NDP) 2030 is aimed at eliminating poverty and reducing inequality by 2030. The NDP aims to achieve this by drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society. While the achievement of the objectives of the NDP requires progress on a broad front, three priorities stand out, namely:

- Raising employment through faster economic growth;
- Improving the quality of education, skills development, and innovation; and
- Building the capability of the state to play a developmental, transformative role.

In relation to mining, the NDP acknowledges that South Africa has a comparative advantage in mineral and natural resource endowments, including, amongst other commodities, iron ore, yet the domestic mining sector has "failed to match the global growth trend in mineral exports due to poor infrastructure, alongside regulatory and policy frameworks that hinder investment" (National Planning Commission, 2017, p. 43).

Importantly, the NDP notes that while minerals beneficiation is a good way to increase productivity and export revenues and stimulate the development of a larger manufacturing sector, it is neither necessary nor essential to beneficiate all the country’s mineral resources and selectivity should be based on competitive advantage. Mining is seen as a critical activity for economic participation in the rural parts of the country, with human development considered an essential part of an inclusive economy. Mining and minerals processing provides both direct and indirect employment, and through social investment which is regulated through the Mining Charter III.

The NDP aims to provide a supportive environment for growth and development, while promoting a more labour-absorbing economy (National Planning Commission, 2017). The proposed Jindal MIOP can contribute towards the realisation of economic development and inclusive growth through revenue and tax generation and the creation of employment opportunities. Through the social interventions contained in the associated SLP, the proposed project can positively contribute to the Local Economic Development (LED) interventions of the Mthonjaneni LM, which in turn should deliver benefit to the communities directly affected by the establishment of the project.

5.5 PROVINCIAL POLICY AND PLANNING

5.5.1 The Draft Provincial Growth Development strategy 2021

The Provincial Growth Development Strategy (PGDS) provides KZN with a reasoned strategic framework for accelerated and shared economic growth through catalytic and developmental interventions, within a coherent equitable spatial development architecture, putting people first, particularly the poor and vulnerable, and building sustainable communities, livelihoods and living environments (KZN Provincial Planning Commission, 2021).

The PGDS vision is for KZN to be “a prosperous Province by 2035 with healthy, secure and skilled population, living in dignity and harmony acting as a gateway for Africa and the World”. The strategic pillars of the KZN PDGS are:

- Building a capable, ethical, and developmental state;
- Economic transformation and job creation;
- Education, skills, and health;
- Consolidating the social wage through reliable and quality basic services;
- Spatial integration, human settlements, and local government;
- Social cohesion and safe communities; and
- Better Africa and Better world.

In addition, other cross cutting goals and objectives relate prioritising the significant role of women, youth, and people with disabilities in our society. It is believed that if these three groups are strong, the whole society will be strong. These are cross-cutting focus areas that need to be mainstreamed into all elements of South Africa’s developmental future and all programmes of government. They will inform interventions across the three pillars.

Through its operations, the proposed Jindal MIOP can positively contribute towards the aims of the PDGS through creating employment opportunities, supporting the economic development of the province, enhance the inclusion of vulnerable groups in the economic activity of the province, and through spatial integration (UrbanEcon, 2021).

5.5.2 The Provincial Growth and Development Plan 2035

The main purpose of the Provincial Growth and Development Plan (PGDP) is to translate the PGDS into an implementation plan which will provide a sound platform for departmental, sectoral, and stakeholder annual performance planning and therefore to guide resource allocation. This document is a strategic management tool to ensure that as a province, there is a concerted and measured effort to achieve the 2035 Vision of the PGDS.

The proposed Jindal MIOP should be aligned to the objectives of the province to ensure that the 2035 vision is achieved. The spatial marginalisation from economic opportunities of most of the population needs to be addressed to reduce poverty and inequality and ensure shared growth and the protection of vulnerable bio-resources and supporting the inclusion of these marginalised groups in the economy is a likely outcome of the Jindal MIOP's operations.

5.5.3 Provincial Spatial Development Framework (PSDF)

The KZN Provincial Spatial Development Framework (PSDF) vision is to utilise physical and environmental resources toward greater spatial integration and sustainability. The envisaged provincial spatial development outcomes include an integrated and inclusive province, sustainable province, resilient province, productive and efficient province, and well managed province (KZN CoGTA, 2021).

Implications of the PSDF to mining, is to ensure that sustainability is achieved. Spatial sustainability of the province is based on the spatial structuring and development of the province in a manner which will maintain the bio-physical environmental while providing the social and economic opportunities required within settlements and communities. The following intended outcomes will contribute to the development of a sustainable province and will need to be observed by the mine:

- Protection and sustainable development of land and water resources towards an integrative economic structure;
- Water resources are protected, used sustainably and well-managed by both authorities and communities; and
- Increased air quality monitoring and management in both urban and rural production areas.

5.6 LOCAL AND DISTRICT MUNICIPALITY DEVELOPMENT

5.6.1 Mthonjaneni LM Local Economic Development Strategy review

The Mthonjaneni Municipality LED Strategy (Mthonjaneni Municipality, 2021/2022) aims to achieve the following objectives.

- Reduction in income leakage – ensure spendable income is utilised within itself.
- To increase investment (local and external) – investment in tourism, agriculture and business is to be promoted.
- To promote local business development and business interaction – interaction between businesses will contribute to countering income leakage and establishing a new vibrancy in the economy.
- Increase entrepreneurial opportunities and employment – all the objectives need to be supported by a strong focus on entrepreneurial development, micro and small business establishment, and employment creation through appropriate support mechanisms.

Considering the above, the proposed Jindal MIOP has a responsibility to respond to or to align itself with the objectives of the municipality. Jindal intends to recruit as many employees as possible from the local communities that will be affected by the establishment and operations of the Jindal MIOP and will conduct a skills audit to determine the skill requirements. Jindal should promote local business development and business interaction by supporting local businesses, giving priority to existing businesses when outsourcing work which will encourage interaction between businesses and will contribute to countering income leakage and establishing a new vibrancy in the economy. Through capacity building and training interventions, the proposed project will also contribute meaningfully to the upskilling of the community. Importantly, the proposed Jindal MIOP must take measures to limit any negative impacts on agriculture and tourism development, as these are both considered vital sectors of the municipal economy.

5.6.2 Mthonjaneni LM Integrated Development Plan review

According to the Mthonjaneni Integrated Development Plan (IDP), Mthonjaneni's vision is to excel in service delivery and good governance to all their communities, building the trust between the communities and the municipality (Mthonjaneni Municipality, 2021/2022). The municipal mission is committed to creating a stable and secure environment, and delivering quality services to residents.

There are many challenges for local municipalities, but there is the potential for the proposed Jindal MIOP to help mitigate some of these challenges that the municipality is currently facing by creating employment opportunities for the resident population. The mine will bring new job opportunities that require various skills from unskilled labour, semi-skilled and skilled labour. This will shift the dependence of the community on the agricultural sector for employment opportunities and provide the community with in-demand skills. An effective SLP will support the municipality in tackling some of these challenges through investment in Adult Basic Education and Training (ABET) and investment in municipal infrastructure, amongst others.

5.6.3 uMlalazi Municipality Integrated Development Plan

The uMlalazi LM IDP states that the municipal vision is to model the municipality for community empowerment and provision of services by a transformed institution in an area where everyone lives in harmony, by 2035 (uMlalazi LM, 2021/2022).

In the uMlalazi Municipality, mining is considered as a competitive advantage, with various types of mining activities possible throughout the municipal area. Mining is also used as mechanism aimed at expanding employment opportunities through direct employment and the development of small, medium, and micro-enterprises (SMMEs). The IDP highlights that the municipality still has untapped opportunities in the mining sector; although, there is an existing operational mine in the municipal area, the mining sector is underdeveloped.

5.6.4 uMlalazi LM Spatial Development Framework

The SDF is the spatial representation of uMlalazi IDP's and is intended to guide decision-making related to the development of land or planning for the future use and development of land. The SDF vision for uMlalazi is that by 2035, uMlalazi Municipality will be a socially inclusive, economically viable, environmentally friendly, and a spatially resilient Municipality where its people enjoy living (uMlalazi LM, 2019a).

These objectives will need to be taken to account in the development of the proposed Jindal MIOP, which although not located within uMlalazi LM (LM), could have spill-over effects into the municipal area due to its location on the municipality's border.

5.6.5 uMlalazi Agricultural Plan

Agriculture in uMlalazi is the second largest contributor to the municipal economy and the number one employer of all economic sectors. This strategic plan is designed to grow the agriculture sector so that it becomes a sustainable economic sector that continues to contribute positively to the Gross Regional Domestic Product (GRDP) while responding unequivocally to the challenges of unemployment, inequality, and poverty. The focus of this strategic framework is on developing local emerging farmers into commercial farmers through the implementation of agricultural practise that is sustainable, innovative and respond to the challenges of climate change.

As stated above, agriculture is one of the leading sectors in uMlalazi LM. Therefore, any negative impact that can threaten this sector could have adverse consequences for the municipal economy, the individuals that are dependent on this sector for employment, and the enterprises and businesses in the agricultural value chain. Mine operations have the potential to negatively impact the sustainability and success of the agricultural sector through direct impacts to water, soil, and air quality. These negative impacts can be permanent and render previously fertile agricultural land unusable. It should, however, be noted that only a small portion of the proposed Jindal MIOP falls within this LM and impacts on agriculture are unlikely.

6. MOTIVATION FOR THE PREFERRED SITE, ACTIVITIES AND TECHNOLOGY ALTERNATIVES

The assessments and process undertaken to determine the preferred alternatives for the Jindal MIOP are included in Section 7 with the final outcomes discussed in Section 7.10 and 7.11 and the preferred layout included in Figure 7-46. The motivation considers the potential impact of the proposed Jindal MIOP on the biophysical, cultural/heritage and socio-economic environment as determined by specialists as well as issues and concerns raised by I&APs.

7. PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED ALTERNATIVES WITHIN THE SITE

7.1 DETAILS OF THE DEVELOPMENT FOOTPRINT CONSIDERED

7.1.1 Mitigation Hierarchy

Implementing the mitigation hierarchy is crucial when considering alternative sites and alternative infrastructure layouts.

The mitigation hierarchy is defined as:

- **Avoidance:** measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity.
- **Minimisation:** measures taken to reduce the duration, intensity and / or extent of impacts (including direct, indirect, and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.
- **Rehabilitation/restoration**: measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised.
- **Offset:** measures taken to compensate for any residual significant adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored, in order to achieve no net loss (NNL) or a net gain (NG) of biodiversity . Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation, or averted risk, protecting areas where there is imminent or projected loss of biodiversity.

7.1.2 Details of All Alternatives

This section describes land use or development alternatives, alternative means of carrying out the operation, and the consequences of not proceeding with the proposed Jindal MIOP.

The main project alternatives considered include:

- Locality alternatives;
- Design alternatives;
- Site layout alternatives;
- Activity alternatives;
- Transportation alternatives; and
- The ‘no-go’ alternative.

7.1.2.1 Locality

Jindal was granted Prospecting Rights by the then Department of Mineral Resources (DMR) on 26 August 2011 for the North Block (PR 10644) and South Block (PR 10652) which have a total combined area of 20 170 ha. Jindal undertook drilling and exploration activities on the study area to determine the presence of a viable iron mineral resource. Following the completion of the drilling and exploration activities, the presence of an iron ore body was confirmed within the study area. As a result, Jindal investigated the feasibility of developing an iron ore mine within the study area. Consequently, no further location alternatives were considered for the Jindal MIOP as the location of the mine is restricted by the presence of the ore body.

An assessment was undertaken to determine the viability of mining the North vs the South Block first (Table 7-1).

Due to difficulties with access to the North Block significantly more baseline work and detailed design has been done for the South Block. In addition, the South Block has better established access roads, is closer for potential water supply from the Mhlathuze catchment, has existing Eskom power lines that run past the preferred processing plant area and is the most accessible to the Nkwalini Siding (proposed for concentrate transport to Richards Bay).

The current mine plan is to undertake initial Phase 1 mining in the south-eastern section of the South Block and once established would at a later stage progress into the North Block.

Table 7-1 North vs South Block

	North Block	South Block - Preferred
Description	North Block (PR 10644)	Description
Advantages		Existing access into the area. Water supply more easily accessible. Easiest access to the existing road and rail routes. Existing power supply.
Disadvantages	Longer distance from access routes.	Numerous communities in the area.

7.1.2.2 Design Alternatives

Various scenarios for production rate were assessed by A&B Global Mining (ABGM) in 2021, these were 20, 24, 28 and 32 mtpa (Table 7-2). Detailed planning for a 25 year LoM shows that each of these is a viable option for this iron ore resource.

Table 7-2 ROM Schedule of Four Assessed Scenarios (total over 25 year mine schedule)

Mtpa	Rock (Mt)	In situ Ore (Mt)	Waste (Mt)	RoM Ore (Mt)	Stripping Ratio (t/t)	Concentrate (Mt)	Average Yield
20	661.38	496.94	164.44	487.00	0.34	119.23	24.5%
24	817.59	596.33	221.26	584.40	0.38	140.86	24.1%
28	996.31	695.72	300.59	681.80	0.44	161.01	23.6%
32	1 203.76	795.10	408.66	779.20	0.52	182.01	23.4%

The generation of the schedules demonstrates, from a mining perspective, that 32 mtpa ROM is a practical limit to the production capacity of the resource (ABGM, 2021). With an average stripping ratio of 0.52, this equates to an annual rock movement of approximately 50 Mt. At this scale of operation, the average concentrate production rate was assessed to be approximately 7 mtpa. This volume of concentrate makes the project economically viable.

7.1.3 Site Layout Alternatives

The options for alternative placement of the processing plant and the WRD were greatly restricted due to the mountainous terrain but a minimum of two layout alternatives were studied.

7.1.3.1 South East Pit Alternatives

Two alternative sites were assessed for the location of the open pit (Table 7-4,Figure 7-1).

Table 7-3 Alternative Open Pit Layout

	Pit 1 - Preferred	Pit 2
Advantages	Designed for a 32 mtpa mine.	Limited impact on sensitive biodiversity. Avoids crossing a sub-catchment at the current southern extent of the pit.
Disadvantages	Pit encroaches upon vegetation community 1 (Open Savannah) and vegetation community 2 (Thicket/Closed Woodland), which are both assigned a very high sensitivity rating and form part of the recommended 'no-go' area. Crosses a sub-catchment at the current southern extent of the pit.	Not commercially viable due to limited ability to extract sufficient ore from the reduced footprint. Reduced footprint could impact of wall stability and the related health and safety requirements.

Pit 1 is the preferred site as Pit 2 would not be commercially viable for the Jindal MIOP.

7.1.3.2 Waste Rock Dump Alternatives

Three alternative WRD sites were assessed (Table 7-4, Figure 7-1).

Table 7-4 Alternative WRD Locations

	WRD 1 - Preferred	WRD 2	WRD 3
Advantages	This is a revised design of WRD 2 and has a significantly smaller footprint of approximately 204 Ha and would therefore be less visually intrusive and better shaped for rehabilitation post mining operations.	Closer to the primary crusher. Sufficient capacity for Phase 1 of mining. Has a proposed footprint of approximately 650 Ha. Visually would be less intrusive than WRD 3 but more than WRD 1.	Smaller footprint than WRD 1 and 2.
Disadvantages	Footprint within a valley and intersects with large portions of Medium to Very High SEI vegetation communities resulting in direct physical habitat loss. Likely to impact watercourses in the area.	Footprint within a valley and intersects with large portions of Medium to Very High SEI vegetation communities resulting in direct physical habitat loss. Likely to impact watercourses in the area.	Insufficient capacity for the proposed 32 mtpa mine. WRD 3 also intersects with proposed terrestrial 'no go' areas. Visually more intrusive as it would have been situated at a higher altitude than WRD 1 and 2.

	WRD 1 - Preferred	WRD 2	WRD 3
			Likely to impact watercourses in the area.

WRD 1 is the preferred site in terms of footprint, stability and rehabilitation potential.

7.1.3.3 Processing Plant Alternatives

Three processing plant and primary crusher layout options were considered as can be seen in Table 7-5 and Figure 7-1.

Table 7-5 Alternative Plant Layouts Considered

	Plant 1 - Preferred	Plant 2	Plant 3
Advantages	Closest to the Eskom high voltage transmissions lines. Sufficient area of reasonably flat topography thus requiring less earth works and consequent disturbance for borrow material sourcing. Can be serviced by access road that also gives access to the mine pit. Closest to the pit and the preferred WRD area. Enables concentration of infrastructure and vehicle movement to a smaller area than Plant 2.	Closer to Nkwalini Siding for concentrate transport. Closer to Mhlathuze catchment for water supply.	In the current proposed locations (Plant 1), the processing plant footprint coincides with open savannah/grassland areas rated as being of Very High SEI which forms part of the recommended Terrestrial 'no-go' Area. Relocation to this site would minimise the impact on sensitive biodiversity.
Disadvantages	Further from the Nkwalini Siding for concentrate transport. Coincides with the headwater areas of two Mountain Headwater Streams, a single wetland, and a single Mountain Stream.	Further away from the pit area requiring further distances for transporting RoM. Requires more earth moving activities therefore generating additional impacts and costs.	Further away from the pit area requiring further distances for transporting RoM. Further from the Nkwalini Siding for concentrate transport. Due to the hilly terrain of the area and the required footprint for the processing plant this site is not suitable.

Processing plant site 1 is the preferred option.

7.1.3.4 Primary Crusher Alternatives

Two alternative sites were assessed for the primary crusher (Table 7-4, Figure 7-1).

Table 7-6 Alternative Primary Crusher Locations

	Primary Crusher 1 - Preferred	Primary Crusher 2
Advantages	Close to the pit so minimal conveyance of ROM ore.	In the current proposed locations (Primary Crusher 1), the primary crusher footprint coincides with open savannah/grassland areas rated as being of Very High SEI which forms part of the recommended Terrestrial 'no-go' Area. Relocation to Site 2 would minimise the impact on sensitive biodiversity. Close to the edge of the Mining Right area so would have a greater impact on nearby sensitive receptors.
Disadvantages	Situated within an open savannah/ grassland area rated as being of Very High SEI. Advance into the recommended watercourse buffer zone area for a Mountain Headwater Stream and a Mountain Stream.	Further away from the pit so longer distance required to transport ROM ore.

Primary Crusher site 1 is the preferred option due to ease of access to the Jindal MIOP South East Pit as well as the reduced distance that ROM would need to be transported.

7.1.3.5 Access Road Alternatives

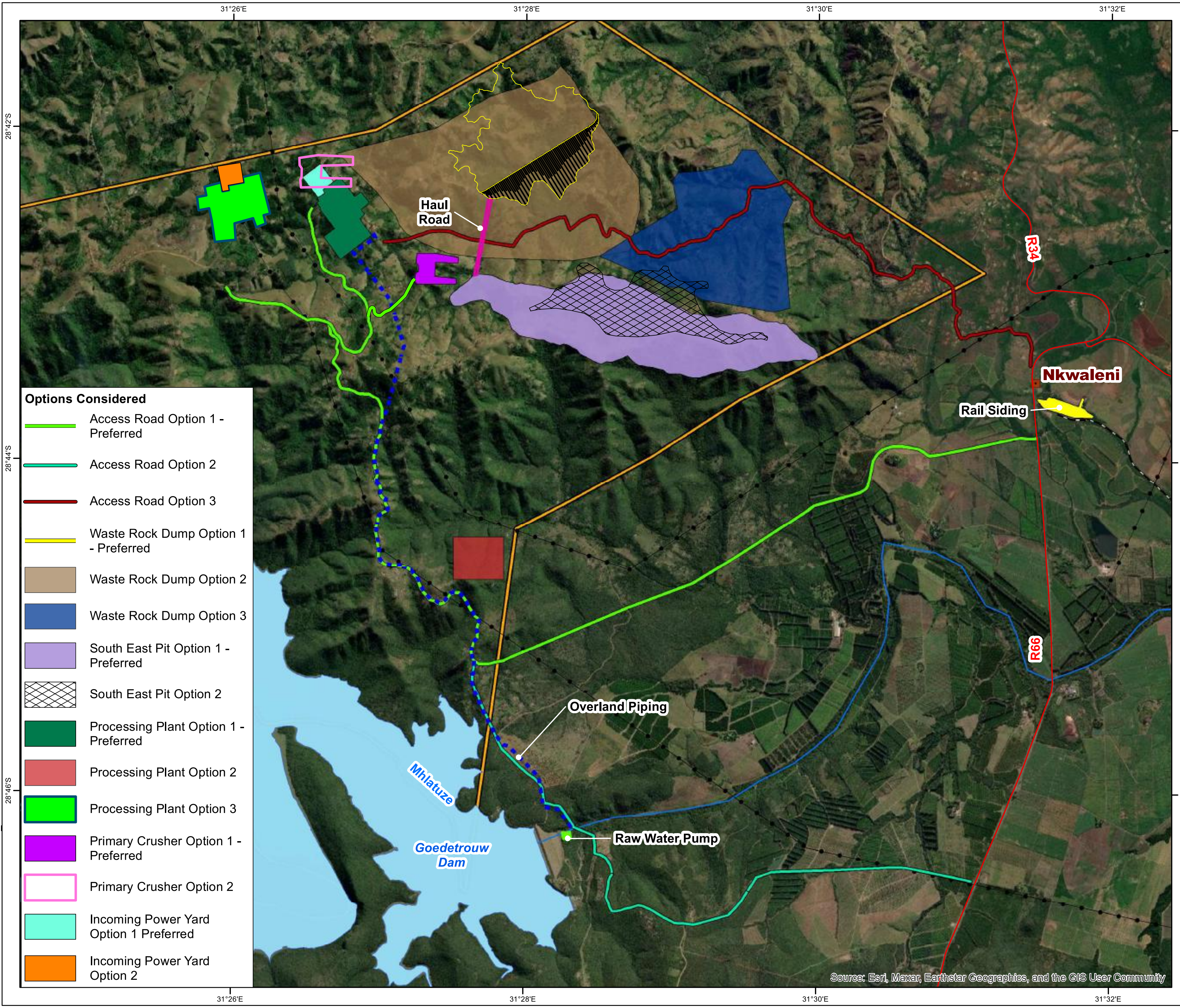
Three access roads have been considered for the Jindal MIOP and are included in Figure 7-1. The advantages and disadvantages of each are discussed in Table 7-7.

Table 7-7 Alternative Access Roads Considered

	Access Road 1 - Preferred	Access Road 2	Access Road 3
Description	Access from the south side of the pit, cut through privately owned land to the R66.	Access from the south side of the pit, crossing the Goedertrouw dam wall and joining the R66 further to the south than Option 1.	Access from the north side of the pit from the R66.
Advantages	There are fewer individual households on this road. Shorter distance to Nkwalini Siding. The road is further away from the Goedertrouw Dam and therefore has a lower impact on potential tourism use. The capital cost was estimated at R243 million which was the cheapest option.	A gravel road is already exists therefore less clearing and earthworks required	The road is the shortest distance 12km compared to Option 1 which is 16 km.

	Access Road 1 - Preferred	Access Road 2	Access Road 3
	Follows the proposed water supply pipeline servitude for 4-5 km.		
Disadvantages	There is no existing road so additional clearing and construction would be required. Land will need to be acquired from individual landowners.	The road passes directly next to Shakaland, a tourist destination. Would require upgrading the Goedertrouw Dam wall to be able to accommodate large trucks and heavy loads. This road would require a longer distance to be travelled to the Nkwalini Siding.	Requires two river crossings and major culvert and embankment works due to the severe topographic conditions. The capital cost was estimated to be R405 million.

Access Road 1 is the preferred option due to a more direct access to the Jindal MIOP and has significantly less major engineering work required. In addition, it follows the water supply pipeline servitude and therefore minimises areas required to be cleared.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Scale: 1:40 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

JINDAL IRON ORE (PTY) LTD

FIGURE 7-1
ALTERNATIVE SITE LAYOUT OPTIONS CONSIDERED

PO BOX 1596
CRAMERVIEW
JOHANNESBURG
2060

T: +27 (11) 467-0945
www.slrconsulting.com

Project No: 720.10023.00001
Prepared By: BG
Map Ref No: ESIA 7-1
Date: 04/07/2023

7.1.4 Activity Alternatives – Open Pit vs Underground Mining Method

The type of mining method selected for implementation is dependent on a number of environmental factors such as topography, geology and stability of the area, and depth and orientation of the mineral resource. Technical factors taken into consideration when selecting a preferred mining method are included in Table 7-8.

Table 7-8 Open Pit/Underground Trade-off

Criteria	Underground	Open Pit	Recommendation
Pre-production capital	2 Inclined shaft complexes	Out cropping ore, low pre-strip	Open Pit
Maximum production capacity estimate	+-4Mtpa ROM	20-32Mtpa ROM	Open Pit
Mining Cost	US$27.59/t ROM	US$5.33/t ROM	Open Pit
Infrastructure required	Backfill plant/Lack of Material	None	Open Pit
Extraction	+-70%	100%	Open Pit
Stripping Ratio	N/A	0.5	Open Pit
Mineability	Challenging (BIF)	Established mining operations	Open Pit
Mine surface disturbance (relocation)	Not excluded but not total	Total	Underground
Time to develop to full production	+-3 years (slow build up)	+-2 year (ore produced from day one)	Open Pit
Closure commitments	Long term responsibility	Established closure procedure	Open Pit
After closure utilisation	None	Fresh water storage and supply	Open Pit

Source: A&B Global Mining (ABGM) (2021)

According to ABGM (2021), in order to match an open pit production capacity of 20 mtpa ROM, 10 inclined shaft complexes would be required for an underground mining operation, each made up of three inclined shafts. Each would have to be approximately 750m in length to access the whole orebody. At an estimated cost of US$3 400/m for sinking and equipping the capital cost of these excavations would be approximately US$77 million. This can be compared with a minimal pre-strip for open pit access as the geological model shows the orebody outcrops at surface. This would be even more significant for the proposed 32 mtpa.

The decision matrix in Table 7-8 and the estimated capital cost difference show that the open pit mining method is the preferred method in terms of economics.

7.1.5 Transportation Alternative

Three different methods of transporting iron ore concentrate to Richards Bay have been considered. These include rail, road and pipeline. From studies done the preferred alternative is to transport iron concentrate from the Nkwalini Siding to Richards Bay port via rail. This will, however, be undertaken under a separate process.

7.1.6 The 'No-Go'

The 'no-go' alternative would result in the south-east section of the South Block remaining in its current state without mining operations being established onsite. Potential positive benefits of this are that the natural environment would not be impacted upon, water resources would not need to be physically impacted, ecological processes would not be affected and mining operational impacts such as dust, noise etc would not be generated.

However, as discussed in Section 5.1, given the nature of the grazing across the sub-region the primary intact grasslands are to some extent already degraded/ transformed through increased anthropogenic pressures such as grazing and too frequent burning. Ongoing engagement with local stakeholders and the development of a sustainable grassland management programme would be critical in ensuring that remaining intact primary grassland is not further degraded. These programmes, including offsets, could be implemented under the EMPr for the Jindal MIOP which would not occur if the Jindal MIOP does not go ahead.

Furthermore, the iron ore body identified within the area would remain unmined and the benefits (Section 5.2) associated with the establishment of mining operations and alignment with objectives laid out in the various national, provincial and local development plans could remain unrealised. Economic benefits would not be derived through wages, taxes, and profits at a local, provincial, and national level. Additionally, no indirect economic benefits would be derived through the procurement of goods and services, enhancement of socio-economic benefits for employees and members of the surrounding communities and career progression, mentorship plans, internships, and bursaries as a result of the SLP implementation. The local communities would continue with life as they know it with no additional impact to the natural receiving environment. There would be no need for residents within the mining area, prospecting site, or exclusionary buffer zones to be resettled. The 'Status Quo' would remain.

7.2 DETAILS OF THE PUBLIC PARTICIPATION PROCESS

This section describes the PPP undertaken in line with Section 6 of the EIA Regulations, 2014. The aim of the public consultation process is to co-ordinate a process through which I&APs are informed of the proposed Project and environmental assessment process and are provided with an opportunity to provide input into the project plan, the assessment and proposed mitigation measures. I&APs broadly refers to all landowners, adjacent landowners, land users, non-government organisations, municipalities, surrounding mines and industries, communities, commenting authorities and parastatals. The PPP undertaken in support of the current application is provided in Table 7-9.

Table 7-9 Public Participation Process

Task		Description
Public participation completed to date	**Pre-application phase**	
	DMRE pre-application meeting	A pre-application meeting was held with the KZN DMRE on 03 March 2021 (Appendix CX1). The purpose of this pre-application meeting was to provide notification of Jindal's proposed MRA for the Jindal MIOP and to confirm the legislative requirements and the approach to the EA process. Furthermore, SLR discussed the stakeholder engagement plan with the DMRE to obtain their advice and input on the requirements and approach to public participation. The DMRE approved the stakeholder engagement plan on 15 March 2021 (Appendix C2).
	Notification – I&APs	
	Land Claims Commissioner	The Commission on Restitution of Land Rights was contacted on 17 June 2021 for the following properties: • North Block: RESERVE NO.11 15831 (Ptn 3, 4) and NTEMBENI 16921' • South Block: NTEMBENI 16921, KROMDRAAI 6110, NTEMBENI 16921, BLACK EYES 13385 (Ptn 1, 2, 3, 4, RE), WILDERNESS 6107 (Ptn 3, 4, 5, 6, 7, 8,12, 13, 14, 15, 16) and GOEDGELOOF 6106 (Ptn 1, 2, 3, RE). As of 15 July 2021 the Regional Land Claims Commission indicated that a claim has been lodged on the properties described as VERGELEGEN 6104. This property falls under the Entembeni Community claim. However, the notice of the claim was subsequently amended to exclude said property (Appendix CX). At this stage no mining is proposed on this farm.
	Pre-application PPP	Although not a legislated requirement of the EIA Regulations 2014, a pre-application PPP was undertaken. This notified landowners and other key stakeholders of the proposed project and provided potential I&APs with an initial opportunity to raise any up-front issues or concerns regarding the proposed project. All written comments received have been collated, and responded to, in a Comments and Responses Report (CRR). The CRR has been continuously updated throughout all phases of the EIA process. All landowners for whom contact details were obtained were notified of the application and S&EIA process by means of a Background Information Document (BID). This was sent via email, post or fax. An SMS was also sent to those landowners for whom only a cell number was available. Proof of all I&AP notification is provided in Appendix E5. The list of landowners that have been notified of the project is provided in the I&AP database (Appendix E4).

Task		Description
		It was not possible to source contact information for all landowners and occupiers; however, every effort was made to contact all stakeholders in the process. The task of notifying landowners and occupiers has been on-going.
	Project database	As part of the PPP an I&AP database has been developed for the project. I&APs identified for the project include: • Authorities (including the Entembeni Traditional Council, community leaders, State Departments with jurisdiction in the area, municipal offices and ward councillors); • Landowners/residents, lawful occupiers, land users (within and adjacent to the application area); • Community forums and action groups; • Non-Government Organisations and associations and Non-Profit Companies working in the area; • Businesses in the area; • Parastatals; • Service Providers; and • Other key stakeholders database has been updated on an ongoing basis throughout the EIA process. Additional I&APs were added to the database following responses to the advertisements, distribution of the BID and attendees at community, key stakeholder and public information meetings.
	Background Information Document	On 17 June 2021 all identified I&APs were notified of Jindal's intent to apply for a Mining Right and EA, and the start of the S&EIA process by means of a BID which was distributed by post, email and hard copy. The purpose of the BID was to convey initial information on the proposed project, outline the environmental regulatory process, the S&EIA process and the baseline environment of the site as well as to invite I&APs to register on the project database and provide initial comment. The BID was also made available, in English and isiZulu, at all the community and stakeholder meetings. Due to the implementation of the COVID-19 adjusted Alert Level 4 Restrictions from 28 June to 25 July 2021, which prohibited gatherings to address, prevent and combat the spread of COVID-19, the physical public information meeting which was scheduled to take place on 30 June 2021 was postponed to 18 August 2021. In that regard, a second round of BID notifications was done detailing the new date of the public meeting, following the easing of COVID restrictions. Additionally, the BID comment period was extended from end of July to the end of August 2021. Copies of both versions of the BID are included in Appendix C5. I&AP correspondence received during the BID comment period is presented in Appendix C3.
	Advertisements	Newspaper advertisements were placed in the following newspapers: • The Mercury, 15 June 2021, English; • Eyethu Baywatch - 16 June 2021, English; • Isolezwe - 18 June 2021, isiZulu; and • Zululand Observer - 21 June 2021, English.
	Site Notice	

Task		Description
		Site notices with the same information as the adverts were placed at conspicuous locations in the towns of Melmoth and Eshowe at the following locations: • Melmoth - BP Driving School; • Melmoth - Luthuli Store (next to Mehlamasha Combined School); • Melmoth- Nogajuka Clinic; • Melmoth - Nogajuka Primary School; • Melmoth -Ndundulu Store; • Melmoth – Public Library; • Melmoth- Kwa Shange Store (Ndundulu area); • Melmoth- Emthonjaneni Sanguye Traditional Court; • Melmoth - Obuka Traditional Court; • Melmoth- Thubalethu Location; • Melmoth - Early Childhood Centre next to Jindal Offices; • Melmoth- Nkwaleni Store; • Melmoth - Sitheku School (Ndabazensangu); • Melmoth- Local Store; • Melmoth – Shoprite; • Melmoth - Boxer Superstore; • Eshowe- King Dinizulu Township Public Library; • Eshowe – The Atrium Shopping Mall; • Eshowe -Checkout Shop; • Eshowe -Pick & Pay; • Eshowe -Spar; • Eshowe - Public Library (Town); • Eshowe - Maqhinga Store (King Dinizulu Township); and • Eshowe - uMalazi LM. Radio advertisements with key project information were aired on the following radio stations: • Icora 100.40 fm – 15 to 19 June 2021; and • Izwi Lomzansi 98.0 fm – 21 to 23 June 2021. Proof of the newspaper and radio advertisements (log sheets) as well as the placement of site notices is included in Appendix C4.
	Focussed meeting and public meetings	
	Focussed meeting	

Task		Description
	Public meeting	SLR and Jindal met with the Entembeni Traditional Council on 15 June 2021 to announce the Jindal MIOP and to propose dates to hold community information sharing meetings in the directly affected and adjacent project areas. The proposed dates from 21 June to 2 July 2021 were accepted by the King and the community izinduna/traditional leaders. The first round of community information sharing meetings were, however, only held for one week during the week of 21 June to 25 June 2021. This was as a result of the implementation of the COVID-19 adjusted Alert Level 4 Restrictions from 28 June to 25 July 2021. Following the easing of the COVID-19 restrictions, the second round of community information sharing meetings resumed from 16 August to 22 August 2021. Other key stakeholders, including State Departments; Forums; Associations and Trusts, were also consulted (both virtually and physically) during the two weeks of stakeholder engagement. Furthermore, the virtual and physical public information meetings were also held within those two weeks, 06 July and 18 August 2021. All meeting notes (including the presentation and attendance registers) as well as meeting photos are presented in Appendix E8.
	Review of the Scoping Report and EIA and EMPr Report	
	I&AP Review of the Scoping Report	The Scoping Report was distributed for a 30-day comment period from 16 February to 18 March 2022 in order to provide I&APs an opportunity to comment on any aspect of the project and the findings of the S&EIA process to date. The Scoping Report was made available for public review through the methods listed below: • On the SLR website and a zero-data website. • Physical locations - libraries and locations which were acceptable to the King, Izinduna/ Traditional Leaders and the wider community: ◦ Dlozeyane Primary School; ◦ Entembeni High School; ◦ Entembeni Traditional Court; ◦ Eshowe Library; ◦ Gqokubukhosi Secondary School; ◦ Mehlamasha Primary School; ◦ Melmoth Library; ◦ Mfanefile Primary School; ◦ Mthonjaneni High School ◦ Mthonjaneni Municipality; ◦ Mxosheni Primary School; ◦ Nkwalini Stores; ◦ Nogajuka Primary School; ◦ Ntandokazi Primary School; ◦ Obuka Traditional Court;

Task		Description
		- Sinqobile High School; - Siyavuna Primary School; and - Yanguye Traditional Court. A Non-Technical Summary (NTS) was also made available (email, website and hard copy), which summarised the proposed Jindal MIOP Scoping Report including the project description, potential identified impacts and the Plan of Study for the EIA. The NTS was made available in English and isiZulu.
Planned public participation	I&AP review of the EIA and EMPr Report	The following PPP is proposed for the EIA Phase of the Jindal MIOP: Advert to be placed in the Isolezwe and Zululand Observer notifying I&APs of the availability of the EIA and EMPr for a 30 day public review and the public meeting Site notices to be placed at strategic positions notifying I&APs of the availability of the EIA and EMPr for a 30 day public review and the public meeting. Public review from 14 July 2023 – 14 August 2023 Public open day on 26 July 2023. Various focus group meetings Distribution of the link for the EIA and EMPr for public review (14 July 2023) Upload of the EIA and EMPr to the SLR website (14 July 2023) Distribution of the NTS to all registered I&APs (14 July 2023) Distribution of hard copies to:

7.3 SUMMARY OF ISSUES RAISED BY I&APS

The issues and concerns raised by I&APs and regulatory authorities during the pre-application phase to date have been compiled into a CRR (see Appendix C3). Also included in the CRR are responses to the questions or issues raised as well as where these have been addressed.

The main themes to come out of the PPP thus far are summarised in Table 7-10.

Table 7-10 Summary of Comments from I&APs

#	Key Issue	Where addressed in the EIA
1	**Community relocation** Will communities need to be relocated?	A Resettlement Action Plan will be undertaken at such a stage as when the Jindal MIOP has been granted Environmental Authorisation. This is a highly regulated process and will involve a significant stakeholder engagement process during the planning phases and prior to any relocation being undertaken. The RAP would be undertaken as a completely separate process should Environmental Authorisation and a mining Right be authorised by the DMRE and the Jindal MIOP move ahead.
2	**Health impacts** What will the health impact from the Jindal MIOP on the communities, workers (occupational health) and the environment?	Community Health Study - Appendix P EMPr Chapter 28 Appendix D – Section 12
3	**Impacts on agriculture** Will the Jindal MIOP impact on agriculture which is very important in this area.	Appendix D – Section 5.1.3 EMPr Chapter 28
4	**Job opportunities and training for local people** Most of the employment and SME's should be for the local communities Mthonjaneni municipal area. The community must be provided with training to be able to do higher level jobs rather than only being general workers.	EMPr, Appendix D Section 15.3 EMPr Chapter 28 Jindal MIOP SLP (not part of this document)
5	**Influx of job seekers** How will the influx of job seekers be managed?	EMPr, Appendix D Section 15.1 EMPr Chapter 28
6	**Process of employing job seekers and SME's** The job and training opportunities must be advertised properly to the communities so that the people have a fair chance of applying and getting a job.	EMPr, Appendix D Section 15.1 EMPr Chapter 28 Jindal MIOP SLP (not part of this document)

#	Key Issue	Where addressed in the EIA
	Local SME's should be given the opportunity to do work.	
7	**Opposition from some stakeholders/ I&AP's** Certain communities do not support the project and support the 'no-go' option.	Appendix S Socio-economic Impact Assessment EMPr Chapter 28
8	**Graves and other heritage sites** What will happen to our ancestral graves and other heritage sites in the area?	Appendix Q Heritage Study EMPr Chapter 28
9	**Environmental impacts** 1. Dust pollution/generation 2. Loss of biodiversity 3. Water resource stress 4. Water contamination 5. Soil contamination	Appendix D EMPr Chapter 28
10	**Water Resources** What is the potential impact on groundwater and surface water availability and possible contamination?	Appendix D Sections 1 and 2 Section 28
11	**Community benefits** Will benefits from the Jindal MIOP go to affected communities and be fairly distributed?	Appendix S Socio-economic Impact Assessment EMPr Chapter 28 Appendix D Section 15.3
12	**Impacts on sensitive biodiversity** This area contains sensitive biodiversity features including critical biodiversity areas, freshwater habitats, sensitive vegetation types, and flora and fauna of conservation significance.	Terrestrial Ecology Specialist Study, Appendix G EMPr Chapter 28 Appendix D Section 3
13	**Water abstraction** Where will water for mine water supply be obtained from?	Appendix F Hydrological Study Section 3.1.2.5

7.4 BIOPHYSICAL ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PROJECT AREA

This section provides a baseline description of the biophysical environmental attributes of the Project area (defined as both South Block and North Block). For ease of reference, the description of the environmental attributes of the South Block and North Block will be discussed separately (where necessary).

7.4.1 Climate

Information in this section was sourced from the Climate Change Impact Assessment (CCIA) (Promethium Carbon, October 2022) included in Appendix M and the Hydropedological Assessment (GCS Water and Environmental Consultants, 2023) included in Appendix T.

7.4.1.1 Regional Climate

The KZN province has a subtropical climate in inland regions and tends to experience decreased temperatures with increasing altitudes. The Jindal MIOP is located approximately 70 km inland from Richards Bay.

7.4.1.2 Local Climate

TEMPERATURE

The Mthonjaneni LM has a warm and humid subtropical climate, which is favourable for the extensive agricultural activity in the region. Mthonjaneni LM experiences average annual temperatures between 17°C and 20°C.

Wind Direction and Wind Speed

An analysis of the wind roses for the period 2019 to 2021 indicates that the prevailing wind direction is west and north easterly directions. There is a high occurrence of low to medium winds (speeds less than 8.8 m/s) and a lower frequency from the south westerly direction (Figure 7-2).

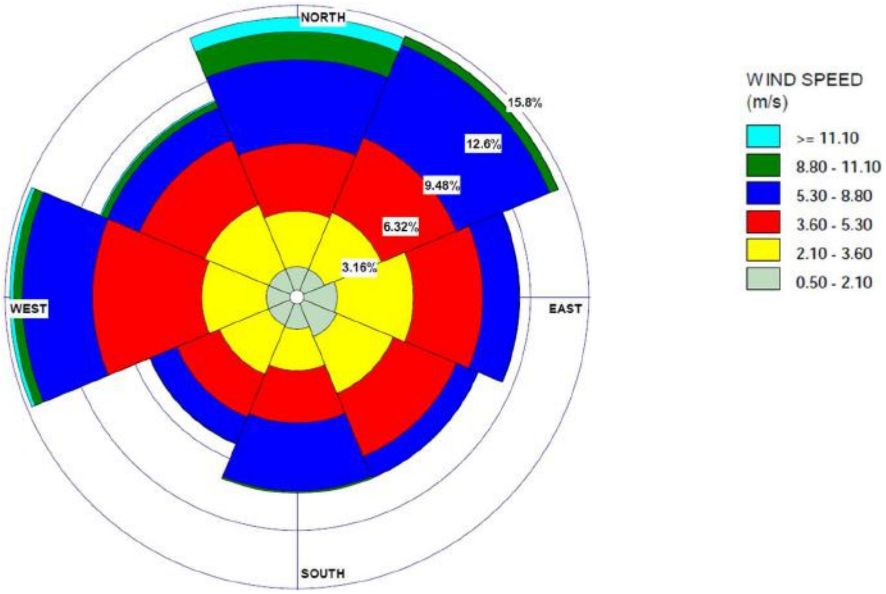


Figure 7-2 Wind Rose for the Project Area 2019-2021 (WKC, 2023)

Rainfall and Evaporation

The Mean Annual Precipitation (MAP) for the area around Melmoth ranges from 719 mm/year to 1 457 mm/year for the period 1971 to 2002. The MAP for the catchment W12C, W12B and W12D is approximately 848 mm/year. The Project area falls within evaporation zone 22A, of which Mean Annual Evaporation (MAE) ranges from 1 300 mm/year to 1 350 mm/year.

HISTORICAL CLIMATIC TRENDS

Historical precipitation data for the period 1985 to 2021 indicates an increase in the amount of precipitation that has been above average, and the amount of rainfall days experienced in the Mthonjaneni LM. The increased precipitation is associated with an increased flood risk. The south and west regions of the Mthonjaneni LM are currently associated with low to medium flood risk, whilst the north and eastern regions are associated with a medium-high to very high flood risks.

Historical temperature data for the period 1985 to 2021 has increased over time resulting in the Mthonjaneni LM becoming hotter. The temperature increase is associated with increased drought and fire risks. Drought tendencies are increasing throughout the Mthonjaneni LM, with the northern region having the highest tendencies. Fire risks are currently only likely in the central region of the Mthonjaneni LM.

REGIONAL AND LOCAL CLIMATIC PROJECTIONS

The KZN province is anticipated to experience rising temperatures as a result of climate change impacts and a change in precipitation patterns with increased extreme weather events. The climate change projections indicate that annual average ambient temperatures are likely to increase by 1 - 2°C in the near future. Furthermore, it is identified that KZN will be exposed to more extreme rainfall events and an increase of extreme hot days by more than 30 days per annum. Such changes are likely to influence the province’s risks to floods and fires in the future.

The projected changes in climate at the Mthonjaneni LM include an increase in temperature and extreme hot days, increased rainfall variability and high risks to floods and fires in central parts of the region. The climate in the Project area is thus likely to become hotter and wetter.

7.4.2 Topography

Information in this section was sourced from the Hydrogeology Specialist Scoping Report (SLR, 2021).

The topography of the Project area is determined by the type of bedrock underlying the soils, the geology of the area and the dissection of the streams flowing in the area. Melmoth is approximately 800 metres above mean sea level (mamsl) and is surrounded by low sandstone mountains and mudstone valleys. The regional geology of the area has given rise to a considerable diversity of relief, from gently rolling slopes to hilly and severely incised slopes found along drainage ways and stream valleys. This topography gives the area its aesthetic appeal and makes it conducive for agricultural practises.

7.4.3 Geology

7.4.3.1 Regional Geology

Information in this section was sourced from the Melmoth Iron Ore Mineral Resource Estimate (The Mineral Corporation, 2016) and the Geohydrology Specialist Scoping Report (SLR, 2021).

The Project area is located within the Ilangwe Greenstone Belt close to the southern margin of the Kaapvaal Craton. The geology of the Ilangwe Greenstone Belt by Mathe (1997) conforms to the general description of greenstones by Brandl et al (2006) in that they are:

- generally lenticular in shape with widths of between 10 – 50 km and lengths between 100 – 300 km;
- composed largely of extrusive mafic rocks with some ultramafic and felsic rocks; and
- contain sedimentary rocks throughout but they are usually dominant in the upper part and all subjected to mainly greenschist facies metamorphism.

Brandl et al (2006) further comments on the cyclicity that greenstone belts were previously understood to display with basal ultramafic rocks becoming more evolved rocks towards the top not now understood to always be the case. Also, most of the belts exhibit strong tectonism with possible duplication and elimination of the original succession. The greenstone belts are locally infolded into grey granitic gneisses composed of tonalities, trondhjemites or granodiorites of banded to migmatitic varieties.

The contact between the gneisses and the greenstone is either tectonic or intrusive, the latter displaying evidence of assimilation of greenstone material within the gneiss close to the contact. Within the Kaapvaal Craton, there are several locations of preserved greenstone belts infolded into granitoid gneiss with the ages ranging from 3 500 to 2 700 Ma.

7.4.3.2 South Block

LOCAL GEOLOGY

The Ilangwe Greenstone Belt is some 45 km from west to east and 2 to 4 km in width. The Kaapvaal Craton boundary to the south of the Ilangwe Greenstone Belt (only some 5 km distant) is marked by the Tugela Thrust Front. The rocks to the south of this tectonic divide are of the Namaqua-Natal Province that have been accreted northeast-wards onto the craton. The most northerly of the Namaqua-Natal Province rocks are termed the Tugela Terrane and are rocks of greenschist to amphibolite grade metamorphism. Strong east-north-easterly shearing is evident in the Namaqua-Natal Province rocks. The local geology of the South East Block is summarised in Table 7-11 and depicted in Figure 7-3.

Table 7-11 Ilangwe Greenstone Lithostratigraphic Subdivision (The Mineral Corporation, 2016)

Group	Subgroup	Formation	Lithologies	Location
Nondwezi	Nkandla	Nomangci	Quartzite with quartz-sericite schists and minor chert bands	Far Western
		Simbagwezi	Phylites intercalated with pillowed metavolcanics, actinolite schists, talc-chlorite schists and metachert bands	Western
		Entembeni	Phylite and minor pillowed metavolcanics intercalated with cherty BIF, metacherts and cherty quartzite bands	North Margin East-Central
	Mhlatuze	Olwenjini	Pillowed metabasalt, garnetiferous amphibolite, actinolite-tremolite schist, minor phylite, banded cherty quartzite and metacherts, fuchsitic quartzites, silicate BIF, magnetite quartzite and quartz-biotite cordierite fuchsite gneiss	North Margin West-Central
		Matshansundu	Actinolite-tremolite schist, amphibole-mica schist, massive metabasalt intercalated with silicate BIF	Eastern

Group	Subgroup	Formation	Lithologies	Location
		Sabiza	Pillowed metabasalt, banded amphibolite, massive amphibolite, actinolite-tremolite schist, talc-tremolite schist, serpentinite-talc schist, thin metachert bands and khaki-coloured siliceous pelitic rock towards top	South Margin West and East Central

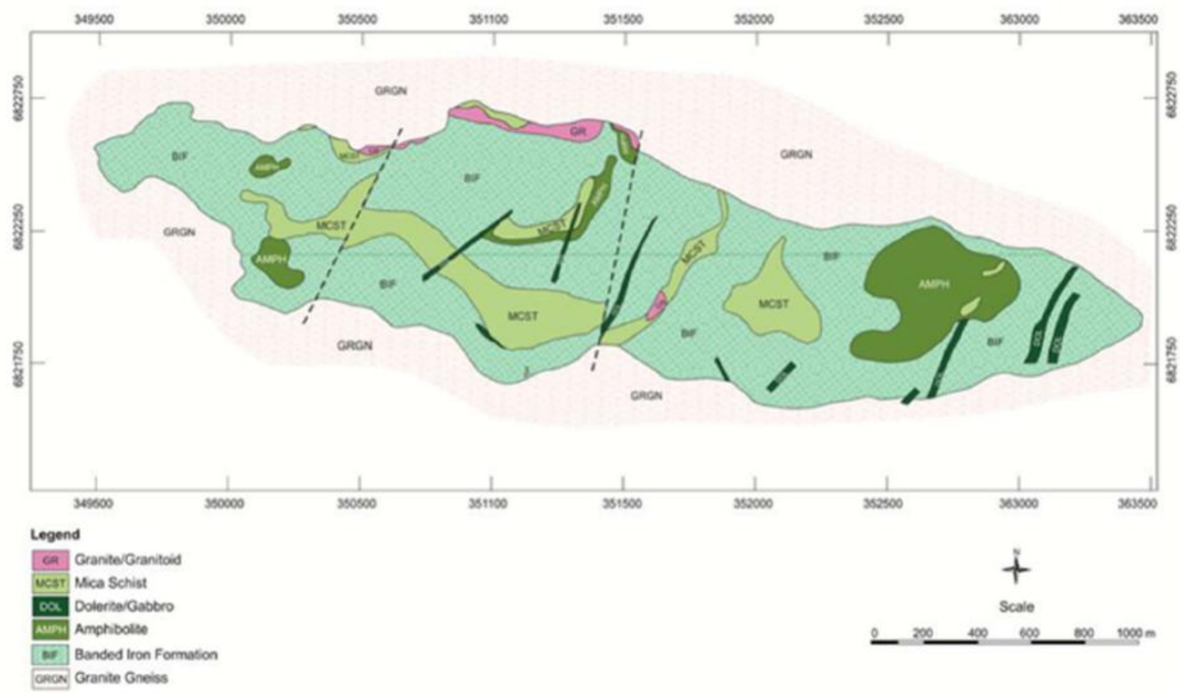


Figure 7-3 Surface Geology of the South East Block (SLR, 2021)

Drilling was undertaken in 2014 to understand the iron ore resource. The results of this drilling programme can be seen in Figure 7-4.

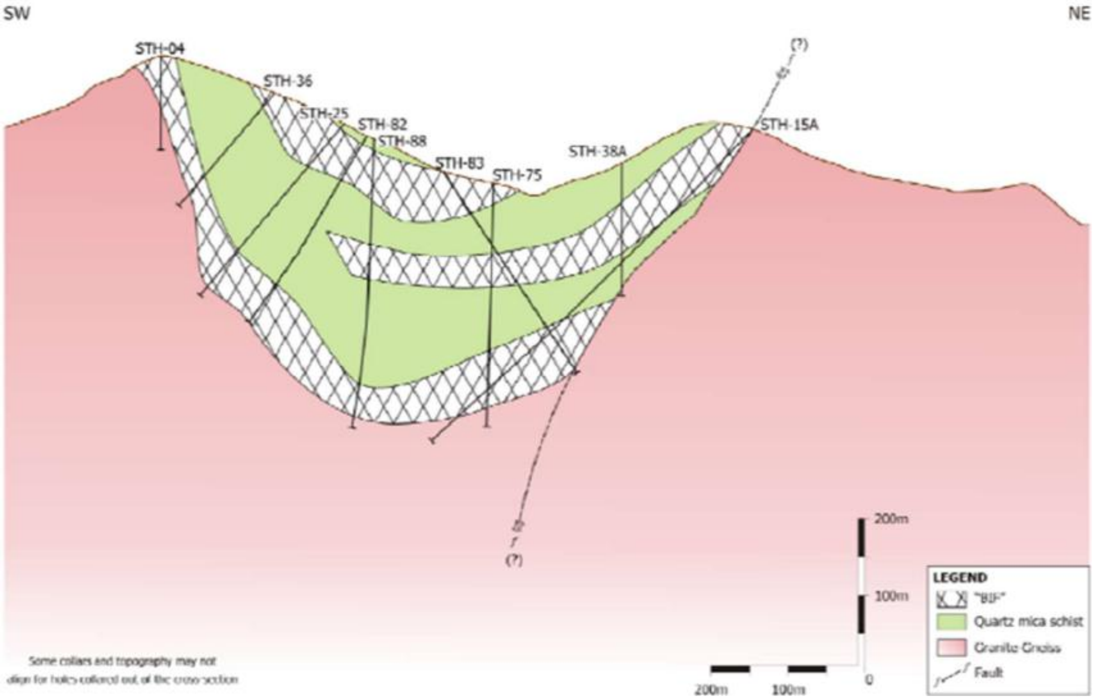


Figure 7-4 Geological Cross-Section (Jindal, 2014) (SLR, 2021)

7.4.4 Soils and Land Capability

Information in this section was sourced from the Agricultural Agro-Ecosystem Assessment Report (TerraAfrica, 2023) included in Appendix K.

7.4.4.1 South Block

LAND TYPES SOUTH BLOCK

The South Block consists of nine different land types as described in Table 7-12.

Table 7-12 South Block Land Types

Land Type	Description
Ac62	Only two small areas of Land Type Ac62 are present along the western boundary of the North Block and directly north-east of Land Type Ac61. Areas consisting of Land Type Ac62 are typically bordering on areas with Land Type Fa120 and Land Type Ac61. This land type only consists of two terrain units. About 60% of the total land type area consists of crests with slope length between 200 and 600 m and slope between 2 and 8%. The mid-slopes have shorter slope length between 150 and 300 m and slope between 6 and 10%. Both the crests and mid-slopes consist of a mixture of soil forms including Glenrosa, Hutton, Griffin, Clovelly, Mispah and Katspruit.
Ac63	Land Type Ac63 is present in one area along the northern boundary of the eastern part of the South Block. This land type consists of three terrain units representing the middle section of a hilly landscape between Land Type Aa1 (located at higher elevations) and Fa126 (located at lower elevations). The crests are present in 15% of the total land type area where 45% of the soils are Hutton soils between 0.6 and 1.0 m deep. The other soil forms Glenrosa, Griffin, Clovelly and Mispah

Land Type	Description
	and 2% is solid rock. The mid-slopes have an identical combination of soil forms but the slope is steeper (10 to 20%) and mid-slopes cover about 80% of the total land type area. The valley bottoms (about 5% of the total land type area) consist of 40% stream beds and 60% Katspruit soils that indicate wetland areas.
Fa108	Land Type Ac108 is present in three areas within the South Block areas. One area is the most northern corner of the western part of the South Block while a second area is found along the middle of the area. The third area is located approximately 1 km east of the KwaMazula River. This land type consists of three terrain units representing an area with undulating hills between Land Type Fa126 (located at higher elevations) and Fb308 (located at lower elevations). The crests are present in 10% of the total land type area where slope ranges between 2 and 20%, while 80% of the total land type area consists of mid-slopes with slope between 20 and 100%. The crests and mid-slopes have a similar combination of soil forms consisting of Swartland, Bonheim, mayo, Shortlands, Hutton, Glenrosa and Mispah soils. The valley bottoms, have slope between 10 and 60% and consist of 35% stream beds. The remaining areas consist of Hutton, Shortlands, Bonheim, Oakleaf and Dundee soils.
Fa126	Land Type Fa126 forms the largest part of the South Block area and runs all along the middle of it, from the far western boundary to the northern corner of the eastern part. This land type consists of four terrain units and is typically found between Land Type108 and Land Type Fa320 in the landscape. About 10% of the total land type area consists of cliff faces consisting of rock and shallow soils of the Mispah and Glenrosa forms. The largest part of the land type area consists of mid-slopes with slope between 6 and 90% and several soil forms including Glenrosa, Mispah, Cartref, Hutton, Mayo, Bonheim and Shortlands. Valley bottoms (Terrain unit 5) typically comprises of stream beds (65%), Dundee and Oaklands soils. The crests consist of a mixture of shallow soils of the Mispah, Glenrosa, Milkwood and Hutton forms and rock.
Fa127	Land Type Fa127 represent lower mid-slopes at 300 to 350 mamsl and is typically found between Land Type 124 at upper mid-slopes and Land Type Fb322 in flatter landscapes below 300 mamsl. There are two terrain units within this land type although 95% of it, consists of mid-slopes. The mid-slopes consist of 50% Glenrosa soils, 30% Mispah soils, 10% solid rock and 10% shallow Hutton soils. The remaining 5% of the total land type area consists of valley bottoms where 60% are typically wetland soils of the Katspruit form and the remaining 40% are stream beds.
Fb320	Land Type Fb320 represent the lower, flatter landscape positions between areas with Land Type Fa126 and is typically located at 230 to 235 mamsl. There are three terrain units with the mid-slopes present in 72% of the total area, crests in 8% and valley bottoms in 20%. The crests are flat with slope between 1 and 5% and slope length of 50 to 300 m. The mid-slopes have slope between 3 and 30% and slope lengths between 200 and 800 m. The crests and mid-slopes consist mainly of Mispah and Glenrosa soils but also include soils of the Hutton, Dundee, Mayo, Bonheim and Cartref forms. The valley bottoms have short slope length (10 to 50 m) and slope between 2 and 25%. The valley bottoms have 50% stream beds, 25% Dundee soils, 15% Mayo soils, and 5% each of the Cartref and Oakleaf soils.
Bh321	Land Type Fb321 consists of three terrain units that are dominated by the mid-slopes. While the crests and valley bottoms are flat to almost flat, with slope ranging between 1 and 6%, the mid-slopes are slightly steeper with slope ranging between 3 and 12%. The crests consist of 74% shallow soils of the Mispah and Glenrosa forms and 12% solid rock. The remaining soil forms at the crests are soils of the Cartref and Swartland forms. The mid-slopes have similar soil forms and also include

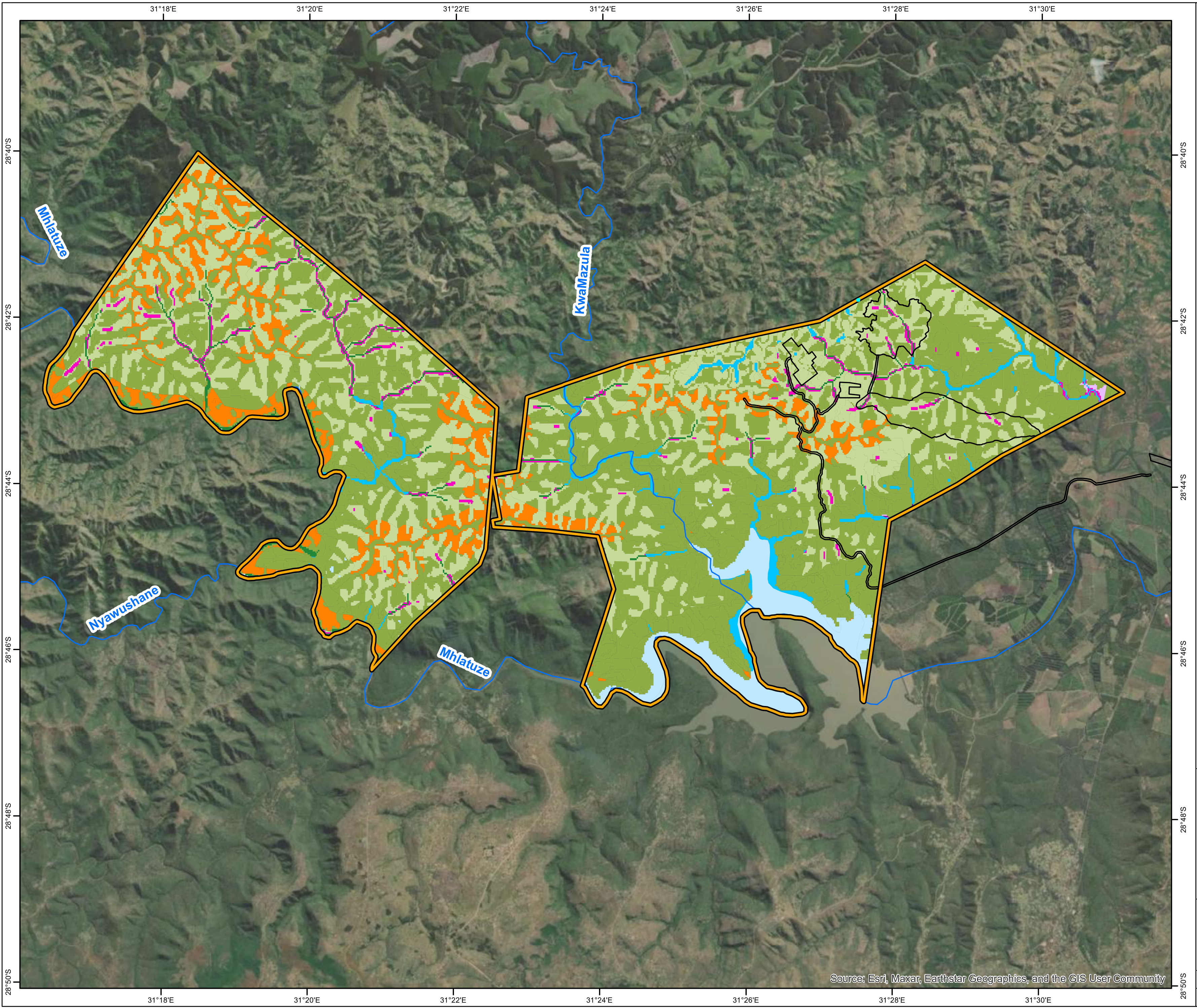
Land Type	Description
	Valsrivier, Fernwood, Kroonstad and Hutton soils. The valley bottoms consist of 45% stream beds, while the soil forms in these areas include Swartland, Valsrivier, Dundee, Oakleaf and Katspruit soils.
Fb323	Land Type Fb323 is present in one area along the eastern part the southern boundary of the South Block, about 1 km east of the KwaMazula River. It represents an undulating terrain with short slope lengths and a typical sequence of crests, mid-slopes and valley bottoms between 200 and 280 mamsl. The crests make up 13% of the total land type area where the slope ranges between 1 and 8% and slope length between 100 and 300 m. Of the crest positions, approximately 58% consists of Glenrosa soils that range in depth between 0.3 and 0.5 m. The remaining areas are either rock or rock covered in shallow topsoil (Mispah soils). About 80% of the total land type area consists of mid-slopes where slope ranges between 3 and 50% and slope length between 200 and 700 m. The soil forms here are a similar mixture to that of the crests as well as soils of the Valsrivier, Oakleaf, Swartland and Hutton forms. The valley bottoms comprises the remaining 7% of the land tpe area and slope here ranges between 2 and 25%. The valley bottoms consist of 45% stream beds, 30% Dundee soils, 20% Valsrivier soils and 5% Oakleaf soils
Db151	Land Type Db151 represents areas with long slope length consisting mainly of mid-slopes that are typically positioned between Land Type Fb335 and Land Type Ac 64. Within the South Block area, it is present in one very small area in the far eastern corner of the site. Only 5% of this land type consists of crests and another 5% of valley. The remaining 90% consists of mid-slopes with slope between 1 and 13%. These mid-slopes consist of several soil forms including Swartland, Valsrivier, Hutton, Glenrosa, Mspah, Westleigh, Shortlands, Oakleaf and Arcadia. The crests and valley bottoms have similar soil forms but also include Rensburg, Kroonstad, Dundee and Fernwood soils in the valley bottoms.

SOIL PROPERTIES

Baseline Soils

The soil and agricultural properties and sensitivities of the proposed Jindal Melmoth Iron Ore project site were the subject of the Agricultural Agro-Ecosystem Assessment conducted. The South Block was the primary focus of the study as this is where the current mining activities are proposed.

Eight soil associations are found within the South Block. The eight associations are named after the most prevalent soil form in the group following the land type data. The soil associations are: Glenrosa, Hutton, Katspruit, Dundee, Mispah, Oakleaf, Swartland and Valsrivier. Seven of the eight soil associations are present within and around the infrastructure footprint (**Figure 7-5**). The Valsrivier association is outside of the development footprint, on the far eastern side of the South Block. The Glenrosa group is the most prevalent in the South Block, followed by the Hutton group and then the Mispah group. Much smaller areas of the Katspruit, Dundee, Oakleaf, Swartland and Valsrivier groups are present, mainly in valley bottom areas. The texture of the topsoil are Sandy Clay Loam, Clay Loam and Clay. The subsoils have Sandy Clay Loam, Clay and Clay Loam texture.



Legend

▭ Proposed South Block Mining Right Area

▭ Proposed Mine Layout

— Rivers

Soil Types (Terra Africa, 2023)

🟩 Dundee

🟩 Glenrosa

🟩 Hutton

🟦 Katspruit

🟧 Mispah

🟪 Oakleaf

🟪 Swartland

🟪 Valsrivier

🟦 Water

N

0 1 2
KM

Scale: 1:80 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

JINDAL IRON ORE (PTY) LTD

FIGURE 7-5
SOIL CLASSIFICATION
MAP OF THE SOUTH BLOCK

PO BOX 1596
CRAMERVIEW
JOHANNESBURG
2060

T: +27 (11) 467-0945
www.slrconsulting.com

Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 7-5	Date: 17/06/2023

The properties of the soil forms identified during the survey and the associations into which they are grouped, are described in Table 7-13.

Table 7-13 Properties of soil forms identified during the site survey

Soil form (2018)	Description	Soil Association
Nomanci (No)	The Nomanci soil form consists of a humic topsoil horizon overlying a lithic subsoil horizon. The humic topsoil horizon is 300 mm deep and the lithic defined as saprolithic. The Nomanci is found on two terrain positions within the South Block, i.e. valley bottoms and crests.	Glenrosa
Shortlands (Sd)	The Shortlands soil form consists of an orthic topsoil horizon overlying a red structured horizon. The red structured horizon has strong structure and was homogenous in colour. The red structured is mesotrophic with a CEC between 5-15 cmol/kg soil.	Hutton
Clovelly (Cv)	Chromic topsoil, with yellow-brown between 500-1000 mm soil depth. The yellow-brown apedal was aluvic and mesotrophic. The lithic horizon is defined as saprolithic.	Hutton
Ermelo (Er)	The Ermelo has a chromic topsoil and reaches depths to 1200 mm and was only found in small areas. The Ermelo soil was aluvic, indicating that water will drain freely.	Hutton
Glenrosa (Gs)	Chromic topsoil is found in the development area. Total soil depths are between 100-400 mm, the difference in depth was mainly due to degree of weathering in the lithic. The Glenrosa is found in the Talus of the slope.	Glenrosa
Mispah (Ms)	The Mispah soil had a chromic topsoil with rock on the surface. The Mispah was found close to the Dundee soil forms which leads to the river.	Mispah
Hutton (Hu)	A chromic topsoil is found in the Hutton soils. The red apedal has a 5YR 4/6 Munsell colour and a soil depth of 1200 mm. The red apedal was aluvic. Freely drained to 1200 mm supported by the weak structure of the red apedal.	Hutton
Nkonkoni (Nk)	The Nkonkoni had a chromic topsoil, red apedal thickness between 500-1000 mm. The red apedal was aluvic. Water will drain freely to the lithic horizon.	Hutton
Fernwood (Fw)	The Fernwood soil forms has a chromic topsoil and a depth of 1200 mm. A Fernwood consists of an orthic A overlying an albic horizon. The soil was found close to the river and is found at the footslope.	Mispah
Longlands (Lo)	The Longlands soil form has a chromic topsoil. The Albic horizon was unsaturated. The albic had a depth of 700 mm whereafter a soft plinthic horizon is found. The Longlands is found higher up in the elevation profile.	Katspruit
Dundee (Du)	The Dundee soil has a chromic topsoil with a brown alluvial. Alluvial wetness was not present. The Dundee occurs in the valley bottom.	Mispah
Griffen (Gf)	The Griffen soil form consists of an orthic A overlying a yellow-brown with a red apedal underneath. The yellow-brown is mesotrophic, aluvic and has a depth of 500 mm. The Griffen is only found on a small area.	Hutton
Magwa (Ma)	The Magwa soil form consists of a humic A, overlying a yellow-brown apedal. The humic was thin and the yellow-brown aluvic. The Magwa is only found on two places, which occur higher up in the elevation profile.	Hutton

Inanda (Ia)	The Inanda soil form has the same properties as the Magwa,with the yellow-brown being a red apedal.	Hutton
Magudu (Md)	The Magudu soil form is found between the Glenrosa soil forms, which occur higher up in the elevation profile. The Magudu consists of an orthic A, overlying a red structured with a saprolithic underneath. The red structured has depths up to 700 mm. The orthic was chromic and the red structured mesotrophic.	Hutton
Gangala (Ga)	The Gangala soil form consists of an orthic A, overlying a red apedal, with a lithic underneath. The Gangala is only found in one small area within the processing plant. The red apedal has a depth to 450 mm, whereafter the lithic horizon occurs.	Hutton
Tubatse (Tb)	The Tubatse soil form has a chromic topsoil, with a brown, aluvic neocutanic and a saprolithic horizon underneath. The Tubatse occurs in various areas of the development. The neocutanic has a depth of 400-1200 mm.	Oakleaf
Henley (He)	The Henley soil forms has the same characteristics as the Tubatse with only the A horizons being different. The Henley has a humic horizon overlying the neocutanic (700-800 mm depth). The lithic horizon is also saprolithic.	Oakleaf

Results of soil analysis

Soil sampling for laboratory analysis was done per individual horizon and were taken in areas which may have the potential for agricultural activity.

Soil texture

The soil texture of the soils present within the proposed project site, was calculated by using the results of the particle size analysis. The results of the particle size analysis of the soil samples as well as the soil texture class into which results translate, are presented in **Table 7-14**. The topsoil samples analysed have mostly Sandy Clay Loam texture, with only a few samples having Clay Loam and Clay texture. The subsoils have Sandy Clay Loam, Clay and Clay Loam texture.

Table 7-14 Summary of Particle Size Distribution and Soil Texture Classes

Sample no		Horizon	Particle size distribution			Texture class
			Sand	Silt	Clay	
E4 A	Topsoil	orthic	63,4	13,3	23,7	Sandy clay loam
E4 B	Subsoil	red apedal	46,7	23,6	30,6	Sandy clay loam
E6 B	Subsoil	Yellow-brown	39,9	25	35,4	Clay loam
E7 A	Topsoil	orthic	43,6	21,6	35	Clay loam
E9 A	Topsoil	orthic	46,3	21,8	32,2	Sandy clay loam
E13 A	Topsoil	orthic	54,3	18,6	28	Sandy clay loam
E17 B	Subsoil	red structured	11,2	38	50,9	Clay
E32 A	Topsoil	humic	71,9	11,9	16,5	Sandy loam

E47 A	Topsoil	orthic	12,7	26,4	61,9	Clay
E49 A	Topsoil	orthic	49,5	18,6	32,6	Sandy clay loam
E54 A	Topsoil	orthic	66,4	10,8	23,2	Sandy clay loam
E76 A	Topsoil	orthic	32,2	27,8	40,5	Clay

Soil fertility parameters

From the perspective of the soil fertility parameters analysed, the soil does have limitations to crop production. The soil pH values are strongly acidic with a pH of 3.32 in sample E13 to 4.94 in sample E54 (**Table 7-15**). For crop production, pH values above 4.5 are recommended to prevent aluminium toxicities, prevent phosphate fixation, and allow for optimal nutrient uptake by crop roots. Thus, should the soil have been used for crop production, only the areas where samples E54 and E32 were collected, would have been suitable for crop production without soil amendment. The rest of the areas where samples were collected, are a risk to aluminium toxicity and nutrient deficiencies from nitrogen, calcium, magnesium, and phosphate. Large volumes of lime would be needed to amend the soil pH which would likely be challenging as a result of the cost associated with soil amendment and access limitations posed by the terrain.

Table 7-15 Results of Soil Chemical Analysis of Samples

Sample ID	Lab nr	Horizon	pH KCl	P (Bray 1)	Ca	Mg	K	Na	S
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
E4 A	742	orthic	4,17	4,04	196,95	34,43	35,77	5,46	9,02
E4 B	743	red apedal	4,13	3,60	22,73	39,94	17,37	26,87	31,64
E6 B	744	Yellow-brown	3,82	4,08	313,31	132,02	43,27	8,45	11,44
E7 A	745	orthic	4,20	5,10	1419,82	526,62	323,09	11,77	8,50
E9 B	746	orthic	3,91	5,22	473,64	153,33	31,87	75,32	6,02
E13 A	747	orthic	3,32	5,44	248,93	111,87	58,68	4,16	17,61
E17 B	748	red structured	4,01	2,84	718,23	661,82	594,45	140,08	16,01
E32 A	749	humic	4,77	63,84	927,48	205,14	286,43	8,87	22,59
E47 B	750	orthic	3,28	2,74	362,15	209,34	29,22	18,08	55,75
E49 A	751	orthic	3,79	7,20	1038,50	305,81	201,56	22,40	6,20
E54 A	752	orthic	4,94	8,52	2937,48	580,09	104,67	4,82	18,55
E76 A	753	orthic	4,15	4,66	1660,21	517,12	30,78	10,99	16,77

The calcium levels range between 22.73 mg/kg in sample E4-B and 2 937.48 mg/kg in sample E54-A. The magnesium levels are the lowest in sample E4-A (34.43 mg/kg) and highest in sample E17-B (661.82 mg/kg). The potassium levels range between a low of 17.37 mg/kg in sample E4-B and 594.45 mg/kg in sample E17-B. The cation concentrations (calcium, magnesium, and potassium) are present at sufficient concentrations should the soil have been used for crop production.

The plant-available phosphorus levels are low in all samples analysed excluding sample E32-A (63.84 mg/kg) and range between 3.60 mg/kg (sample E4-B) and 8.52 mg/kg (sample E54-A). The recommended concentration for maize is 17 mg/kg. Thus, indicating that all samples excluding E32-A are too low and would require additional fertilizer. Low soil phosphorus concentrations are typical of soils under natural vegetation (and without the addition of fertilizer) in South Africa.

LAND CAPABILITY

The South Block area has five different land capability classes. The proposed infrastructure of the Jindal Melmoth Iron Ore project would affect land of all five of the land capability classes. The most prevalent land capability class is Class 5 (Low) where a combination of shallower soil profiles and steep slope limit the crop production potential of the land. These areas consist of the Glenrosa soil category and are more suitable for livestock grazing. Small areas consisting of Class 04 (Low-Very low) land capability, are the areas where the very shallow Mispah soils are present.

Several small, narrow areas with Class 6 (Low-Moderate) land capability, are associated with the Katspruit, Swartland and Valsrivier soils. Larger areas of Class 8 (Moderate) land capability are present where the Hutton, Dundee and Oakleaf soil groups occur in areas with lower terrain capability (Class 3 and Class 4). The small areas with Class 10 (Moderate-High) land capability that are the areas where the Hutton, Dundee and Oakleaf soil groups coincide with better terrain capability (Class 5, Class 6 and Class 7) (Figure 7-6). The proposed infrastructure of the Jindal MIOP will affect land of all five of the land capability classes. This includes land with Class 10 and Class 8 land capability, with both classes considered suitable for rainfed crop production.

LAND COVER AND LAND USE

The main land use of the South Block, including the proposed development footprint, is subsistence farming. The terrain was in most cases too steep for the cultivation of crops with these steeper being grazed by animals. There are, however, some small and scattered crop fields alongside the homesteads. No large commercial agricultural fields are present within the South Block. However, rainfed crops and horticultural crops are cultivated outside the South Block. The most prominent production area located southeast of the south-eastern boundary of the South Block, is the Nkwalini valley. In this area, a variety of horticultural crops are produced under irrigation that include citrus, macadamias, bananas and passion fruit. Other areas consist of irrigated sugar cane. Irrigation systems used in the area include micro and drip irrigation as well as centre pivot irrigation used for sugar cane.

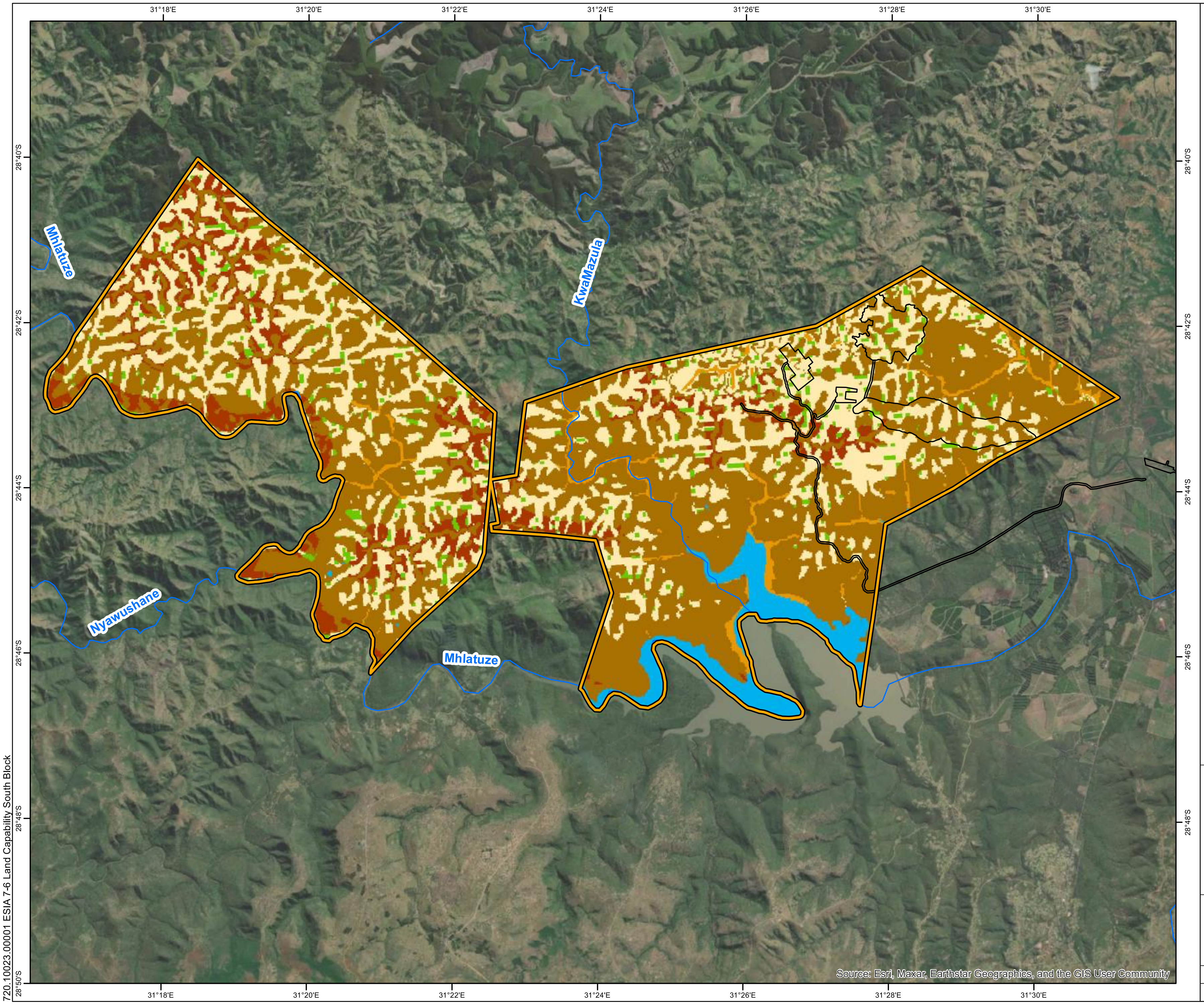
According to the field crop boundaries of the Crop Estimates Consortium (TerraAfrica, 2023), the crop fields within the South Block area only consist of a few small areas of subsistence farming. These subsistence farming fields are mostly scattered along the eastern part of the northern boundary as well as a small area along the western part of the southern boundary of the South Block. The subsistence farming areas within the South Block, are all classified as Subsistence Farming 1 which indicates that they are small scale or emerging farming where the output is produced primarily for home consumption (TerraAfrica, 2023). It consists of many small fields between 5 and 10 ha and it is difficult to distinguish between individual field crop boundaries within these areas. Subsistence Farming 1 areas are usually found close to small villages and in rangeland areas. More Subsistence Farming 1 areas are located outside the South Block, approximately 1.5 km or more to the north.

Subsistence Farming 1 differs from Subsistence Farming 2 in that Subsistence Farming 2 are associated with larger areas of production near commercial farming. The only Subsistence 2 areas indicated, are located at least 25 km southwest of the South Block area.

AGRICULTURAL SENSITIVITY

The agricultural sensitivity was assigned by combining the land capability classification and the field crop boundaries of the South Block. Areas with Moderate-High (Class 09) land capability as well as all the areas where there are Subsistence 1 field crop boundaries, are classified as High agricultural sensitivity. Areas with Moderate (Class 08) and Low-Moderate (Class 06) land capability, have Medium agricultural sensitivity. The rest of the areas where there is Low (Class 05) and Low-Very low (Class 04) land capability, have Low agricultural sensitivity.

The entire South Block area is therefore dominated by land with Low agricultural sensitivity (a total area of 7 542 Ha), followed by land with Medium agricultural sensitivity (3 716 Ha) and with High agricultural sensitivity delineated for a total area of 456 Ha. The areas with High sensitivity include areas where deep soils from the Hutton soil association is present on terrain with suitable slope for cultivation. It also includes the areas where there are homesteads with subsistence agricultural fields near them. Areas with Moderate (Class 08) and Low-Moderate (Class 06) land capability, has Medium agricultural sensitivity. The rest of the areas where there is Low (Class 05) and Low-Very low (Class 04) land capability, has Low agricultural sensitivity. The proposed infrastructure layout of the Jindal MIOP includes areas of all three sensitivity classes (**Figure 7-7**).



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Scale: 1:80 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-6
LAND CAPABILITY
OF THE SOUTH BLOCK

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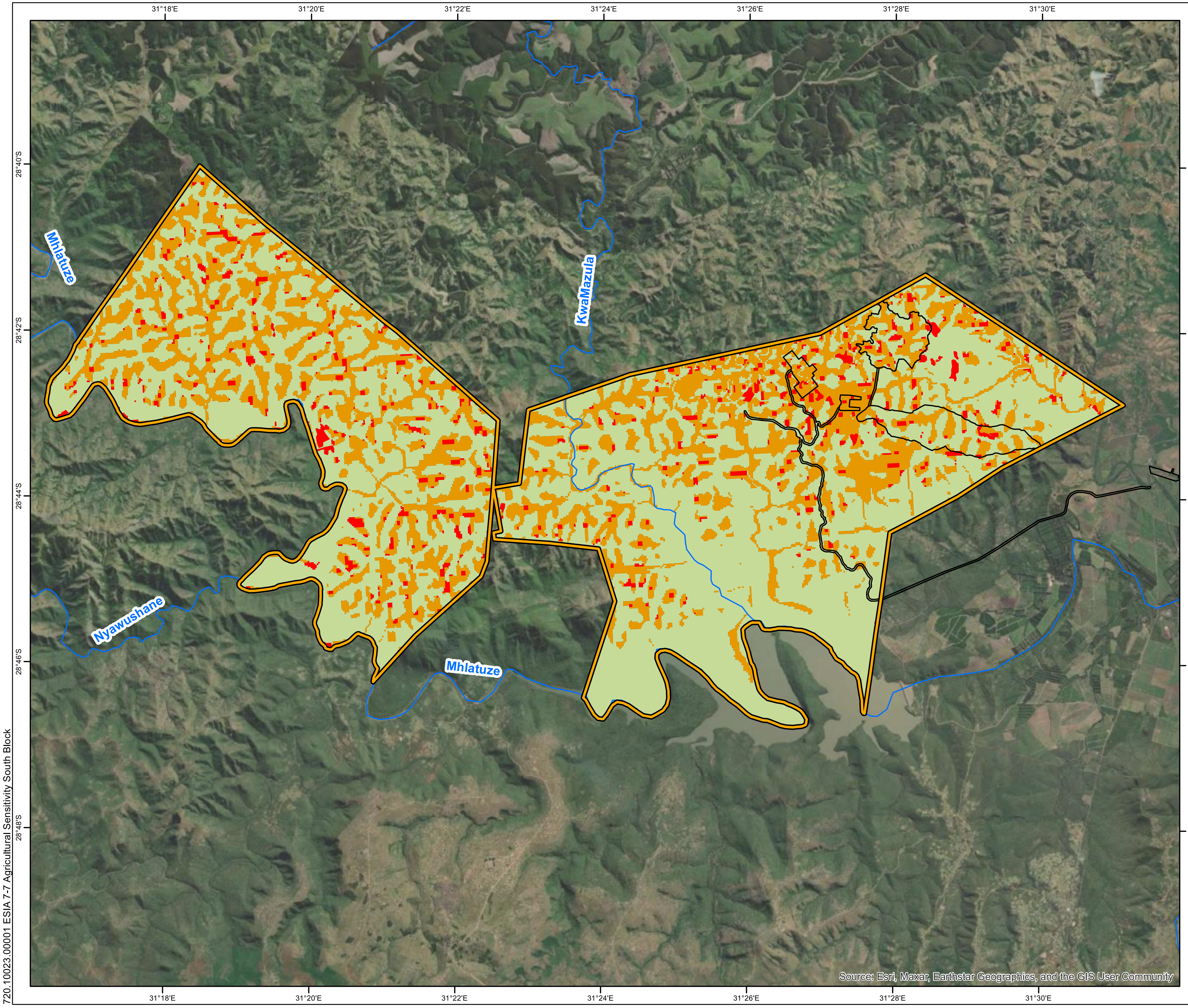
Map Ref No: ESIA 7-6	Date: 17/06/2023

720.10023.00001 ESIA 7-6 Land Capability South Block



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

▭ Proposed South Block Mining Right Area

▭ Proposed Mine Layout

— Rivers

Sensitivity (Terra Africa, 2023)

🟥 High (456 ha)

🟧 Medium (3716 ha)

🟩 Low (7542 ha)

N

0 1 2
KM

Scale: 1:80 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
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FIGURE 7-7
AGRICULTURAL SENSITIVITY OF THE SOUTH BLOCK

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Project No: 720.10023.00001

Prepared By: BG

Map Ref No: ESIA 7-7

Date: 17/06/2023

720.10023.00001 ESIA 7-7 Agricultural Sensitivity South Block

7.4.4.2 North Block

LAND TYPES

The North Block consists of seven different land types as described in Table 7-16. The seven land types belong to four main groups i.e. Ac land types, Ab land types, Fa land types and Fb land types. The Ab land types, yellow soils occupy less than 10% of the area while dystrophic and/or mesotrophic soils occupy a larger area than high base status red-yellow apedal soils. Ac (red and yellow dystrophic and/or mesotrophic) indicates land with red and yellow soils each of which covers more than 10% of the area while dystrophic and/or mesotrophic soils occupy a larger area than high base status red-yellow apedal soils. Fa land types refer to land in which lime in the soil is not encountered regularly in any part of the landscape. Fb land types indicate land where lime occurs regularly in one or more valley bottom soils.

Table 7-16 North Block Land Types

Land Type	Description
Ac61	Land Type Ac61 is present in the south-western corner and along a section of the southern boundary of the North Block. It represents a landscape with undulating hills between the flat crests and mid-slopes. Land Type Ac61 typically has short slope length ranging between 5 and 500 m, depending on the terrain unit. This land type consists of three terrain units with 10% crests, 85% mid-slopes and 5% valley bottoms. The crests have slope of 6 to 12%, while both the mid-slopes and valley bottoms have slope of 12 to 20%. The crests and mid-slopes consist of exactly the same combination of soil forms i.e. 35% Glenrosa soils, 40% Hutton soils, 10% Griffin and Clovelly soils each and 5% Mispah soils. The valley bottoms have 60% streamd beds, 30% Katspruit soils and 10% Dundee soils.
Fa124	Land Type Fa124 is located in a vertical strip that runs from the Mfule River in the north of the North Block to southern boundary of the North Block. This land type is typically consists of three terrain units although 90% of the total land type area consists of mid-slopes with slope ranging between 10 and 80% and slope length between 100 and 1 500 m. The mid-slopes consist of 5% solid rock and the dominant soil form is Glenrosa with average soil depth of 0.15 to 0.35 m. The remaining soil forms within the mid-slopes are Hutton, Oakleaf, Mispah and Shortland soils. The crests consist of a similar combination of soil forms while the valley bottoms are dominated by stream beds (about 60%) followed by Oakleaf soils and small areas with Cartref, Dundee and Fernwood soils.
Ab82	Land Type Ab82 is located in one area along the middle section of the Mfule River that runs through the North Block area. This land type represents the bottom of the hills. Land Type Ab82 consists of two terrain units i.e. mid-slopes with slope between 2 and 12% and flat valley bottoms with slope between 0 and 4%. The mid-slopes represent about 60% of the total land type area and consist of 50% Hutton soils, 20% Cartref soils and 15% each of Fernwood and Oakleaf soils. About 50% of the valley bottoms consist of stream beds while the remaining areas consist of 20% Dundee soils and 10% each of the Cartref, Oaklands and Fernwood soils.
Fb318	Land Type Fb318 is located east and south of Land Type Ab82 along the southern section of the Nhlozane River within the North Block area. The crests are flat with slope ranging between 1 and 3% and slope length between 100 and 500 m. About 15% of the total land type area consists of crests and the dominant soil forms here are Mispah and Glenrosa soils that range in soil depth between 0.2 and 0.5 m. The mid-slopes (Terrain unit 3) have slope that ranges between 4 and 50% and slope lengths between 100 and 300 m. The soil forms of the mid-slopes are a combination of the Mispah, Glenrosa, Cartref, Oakleaf, Hutton, Swartland, Westleigh, Dundee, Valsrivier and Escourt forms. The mid-slopes

Land Type	Description
	are the dominant terrain unit and cover approximately 82% of the total land type area. Only 3% of the total land type area consists of valley bottoms with very short slope length (between 5 and 20 m) and slope of 2 to 25%. These valley bottoms are dominated by stream beds (about 65%), followed by Dundee soils (25%), Oakleaf soils (7%) and Valsrivier soils (3%).
Fa120	Land Type Fa120 is located along the northern part of the Mfule River (within the site boundaries) and within the largest part of the western half of the North Block. It represents the higher positions on hills, starting at 425 mamsl. This land type consists of three terrain units i.e. crests, mid-slopes and valley bottoms. The crests have slope between 1 and 15%, slope length of 50 to 400 m and is present in appxoimately 18% of the total land type area. The crests consist of a combination of rock, shallow Mispah and Glenrosa soils as well as deeper profiles of the Hutton and Cartref forms. The mid-slopes cover about 67% of this land type and here slope range between 6 and 90% and slope length between 600 and 1 700 m. A similar combination of soil forms are present as that of the crests, except that also Swartland and Fernwood soils in these areas. The remaining areas are the valley bottoms (about 15% of the total land type area) where 30% stream beds are present are a mixture of Swartland, Fernwood, Hutton, Cartref, Mispah, Oakleaf and Glenrosa soils.
Fa128	Land Type Fa128 is located in the south-eastern corner as well as a few areas along the eastern boundary of the North Block. It represent the highest position of the hills of the area, starting from 490 mamsl. The crests and mid-slopes are a mixture of shallower soil profiles of the Glenrosa and Mispah forms and deeper soils of the Oakleaf, Clovelly, Hutton and Swartland forms. The valley bottoms represent include hydric soil forms with wetland land capability such as Katspruit and Kroonstad soils, as well as 35% stream beds.
Ac62	Only two small areas of Land Type Ac62 are present along the western boundary of the North Block and directly north-east of Land Type Ac61. Areas consisting of Land Type Ac62 are typically bordering on areas with Land Type Fa120 and Land Type Ac61. This land type only consists of two terrain units. About 60% of the total land type area consists of crests with slope length between 200 and 600 m and slope between 2 and 8%. The mid-slopes have shorter slope length between 150 and 300 m and slope between 6 and 10%. Both the crests and mid-slopes consist of a mixture of soil forms including Glenrosa, Hutton, Griffin, Clovelly, Mispah and Katspruit.

LAND CAPABILITY

The land capability classes within and around the North Block area range between High - Very High (Class 12) to Low – Very low (Class 02). The largest part of the North Block area has land capability that is Low-Moderate (Class 06) to Low – Very low (Class 02). These areas have lower land capability as a result of the steeper slope of the terrain and the hilly nature of the landscape. Other contributing factors to the land capability classification is the high risk of soil erosion and the shallower soil profiles of the steep mid-slopes and crests of the hills. Land capability of Class 07 or lower is considered suitable for livestock farming, with certain limitations and management requirements, depending on the constraining factors.

The flatter areas within the North Block, located along sections of the Mfule River as well as alongside the R66 road, have higher land capability ranging from Low-Moderate (Class 07) to High – Very high (Class 12). A larger area of the higher land capability classes is also present west and south-west of the south-western corner of the North Block. There are also smaller areas of Moderate (Class 08) to Moderate-High (Class 10) land capability along the banks of the Mfulazane and Nhlozane Rivers and south-east of the south-eastern corner of the North

Block. These areas have higher land capability as a result of deeper soil profiles and flatter terrain where crop cultivation under rainfed conditions is possible.

7.4.5 Air Quality

Information in this section was sourced from the Air Quality Impact Assessment Report (WKC, 2023) included in Appendix I.

7.4.5.1 Regional Air Quality

A description of the regional ambient air quality was obtained from the South African Air Quality Information System (SAAQIS) and comprises long term ambient monitoring data from nearest ambient air quality stations. The nearest air quality stations are located approximately 40 km – 60 km away from the Project area in Felixton, eSikhaleni, Brackenham, eNseleni and Richards Bay Central Business District (CBD). Data from these stations was considered to be adequately representative of regional air quality (with respect to the Project area).

The average annual PM_{10} concentrations across all five monitoring stations was 24.40 $\mu g/m^3$, which was below the NAAQS. The Richards Bay area hosts a number of large industries and mining activities, therefore, the background PM_{10} concentrations are likely to be higher than for the inland rural areas.

7.4.5.2 Local Air Quality

The ambient air quality at a local level is influenced by existing pollution sources and activities. The following sources were identified within the Project area:

- *Agricultural activities*: The majority of the commercial farms in the region produce sugarcane, timber, and citrus. Land clearing and ploughing in preparation of fields for sowing can generate a significant amount of dust, in addition to agricultural vehicle movements. Seasonal sugarcane burning results in products of combustion, with pollutants of concern including PM as well as carbon monoxide (CO) and nitrogen dioxide (NO_2) emissions.
- *Biomass burning*: Biomass burning is considered as the incomplete combustion of natural plant matter with PM, CO, and NO_2 being emitted during the process. Crop residue burning and wildfires represent significant sources of combustion-related emissions associated with agricultural areas.
- *Domestic fuel burning*: The rural households within the vicinity of the site are anticipated to rely on wood burning for space heating and cooking purposes. Emissions from these activities are expected to have an impact on air quality. More so during the winter months due to the increased demand for space heating.
- *Unpaved roads and exposed areas*: The quantity of dust emissions from unpaved roads vary based on the volume of traffic. Dust is generated by the loosened material lifted from the road surface by turbulent air currents created when the vehicle is moving. Given the rural nature of the Project site, dust generated by vehicles on unpaved roads is likely to be a source of PM, however, it is expected to be limited due to low traffic volumes. The greatest impacts are expected to be limited to the areas immediately adjacent to the roads (within 200 m).
- *Vehicle emissions:* Given the low population density residing in the region it is anticipated that vehicle exhaust emissions will be limited and therefore relatively insignificant. The nearest major road is the R34 which is located to the north and east of the Project site. The R34 is a long provincial route that connects Vryburg with Richards Bay via Kroonstad and Newcastle.

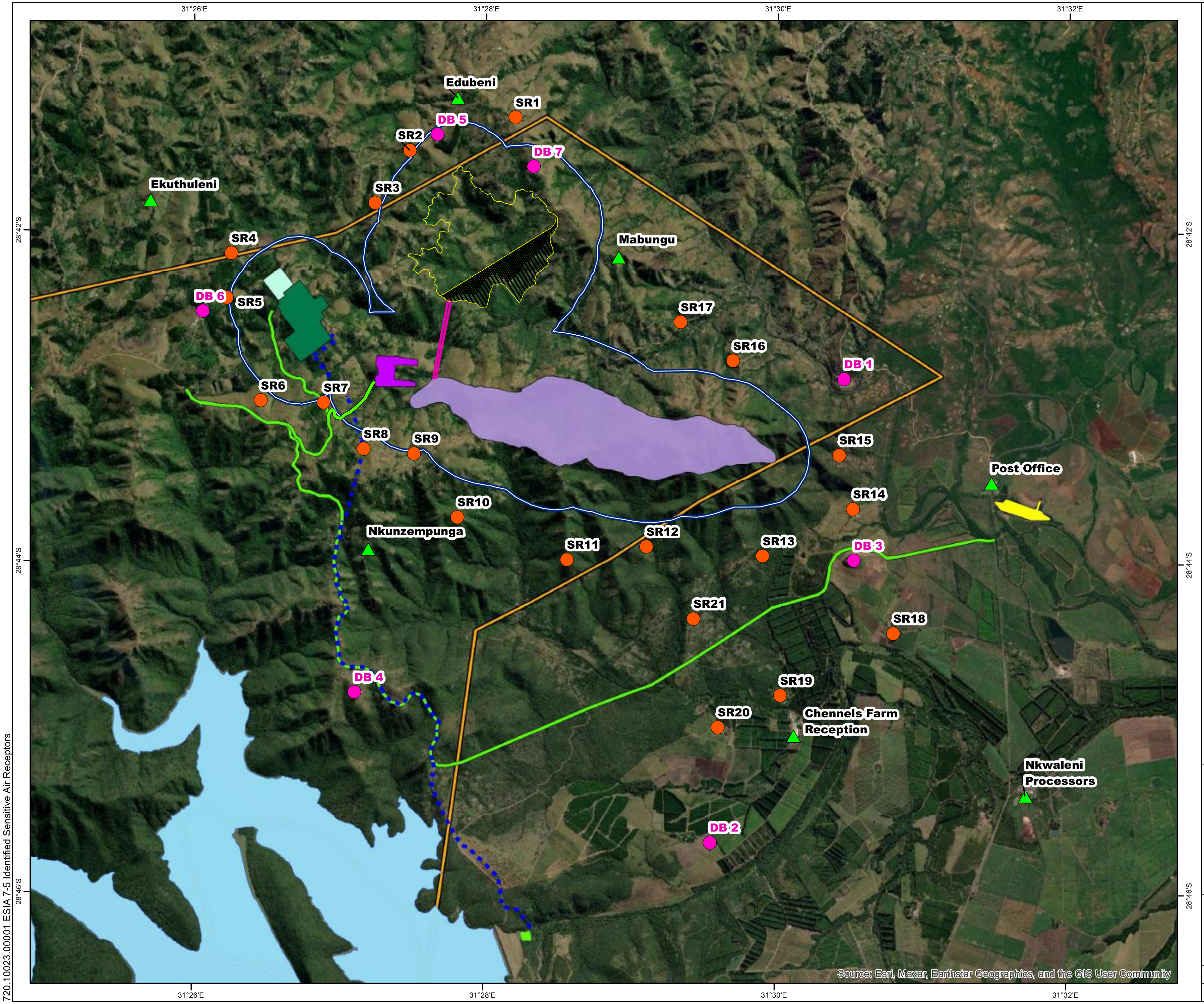
7.4.5.3 South Block

SENSITIVE RECEPTORS

Potential sensitive receptors include communities positioned within close proximity to a Project area. The Project area is predominantly a rural environment, as such, major sources of air pollutants will arise from the Projects' construction, decommissioning and closure activities. Sensitive receptors which were located outside a 500 m buffer of key working areas (it was assumed that sensitive receptors would not be located within the 500 m buffer) were identified. The sensitive receptors were primarily homestead clusters and farmlands. The description of the location of the identified sensitive receptors are provided in Table 7-17 and shown in Figure 7-8.

Table 7-17 Identified Sensitive Air Quality Receptors

Site ID	Site Description	Distance from 500 m Buffer Zone (m)	UTM Coordinates	
			m E	m N
SR 1	Homestead Cluster	103	350,520	6,825,570
SR 2	Homestead Cluster	194	349,352	6,825,184
SR 3	Homestead Cluster	49	348,972	6,824,590
SR 4	Homestead Cluster	214	347,376	6,824,004
SR 5	Homestead Cluster	25	347,335	6,823,502
SR 6	Homestead Cluster	137	347,736	6,822,365
SR 7	Homestead Cluster	66	348,433	6,822,352
SR 8	Homestead Cluster	226	348,890	6,821,841
SR 9	Homestead Cluster	29	349,455	6,821,798
SR 10	Homestead Cluster	421	349,949	6,821,097
SR 11	Homestead Cluster	586	351,180	6,820,644
SR 12	Homestead Cluster	268	352,064	6,820,804
SR 13	Homestead Cluster	561	353,367	6,820,720
SR 14	Farmland	652	354,363	6,821,255
SR 15	Homestead Cluster	356	354,204	6,821,858
SR 16	Homestead Cluster	211	352,998	6,822,891
SR 17	Homestead Cluster	522	352,405	6,823,312
SR 18	Farmland	1 947	354,840	6,819,875
SR 19	Farmland	2 155	353,588	6,819,160
SR 20	Farmland	2 368	352,896	6,818,795
SR 21	Homestead Cluster	1 158	352,603	6,820,002



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- 🟦 Goedetrouw Dam
- ▭ 500m Buffer
- ● Sensitive Receptors
- ▲ Places of Interest
- ● Dust Fallout Monitoring Stations

Proposed Project Components

- ▭ South Block Mining Right Area
- 🟪 South East Pit
- 🟩 Raw Water Pump
- 🟩 Processing Plant
- 🟪 Primary Crusher
- 🟩 Incoming Power Yard
- 🟨 Rail Siding
- — Haul Road
- — Access Road Option 1 - Preferred
- ┅ Overland Piping
- — Waste Rock Dump

N

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Scale: 1:40 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
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FIGURE 7-8
IDENTIFIED SENSITIVE AIR QUALITY RECEPTORS

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Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 7-5	Date: 04/07/2023

AMBIENT AIR QUALITY

Particulate Matter Monitoring:

An ambient air quality monitoring (for particulate matter and dust fallout) survey was undertaken from 14 December to 21 December 2021. A single monitoring station for particulate matter, was set up approximately 2.6 km away from the SE Pit at the Ngobese Homestead (Figure 7-8). The monitoring survey aimed to provide a snapshot of the particulate matter and dust fallout concentration prevalent at the time.

Due to the remote nature of the surrounding environment, the ambient air quality is considered to be reflective of a rural environment, not heavily influenced by anthropogenic background emission sources. The PM_{10} concentrations ranged between 6.5 and 45 µg/m^3**,** whilst the $PM_{2.5}$ concentrations ranged between 1.5 µg/m^3 and 12.7 µg/m^3. The average PM_{10} and $PM_{2.5}$ concentrations are shown in Figure 7-9 and Figure 7-10.

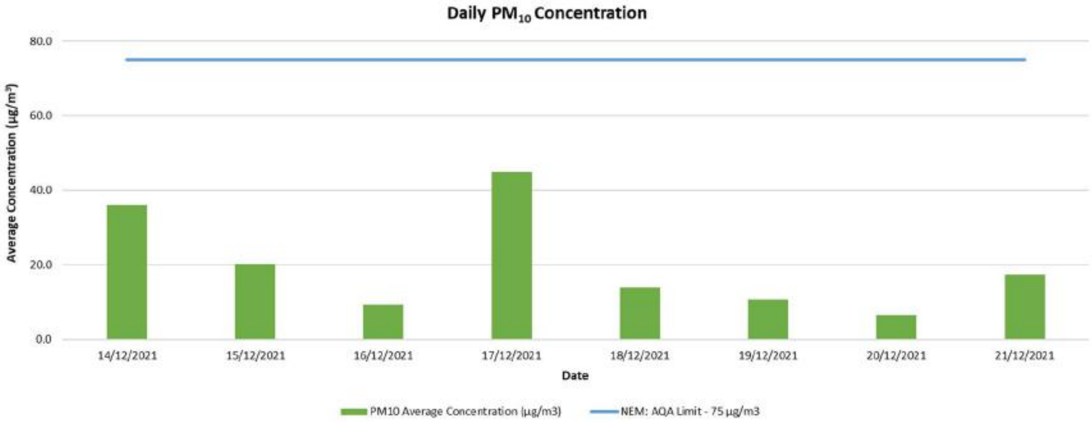

Figure 7-9 PM_{10} Daily Average Concentrations

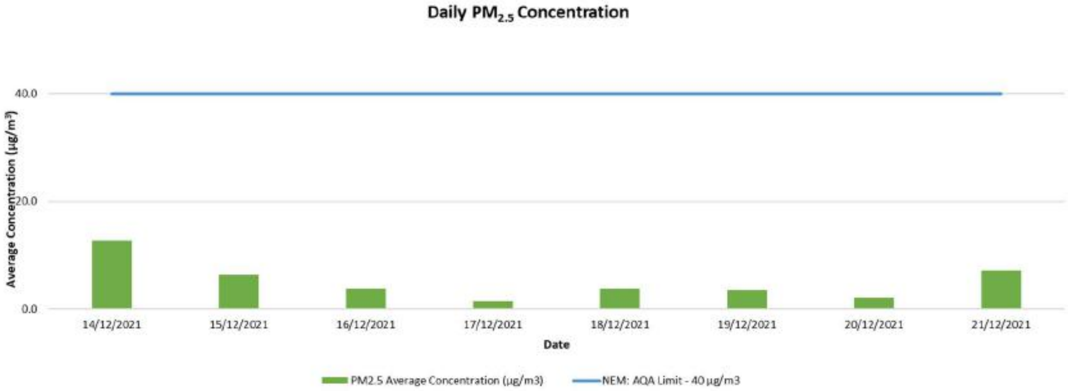

Figure 7-10 $PM_{2.5}$ Daily Average Concentrations

Dust Fallout Monitoring

Dust fallout concentrations were monitored in two cycles over two one-month periods. Cycle 1 was conducted from 16 November 2021 to 14 December 2021 and Cycle 2 was conducted from 14 December 2021 to 13 January 2022. The seven locations where monitoring was undertaken were considered to be sensitive receptors such as schools, homesteads, and farms around the South East Pit (Figure 7-8).

The seven locations were classified as residential (in terms of the Dust Control Regulations), dust fallout concentrations at residential locations should be below the limit of 600 mg/m^2/day. All concentrations for Cycle 1 and Cycle 2 were below the standards set out in the Dust Control Regulations with the exception of the Cycle 2 sample collected at monitoring location, DB 5 (located at the Mxosheni Combined School region). A dust fallout rate of 927 mg/m^2/day was reported and exceeded the dust fallout limit of < 600 mg/m^2/day by 329 mg/m^2/day. The predominant wind direction, proximity to unpaved roadways and natural sources (wind erosion) could have resulted in migration of particulate matter towards the dust monitoring location, DB 5, however given that the value is an order of magnitude higher than the other samples collected, this is suspected to be due to a highly localised dusty event (potentially tampering) contributing to the exceedance at DB 5.

An average dust fallout rate of 173 mg/m^2/day was calculated across all monitoring locations and is considered indicative of background dust fallout rates. The dust fallout concentrations for both cycles are shown in Figure 7-11 and Figure 7-12. Other possible sources of dust within the area are shown in Table 7-18.

Table 7-18 Location of Dust Fallout Stations and Possible Sources of Dust

Monitoring Location ID	Location Description	UTM Coordinates		Possible Dust Source[3]
		m E	m S	
DB 1	Chenells Farm – Venture Compound	354,242	6,822,707	• Re-entrained vehicle dust from external unpaved roadways. • Farm operations. • Natural dust (naturally eroded quartz, topsoil, agricultural soil).
DB 2	Chenells Farm – Hillcrest 40 Block Compound	352,830	6,817,506	
DB 3	Siyavuma Primary School	354,384	6,820,681	• Re-entrained vehicle dust from external unpaved roadways. • Construction material. • Natural dust (naturally eroded quartz, topsoil, agricultural soil).
DB 4	Ngobese Homestead	348,831	6,819,121	
DB 5	Mxosheni Combined School	349,657	6,825,365	
DB 6	Nogajuka Primary School	347,071	6,823,350	• Re-entrained vehicle dust from external unpaved roadways. • Natural dust (naturally eroded quartz, topsoil, agricultural soil).
DB 7	Mehlamasha Combined School	350,738	6,825,025	

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[3] Possible contribution from sources is indicative

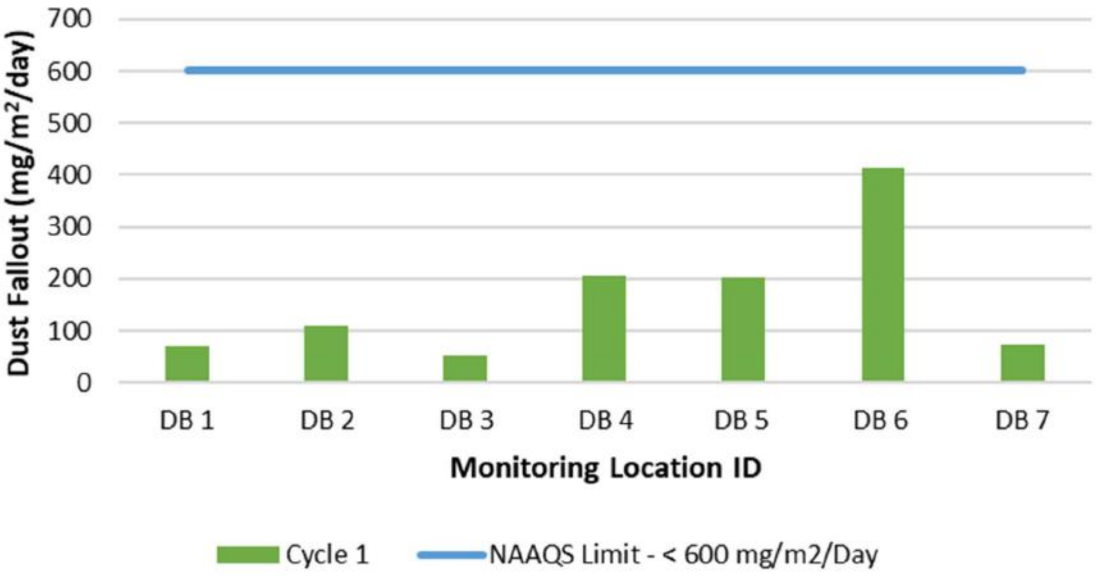


Figure 7-11 Dust Fallout Concentrations for Cycle 1

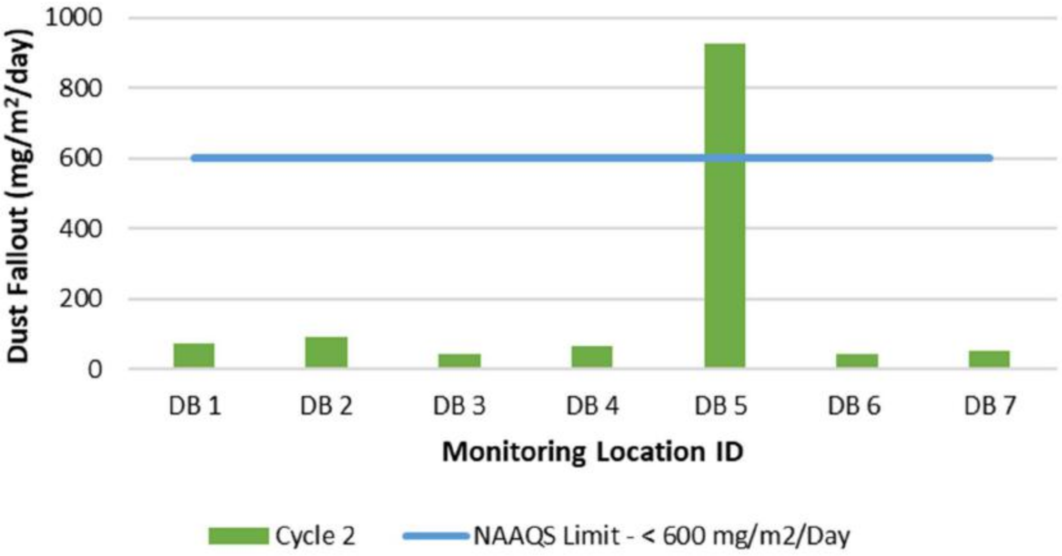


Figure 7-12 Dust Fallout Concentrations for Cycle 2

7.4.5.4 North Block

No site surveys were done in the North Block because the first phase of mining will be undertaken in the South Block (within the SE Pit), as such, there is no baseline air quality data available for the North Block.

7.4.6 Noise

Information in this section was sourced from the Jindal Melmoth Iron Ore Noise Study Report (WKC, 2023) included in Appendix J.

7.4.6.1 South Block

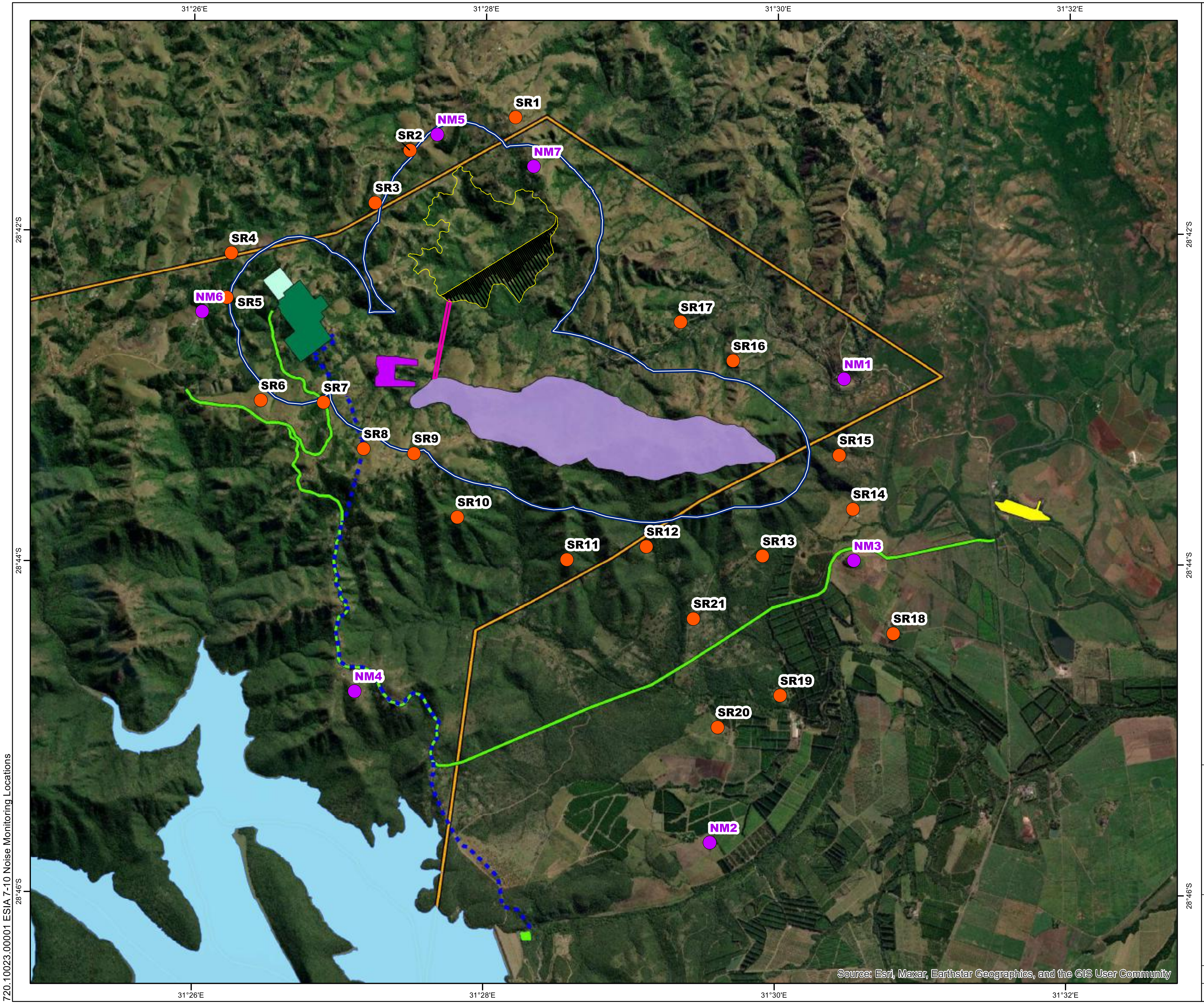
AMBIENT NOISE LEVELS

A description of the environmental noise characteristics at several locations of interest in and around key working areas within the South Block was determined through ambient noise monitoring. The ambient noise monitoring survey was conducted from 17 November 2021 to 21 November 2021 in accordance with best practice and SANS 10103. A total of seven monitoring locations, which were considered representative of the surrounding areas' acoustic environmental conditions were selected for the survey. The key working and mining areas are currently classified as rural according to the SANS Zone Classification. According to SANS 10103, the recommended day and night time noise limits for the rural areas 45 dB(A) and 35 dB(A) respectively. A description of the monitoring locations is provided in Table 7-19 and illustrated in Figure 7-13.

Table 7-19 Noise Monitoring Locations

Site ID	Site Description	Site Classification	UTM Coordinates	
			m E	m S
NM 1	Chennells Farm – Venture Compound	Rural	354,243	6,822,708
NM 2	Chennells Farm – Hillcrest 40 Block	Rural	352,830	6,817,505
NM 3	Siyavuna Primary School	Rural	354,385	6,820,682
NM 4	Ngobese Homestead	Rural	348,834	6,819,130
NM 5	Mxosheni Combined School	Rural	349,655	6,825,364
NM 6	Nogajuka Primary School	Rural	347,065	6,823,343
NM 7	Mehlamasha Combined School	Rural	350,738	6,825,024

The results of the day and night-time ambient noise survey are provided in Table 7-20. All the daytime and night-time recorded noise measurements were above the relevant SANS 10103 limits (prescribed for rural land use types) with the exception of the recorded daytime noise level of 40.3 dB(A) at noise monitoring location NM 7. Noise levels at NM 7 was found to be in compliance with the daytime limit of 45 dB(A). Based on the results of the measurements the average daytime noise level is 51.7 dB(A) and the average night-time noise level is 47.8 dB(A). A description of the existing noise sources observed during the survey is provided in Table 7-20.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

🟦	Goedetrouw Dam
▢	500m Buffer
●	Noise Monitoring Locations
●	Sensitive Receptors

Proposed Project Components

▢	South Block Mining Right Area
🟪	South East Pit
🟩	Raw Water Pump
🟩	Processing Plant
🟪	Primary Crusher
🟩	Incoming Power Yard
🟨	Rail Siding
—	Haul Road
—	Access Road Option 1 - Preferred
┅	Overland Piping
—	Waste Rock Dump

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Scale: 1:40 000 @ A3
Coordinate System: TM WG31
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FIGURE 7-13
NOISE MONITORING LOCATIONS

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720.10023.00001 ESIA 7-10 Noise Monitoring Locations

Table 7-20 Ambient Noise Survey Results and Noise Sources

Site ID and Description	Daytime		Night-time		Description of Noise Source
	SANS Noise Limit (Rural) (dB(A))	Recorded Noise Level (dB(A))	SANS Noise Limit (Rural) (dB(A))	Recorded Noise Level (dB(A))	
NM 1 Chennells Farm - Venture Compound	45	49.4	35	46.3	• Driven machinery (tractors and other associated machinery), Light Duty Vehicle (LDV), motorcycles. • Hooting and reverse sirens may also be presented on an intermittent basis. • Chickens, goats, birds and sun beetles. • People talking and children playing are also anticipated within the compound area. • The weather, in particular, the wind, would have resulted in noise from rustling leaves etc..
NM 2 Chennells Farm - Hillcrest 40 Block	45	49.6	35	46.9	• Driven machinery (tractors and other associated machinery), LDV, motorcycles. • Hooting and reverse sirens may also be presented on an intermittent basis. • Chickens, goats, birds and sun beetles. • People talking and children playing are also anticipated within the compound area. • The weather, in particular, the wind, would have resulted in noise from rustling leaves etc.
NM 3 Siyavuna Primary School	45	52.1	35	48.5	• Children talking, shouting, singing (general play), adults talking, and general noise from nearby classrooms. • Noise from neighbours. • Chickens (including roosters growing), goats, birds and sun beetles include nature sounds. • Vehicles passing on the gravel road ion the distance.
NM 4 Ngobese Homestead	45	48.1	35	44.2	• Dogs barking, chickens and roosters crowing, goats, cattle, sun beetles. • Kids talking and shouting, people talking and shouting. • Vehicles passing on the adjacent gravel road.
NM 5 Mxosheni Combined School	45	56.7	35	52.8	• Children talking, shouting, singing, and general play. • Vehicles passing on the adjacent gravel road. • Goats, dogs barking and distant roosters crowing.
NM 6 Nogajuka Primary School	45	51.8	35	45.9	• Children talking, shouting, singing and general play. • Vehicles passing on the adjacent gravel road. • Distant dogs barking. • Chainsaw activity in the distance, with log loading and offloading operations and activities occurring at a nearby plot.

Site ID and Description	Daytime		Night-time		Description of Noise Source
	SANS Noise Limit (Rural) (dB(A))	Recorded Noise Level (dB(A))	SANS Noise Limit (Rural) (dB(A))	Recorded Noise Level (dB(A))	
NM 7 Mehlamasha Combined School	45	40.3	35	37.1	• The school was closed over the weekend; however, a religious gathering occurred on the Sunday morning. • Goats, roosters, dogs barking, and sun beetles were noted. • Vehicle activity in the area was also noted.

NOISE SENSITIVE RECEPTORS

Sensitive receptors located within and around the mining area were identified to determine the potential impact of the Project to areas of high receptor sensitivity. The identified sensitive receptors are considered rural according to the SANS Zone Classification and included community houses and farmlands. All of the farmlands identified as sensitive receptors are located outside the proposed South Block boundary (SR 14 and SR 18 - SR 20). The community houses are scattered both inside and outside of the South Block boundary (SR 1 - SR 13, SR 15 - SR 17 and SR 21). The location of sensitive receptors is illustrated in Figure 7-13.

7.4.6.2 North Block

There are no baseline noise data available for the North Block because ambient noise monitoring was not undertaken within this area.

7.4.7 Hydrology

Information in the sections below were sourced from the Floodlines Determination Study (SLR Consulting, November 2022), the Surface Water Specialist Scoping Report (SLR Consulting, 2021) and the Wetland and Aquatic Ecosystem Impact Assessment (Eco-Pulse Consulting, 2023)(included as Appendix H).

7.4.7.1 Regional Hydrology

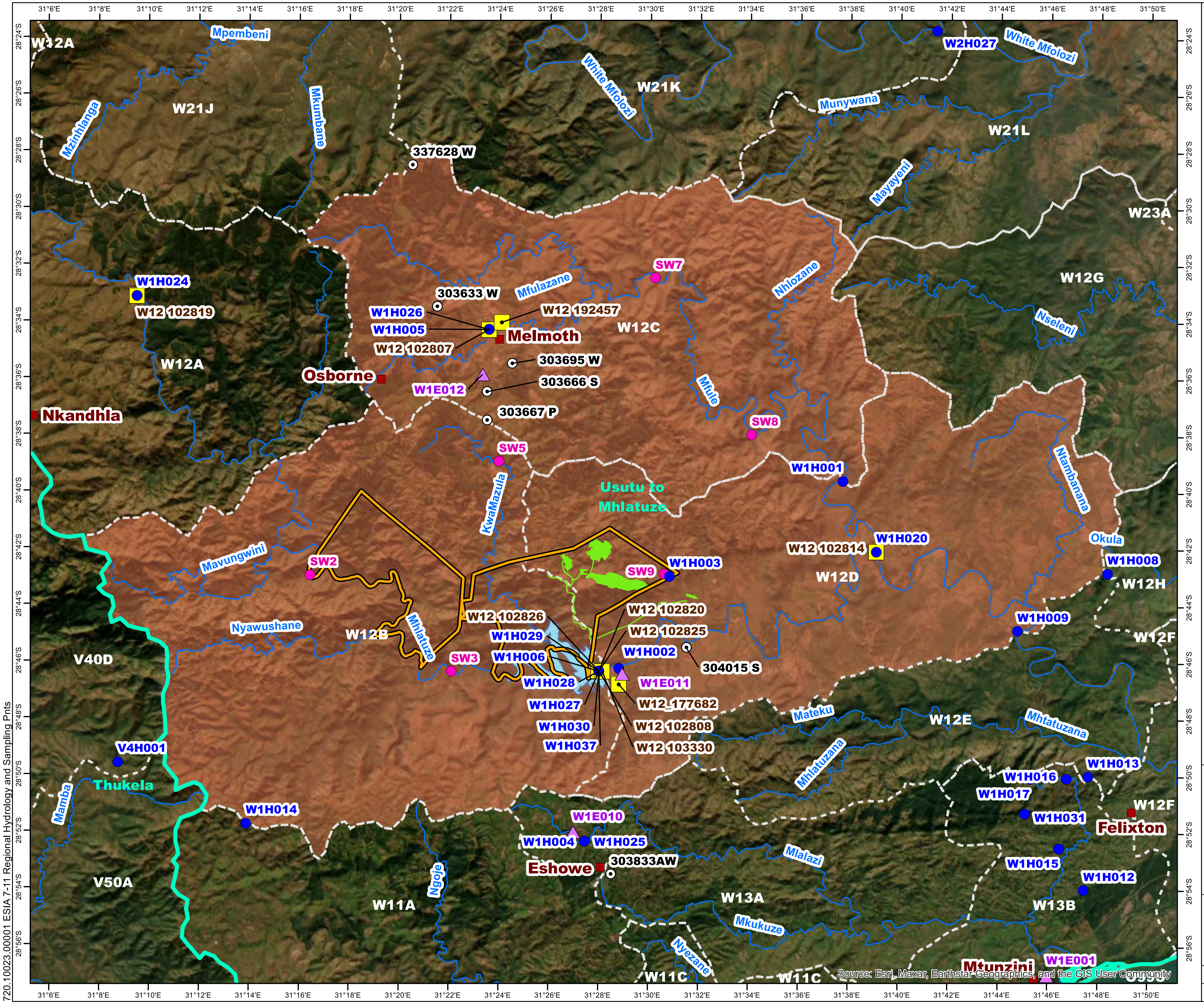
South Africa is divided into nine Water Management Areas (WMAs), where each WMA is made up of quaternary catchments which relate to the drainage regions of South Africa. The Project area (the Jindal MIOP site) is located within the Pongola-Mtavuna WMA and within the Usuthu-Mhlathuze Catchment Management Agency (CMA). The regional hydrology around the Project area is presented in Figure 7-14.

CATCHMENT RUNOFF

The main reason for understanding/modelling catchment runoff is to quantify the amount of runoff before development and how the proposed development will impact (increase or decrease) the catchment runoff. The WRSM2000/Pitman Software is a mathematical model that simulates the movement of water through an interlinked system of catchments, river reaches, reservoirs, irrigation areas and mines. WRSM2000 simulates naturalised runoff around the project site at a unit runoff of 112.5 mm per annum. The runoff, when expressed as a percentage of rainfall, equates to 13%. The monthly runoff is likely to be distributed as presented in Table 7-21.

Table 7-21 Mean Annual Runoff for Catchments around the Project Area

QC	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug		MAR
W12B	6.2	5.4	5.4	5.8	9.0	10.9	7.2	5.9	5.6	5.7	5.1	6.9	79.0
W12C	7.7	7.1	6.9	7.2	11.8	13.2	8.5	6.6	5.8	6.4	5.0	7.5	93.7
W12D	12.6	17.9	17.9	19.2	21.8	18.6	13.3	10.4	7.9	8.3	7.1	9.8	164.8
Average	8.8	10.1	10.1	10.7	14.2	14.2	9.7	7.6	6.4	6.8	5.7	8.1	112.5



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- ■ Towns / Villages
- 🟦 Goedetrouw Dam
- ⬚ Quaternary Catchment Boundaries
- ▨ Quaternary Catchments
- ▭ Water Management Areas
- ▲ Evaporation Stations
- ● Flow Gauging Stations
- ⊙ Rain Gauges
- ▣ DWS Water Quality Sampling Points
- ● SLR Water Quality Sampling Points

Proposed Project Components

- ▭ South Block Mining Right Area
- 🟩 Mine Layout

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Scale: 1:233 303 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-14
REGIONAL HYDROLOGY AND SAMPLING POINTS

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RUNOFF SURFACE WATER QUALITY

Surface water sampling was undertaken by SLR in May 2021 whereby surface water samples were collected at six surface water quality monitoring stations located around the Project area. The six water samples were analysed by an accredited laboratory. The location and description of SLR water quality monitoring stations are provided shown in Figure 7-14. The baseline water quality of watercourses located within the South Block was supplemented by the analysis of water quality data obtained from the DWS Water Quality database. A total of eight water quality monitoring points were identified (Figure 7-14).

The water quality analysis results were compared against the DWS guidelines for irrigation, livestock watering and aquatic ecosystems including the SANS 241 guidelines for drinking water. The DWS guidelines are very stringent because it follows a conservative approach in terms of requirements for the most sensitive crops.

The water quality results obtained as part of the SLR surface water sampling event showed exceedances of Aluminium (A), Copper (Cu), Mercury (Hg), pH and Total Cyanide (CN) concentrations at all six surface water monitoring points when compared to the Aquatic Ecosystems Guidelines. From the DWS Database exceedances have been recorded in Ph, EC and Total Cyanide in all monitoring points when compared to the Most Sensitive User (MSU) Guidelines. Exceedances are highlighted and are marked in bold in the water quality results tables Table 7-22 and Table 7-23.

7.4.7.2 Local Hydrology

The South Block spans over quaternary catchments W12B and W12D. The natural drainage systems in these quaternary catchments flow in an easterly direction towards the Indian Ocean. The primary river draining both W12B and W12D is the Mhlatuze River, which forms the southern boundary of the South Block.The quaternary catchment W12B is drained by the perennial Mhlathuze, Kwamazula, Nyawushane and Mavungwini rivers. A dense drainage network of first, second and third order tributaries is linked to the Mhlatuze and KwaMazula Rivers. The quaternary catchment W12D is drained by the Mfule and Ntambanana rivers flowing in a south-east direction to join the Mhlathuze River.

The North Block falls between quaternary catchments W12B, W12C and W12D. The natural drainage systems in these quaternary catchments flow in an eastern direction towards the Indian Ocean. The area around the North Block is drained by the perennial Mfule River and its tributaries Mfulazane and the Nhlozane rivers, which flows in a southeast direction to join the Mhlathuze River.

SURFACE WATER USE

The Usuthi-Mhlathuze CMA is characterised by large areas of formal and informal agricultural practices. The Goedertrouw Dam is located along the Mhlatuze River (within the South Block) and was built in the 1980s for use as a regional water supply dam. Currently, the Goedertrouw Dam is used as a primary water source for agricultural activities and for water supply to the town of Richards Bay and various industries. The water uses of the Goedertrouw Dam and nearby watercourses for agricultural and bulk water supply services mean that the water resources are sensitive and need to be protected against activities that will compromise all water uses.

Table 7-22 Surface Water Quality Results for SLR Sampled Points

Determinant	Units	Water Quality Monitoring Points						Water Users/Guidelines				
		SW2	SW3	SW5	SW7	SW8	SW9	Irrigation	Livestock Watering	Aquatic Ecosystem	SANS241: 2015	Exceedances in all guidelines
Al	mg/l	**0.48**	**0.81**	**0.18**	**0.24**	**0.23**	**0.24**	5	5	0.005	0.3-0.5	All
As	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	1	0.01	0.01	All
B	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5-15	0.5	-	2.4	All
Cr	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	1	0.007	≤0.05	All
Ca	mg/l	8.41	10.59	3.12	9.56	8.99	12.82	-	1000	-	<150	All
CO	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05 - 5.0	1.0 - 2.0	-	≤500	All
Cu	mg/l	**0.08**	**0.05**	**0.1**	**0.07**	**0.07**	**0.08**	0.2	0.05	0.0003	≤2	All
Pb	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	1	0.0002	≤0.01	All
Fe	mg/l	0.73	0.83	0.58	1.87	0.89	0.88	5	10	-	≤2	All
K	mg/l	1.39	1.34	2.98	2.43	2.62	1.67	-	-	-	-	All
Mn	mg/l	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	0.02	10	0.18	≤0.4	All
Mg	mg/l	4.18	4.3	2.57	9.81	7.78	3.61	-	500	-	<200	All
Na	mg/l	9.98	9.92	11.81	32.55	29.23	16.42	70	2000	-	≤ 200	All
Ni	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.02	0.1	-	≤0.07	All
SI	mg/l	7.96	8.19	5.66	6.22	7.55	10.98	-	-	-	-	
Zn	mg/l	<0.05	<0.05	0.08	<0.05	<0.05	0.05	1	20	0.002	≤ 5	All
Hg	mg/l	**0.008**	**<0.005**	**0.006**	**<0.005**	**<0.005**	**<0.005**	-	0.001	0.00004	≤ 6	All
Cl	mg/l	14.54	16.8	23.69	45.08	43.43	24	-	1500	-	≤ 300	All
F	mg/l	0.41	0.53	0.07	0.15	0.31	0.26	2	2	≤0.75	≤1.5	All
NO2-N	mg/l	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	5	10	-	≤0.9	All
NO3-N	mg/l	<0.5	<0.5	1.03	0.78	<0.5	<0.5	5	10	-	≤11	All
SO4	mg/l	6.71	8.59	2.22	5.55	5.55	3.93	-	1000	-	≤500	All
PO4	mg/l	<0.2	<0.2	<0.2	0.98	<0.2	<0.2	-	-	-	-	All
pH	pH units	**8.02**	**7.87**	**7.03**	**7.93**	**8**	**7.88**	6.5-8.4	-	±5% of Background level	≥ 5 and ≤ 9.7	All
EC	µS/cm	**98**	**100**	**101**	**291**	**245**	**141**	0.4	1.54	-	≤0.17	All
TDS	mg/l	381	255	502	202	634	94	-	1000	-	≤ 1200	All
CN	mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	-	-	0.001	≤0.2	All
NH3-N	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	5	7	-	≤1.5	All
P-Alk as CaCO3	mg/l	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	-	-	-	-	All
M-Alk as CaCO3	mg/l	30	38	13	75	60	45	-	-	-	-	All
Total CN*	mg/l	**<0.07**	**<0.07**	**<0.07**	**<0.07**	**<0.07**	**<0.07**	-	-	0.001	≤0.2	All

Table 7-23 Water Quality Results compared to MSU Water Quality Guideline Requirements (DWS Database Water Quality Results)

Station Number		W12_103330	W12_102826	W12_102825	W12_102820	W12_102819	W12_102814	W12_102808	W12_102807	Water Users/Guidelines				
Parameter	Units	17/01/05	86/04/23	18/04/25	97/06/23	87/05/21	88/04/28	97/08/26	18/03/28	Irrigation	Livestock Watering	Aquatic Ecosystem	SANS241: 2015	Exceedance in all guidelines
Ca	mg/l	-	6.4	7.9	7.6	15.6	8.7	6.4	6.6	-	1000	-	<150	All
Cl	mg/l	13	19.6	16.5	12.5	132.8	40.5	20.2	31.8	-	1500	-	≤ 300	All
DMS	mg/l	-	103	107.80	104	506	154	115	115.57	-	-	-	-	-
EC	µS/cm	-	**17.4**	**17.5**	**15.7**	**76**	**25.9**	**17.4**	**20.4**	0.4	1.54	-	≤0.17	All
F	mg/l	0.27	0.21	0.154	0.19	0.26	0.05	0.17	0.025	2	2	≤0.75	≤1.5	All
K	mg/l	-	1.91	1.5	1.95	4.49	1.72	1.2	3.1	-	-	-		All
N	mg/l	-	0.223	-	-	0.719	0.403	-	-	0.02	0.1	-	≤0.07	All
Mg	mg/l	-	4.9	5.9	4.7	16.8	7.4	4.5	4.7	-	500	-	<200	All
Na	mg/l	-	15.8	13.3	13.2	123.6	27.9	19.1	20.2	70	2000	-	≤ 200	All
NH4_N	mg/l	-	0.04	0.03	0.042	0.07	0.07	0.02	0.03	5	7	-	≤1.5	All
NO3_NO2	mg/l	0.901	0.05	0.666	0.308	0.02	0.31	0.271	0.05	5	10	-	≤11	All
P	mg/l	0.46	0.012	-	-	0.071	0.035	-	-	-	-	-	-	-
pH	pH units	-	7.19	8.1	7.93	7.45	7.02	7.83	7.9	6.5-8.4	-	±5% of Background level	≥ 5 and ≤ 9.7	All
PO4	mg/l	0.41	0.003	0.013	0.016	0.043	0.003	0.01	0.005	-	-	-		All
Si	mg/l	5.49	7.67	7.3	6.38	12.79	8.63	7.67	7.9	-	-	-	-	All
SO4	mg/l	9.58	6.4	8.8	10.3	9.7	14	8.5	4	-	1000	-	≤500	All
TAL	mg/l	**54**	**39.1**	**41.6**	**43.1**	**166.2**	**42.7**	**44**	**36.8**	5	5	0.005	0.3-0.5	All

MHLATHUZE CATCHMENT

The Goedertrouw Dam, with a capacity of 304 million m^3, is situated in the middle reaches of the Mhlathuze catchment. The MAR into the dam is estimated at 163 million m^3/annum. In terms of the MAR, the Goedertrouw Dam is considered to be a large dam (1.87 times the MAR), the implication of which is that there would be little to be gained out of raising the dam. The dam was completed in the early 1970's and was constructed primarily to meet the rapid growth in industrial, mining and urban requirements of the Richards Bay area, but also for irrigation purposes. Water is distributed to irrigators via a canal as well as releases into the Mhlathuze River, which are abstracted by pumps along its length, while water for other users is abstracted at the Mhlathuze Weir. The natural inflow into the Goedertrouw Dam is supplemented by transfers from the Thukela River.

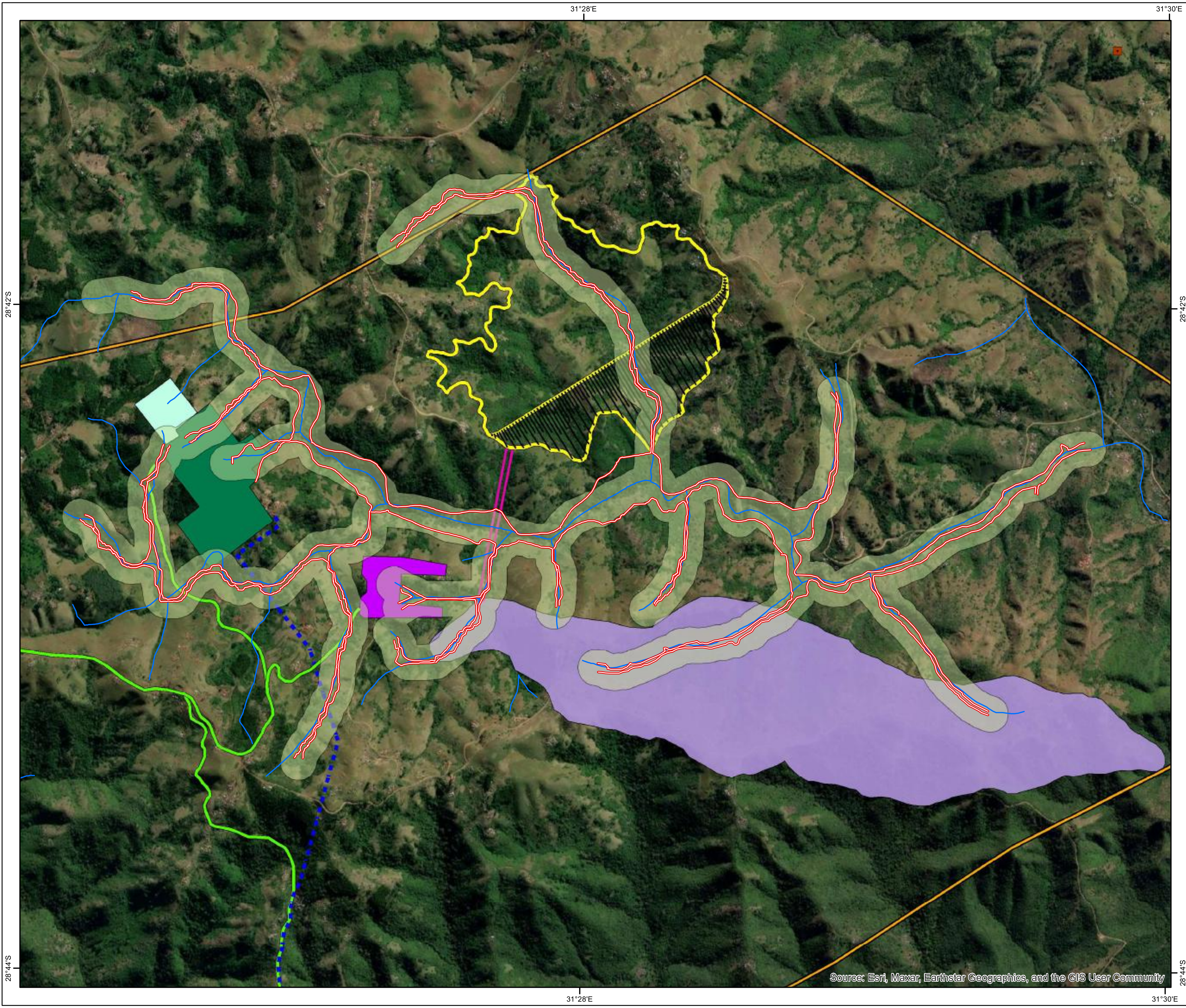
In 1996, an emergency scheme was implemented to transfer water from the Thukela River to the Mhlathuze system, via the Goedertrouw Dam. Water is transferred at a rate of about 1.2 m^3/s whenever the water level in the Goedertrouw Dam drops below 90%, although this is an operating rule that is frequently reviewed. The infrastructure related to the transfer scheme consists of a pump station situated at a small weir at Middeldrift on the Thukela River and a pipeline which crosses the catchment divide and discharges into the upper reaches of the Mhlathuze River. The capacity of the transfer can be increased relatively easily to 3.0 m^3/s by increasing the pumping capacity of the pump station.

The water resources of the Mhlathuze catchment are complex as it consists of numerous inter-related components, namely, a large dam (Goedertrouw Dam), transfers in from the Thukela and Mfolozi Rivers, natural lakes and run-of-river abstractions. The yield of the Mhlathuze system was determined during a recent detailed water resources study taking into account the complexity of the operating rules of the catchment. The total yield of the Mhlathuze system (excluding groundwater) is given as 247 million m^3/annum which relates approximately to the 1:50 year yield of the Mhlathuze system. Compulsory Licencing has been carried out in the Mhlathuze Catchment and the current water deficit is estimated to be approximately 9 million m^3/annum.

The proposed development includes processes that will require raw water and with the Mhlathuze catchment currently experiencing a deficit it will be necessary to undertake one or more proposed interventions to provide the water required (see Section 16.1).

FLOODLINES

Floodlines for the 1:100-year recurrence interval were determined for the current river network passing through the Project area and presented in Figure 7-15. These floodlines have been used in project planning to minimise impacts on flood zones.



Legend

🟦	Rivers
🟥	1:100 Year Floodlines
🟩	100m River Buffer

Proposed Project Components

▭	South Block Mining Right Area
🟪	South East Pit
🟩	Processing Plant
🟪	Primary Crusher
🟦	Incoming Power Yard
🟨	Waste Rock Dump
🟥	Haul Road
🟩	Access Road Option 1 - Preferred
■ ■ ■ ■	Overland Piping

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Scale: 1:20 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-15
1:100 YEAR FLOODLINES AROUND THE MINE INFRASTRUCTURE

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720.10023.00001 ESIA 7-12 Floodlines

7.4.8 Aquatic Ecology

The information presented in this section was sourced from the Wetland and Aquatic Ecosystem Impact Assessment (Eco-Pulse Consulting, 2023), which has been included as Appendix H.

7.4.8.1 South Block

CONSERVATION CONTEXT

A desktop screening was undertaken to determine the national and provincial conservation context of the Project area. At a national level, the National Freshwater Ecosystem Priority Areas (NFEPA) and the National Biodiversity Assessment for Inland Aquatic/Freshwater Realm were considered. The KZN Freshwater Systematic Conservation Plan (FSCP) was considered from a provincial conservation context.

National Freshwater Ecosystem Priority Areas

The South Block coincides with a total of five NFEPA catchment planning units. None of these units have been assigned a management status by the NFEPA Project. There are no NFEPA catchment planning units downstream of the South Block area with a specific management status.

National Biodiversity Assessment

The diversity of inland aquatic ecosystems is represented by river and inland wetlands ecosystem types as prescribed in the latest National Biodiversity Assessment (NBA) - Inland Aquatic Realm. According to the NBA, a wetland ecosystem is comprised of functional wetland diversity (wetland Hydrogeomorphic (HGM) type) and spatial bioregions (which represent broad bioclimatic regions). There are four HGM types, 37 bioregions and 148 potential wetland ecosystem types characterized nationally. Each wetland ecosystem is also assigned an ecosystem threat status (ETS). A summary of the ETS and different wetland types associated with the South Block is tabulated in Table 7-24.

Table 7-24 Ecosystem Threat Statuses and Protection Levels for Wetland Ecosystem Types in the South Block

	Wetland HGM Type			
Bioregion	**Channeled Valley Bottom**	**Unchanneled Valley Bottom**	**Seep**	**Depression**
Sub-escarpment grassland	Critically Endangered[4]	Critically Endangered	Critically Endangered	Endangered[5]
Sub-escarpment savanna	Critically Endangered	Critically Endangered	Critically Endangered	Endangered

River ecosystem types are characterized in the NBA by the following three river levels :

- DWAF (2005) Level I Ecoregion (broad ecological context);
- Flow variability (permanent or non-permanent); and
- Longitudinal zonation (mountain stream, upper foothill, lower foothill, and lowland rivers).

---

[4] According to the NBA, Critically Endangered describes ≤ 20% of wetland ecosystems of this type remain in natural / near natural condition in the country.

[5] According to the NBA, Endangered describes ≤ 35% of wetland ecosystems of this type remain in natural / near natural condition in the country.

The Project area (both the North Block and South Block) is covered by a single level I ecoregion. This ecoregion is the North Eastern Uplands (Ecoregion 14). The NBA rates all permanently flowing rivers and streams in the North Eastern uplands region as Least Threatened. Non-permanently flowing rivers, streams and mountain stream are also considered as Least Threatened. The Upper foothill rivers are considered Endangered, whilst lower foothill and lowland rivers are considered Critically Endangered.

KZN Freshwater Systematic Conservation Plan

The KZN Freshwater Systematic Conservation Plan (KZN FSCP) is used to inform the assessment of aquatic conservation priorities and sensitivities at a provincial level. There are no Conserved catchment planning units in the Project area. The are 13 sub-catchment planning units which occur in the South Block. An *available* status was assigned to 12 of the planning units, and one planning unit was assigned an *Earmarked* status.

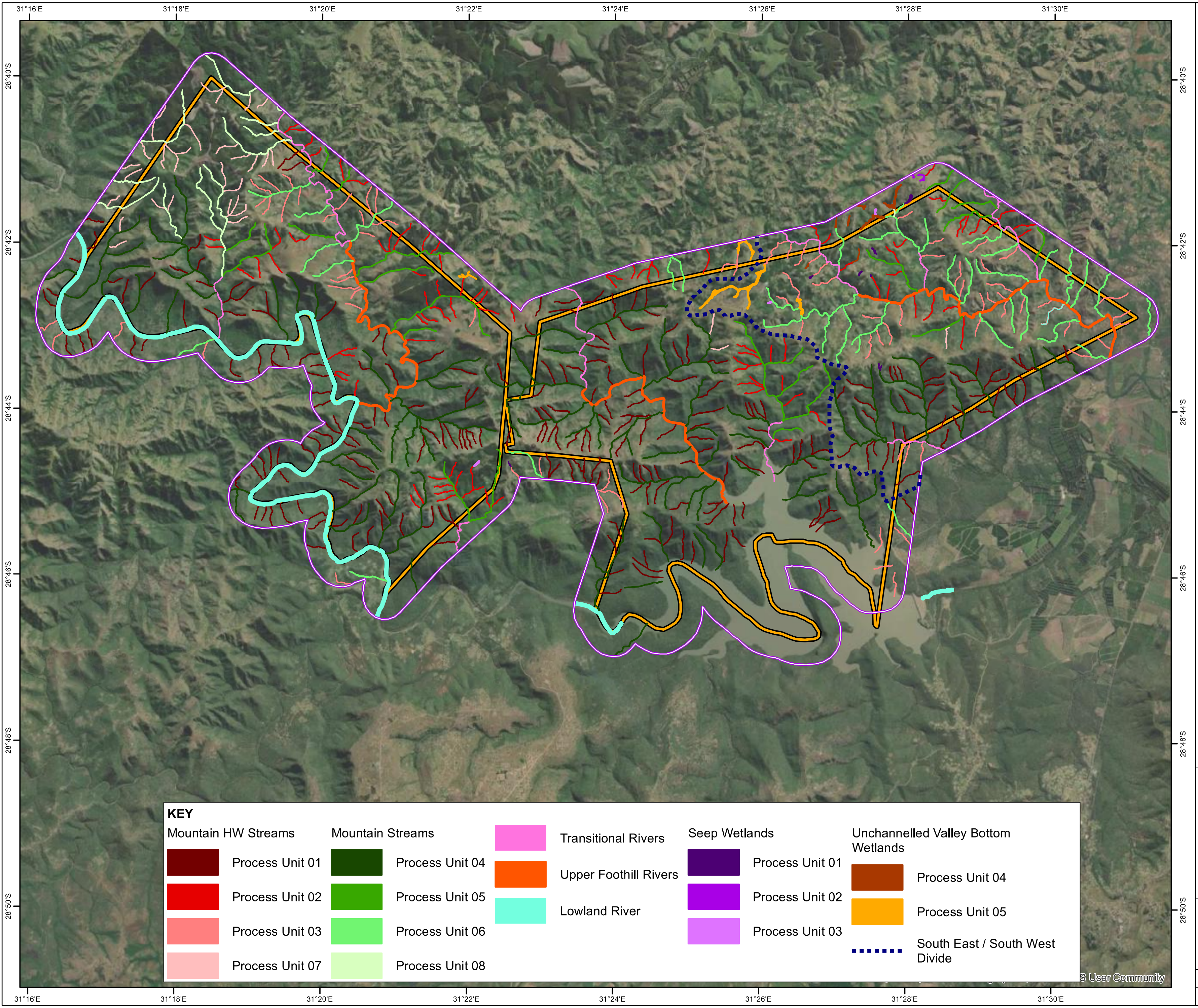
WATERCOURSE CLASSIFICATION AND HABITAT CHARACTERISTICS

Individual assessments of each watercourse in the Project area was not feasible due to the extent of the area, and the occurrence of numerous watercourses within the area. Instead, a process unit approach was used to classify and characterise watercourses and habitats. Each process unit refers to wetlands or rivers of the same classification with similar impacts on ecosystem health, processes, and ecological functions.

There were 599 river/stream units and 22 wetland units identified and classified in the South Block. Rivers and Streams included Mountain Headwater Streams; Mountain Streams; Transitional Rivers; Upper Foothill Rivers and Lowland Rivers (Mhlatuze River). Seep Wetlands and Unchanneled Valley Bottom Wetlands were identified within the South Block. A watercourse delineation and classification map for the South Block is shown in Figure 7-16. These watercourses and wetland units are described in the following sections.

Mountain Headwater Streams

The 431 Mountain Headwater Streams (made up of four process units) were mapped in the South Block. All process units identified within the Mountain Headwater Stream classification are ephemeral in nature with flows expected for short periods of time following heavy rainfall events. All units are identified as steep streams with small catchment areas and display varying degrees of modification between process units. The streams are characterised by alluvial soils (substrate) and generally dry alluvial stream beds (instream biotopes). Riparian features of streams in this classification are associated with macro-channels and wooded riparian zones. Selected photographs of the watercourses identified within the Mountain Headwater Streams classification are shown in Table 7-25.



Legend

- ▭ Proposed South Block Mining Right Area
- ▭ South Block 500m Buffer

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Scale: 1:80 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-16
WATER COURSE DELINEATION AND CLASSIFICATION MAP FOR THE SOUTH BLOCK (ECO-PULSE CONSULTING, 2023)

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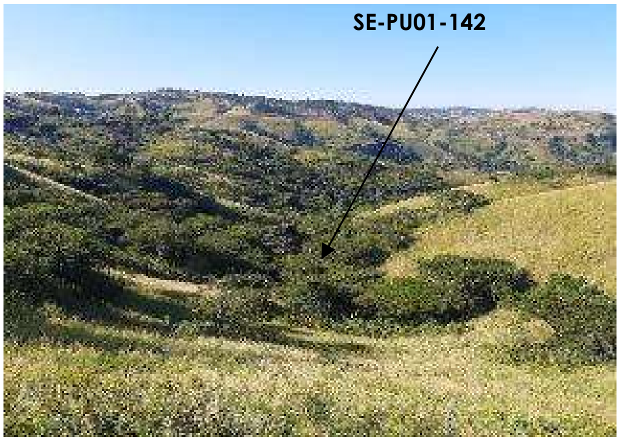
Map Ref No: ESIA 7-13	Date: 17/06/2023

Table 7-25 Mountain Headwater Stream Watercourses

Overview of watercourse unit SE-PU01-141



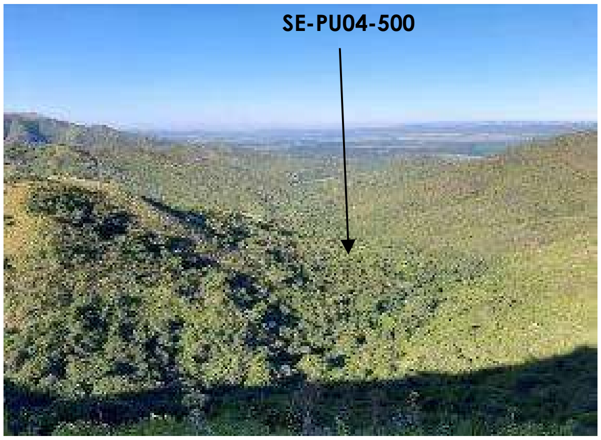
Overview of watercourse unit SE-PU01-141

Mountain Streams

The 154 Mountain Streams made up of four process units were mapped in the South Block. All process units identified within the Mountain Stream classification have a seasonal flow with mixed bedrock and alluvial substrates. All units are identified as moderately steep streams with small catchment areas. The catchment areas display varying degrees of modification between process units. The general instream biotopes include pools, riffles and runs. Both macro channel and active channel banks are expected within the Mountain Stream classification, however, the expected riparian vegetation varies between process units. Selected photographs of watercourses identified within the Mountain Stream classification are shown in Table 7-26.

Table 7-26 Mountain Stream Watercourses

Overview of the upstream reaches of watercourse unit SE-PU04-500.



Overview of the downstream reaches of watercourse unit SE-PU04-500

Transitional Rivers

Ten Transitional River units were identified and reported on within the South Block. Four of these rivers were identified and assessed during a field visit undertaken by aquatic ecology specialists, Eco-Pulse. The remaining six Transitional Rivers were assessed by Eco-Pulse at a desktop level using data extrapolated from the visited rivers.

The key biophysical characteristics of the four Transitional Rivers that were surveyed are summarised in the following sections. Selected photographs of watercourses identified within the Transitional Rivers classification are in Table 7-27.

SE-Transitional River-462

The SE-Transitional River-462 is characterised by seasonal to weakly perennial flow. Bedrock is the dominant substrate in this river unit, whilst sandy alluvium substrates occur in the river reaches. The observed instream biotopes include riffles, rapids, runs, and pools with cobbles, boulders, and bedrock sheets. Both active channel banks and macro channel banks were observed for the SE-Transitional River-462, and the vegetation characteristics associated with these riparian features are listed as follows:

- Macro bank and Flood Terrace:
    - Dominant and sub-dominant species: *Ficus sur and acacia sp*
    - Moderately abundant species: *Biancaea decapetala*
    - Low abundant species: *Solanum mauritianum*
- Active Channel banks:
    - Dominant and sub-dominant species: *Coix lacryma-jobi* and *Ageratum houstonianum*
    - Moderately abundant species: *Chromolaena odorata*
    - Low abundant species: *Commelina benghalensis*

SE-Transitional River-468

The SE-Transitional River-468 exhibits perennial flow with a substrate dominated by sandy alluvium and cobbles, and scattered bedrock boulders. There were three main instream biotopes observed. These were riffles, rapids and runs (cobbles, boulders, and bedrock sheets); pools (cobbles, boulders, and bedrock sheets) and marginal vegetation. The riparian features observed were active channel banks and macro channel banks. The vegetation characteristics associated with the active channel banks and macro channel banks of the SE-Transitional River-468 are listed as follows:

- Macro bank and Flood Terrace:
    - Dominant and sub-dominant species: *Stenotaphrum clandestine, Sporobolus africanus.*
    - Moderately abundant species: *Sesbania punicea, Senna didymobotrya, Ficus sur, Ludwigia octovalvis.*
    - Low abundant species: *Arundinella nepalensis.*
- Active Channel bank:
    - Dominant and sub-dominant species: *Leersia hexandra, Ischaemum fasciculatum.*
    - Moderately abundant species: *Cyperus latifolius.*
    - Low abundant species: *Fimbristylis sp., Pycreus Polystachyos.*

SE-Transitional River-470

SE-Transitional River-470 is a perennial river dominated by bedrock substrate. During the field visit, riffles, rapids, runs, and pools instream biotopes were observed with marginal vegetation and active channel banks. The vegetation characteristics associated with the active channel banks and macro channel banks of the SE-Transitional River-470 are are listed as follows:

- Macro bank and Flood Terrace:
    - Dominant and sub-dominant species: *Syzigium cordatum, Acacia sp.*
    - Moderately abundant species: *Ficus sur.*
    - Low abundant species: *Ludwigia Octovalvis.*

- Active Channel bank:
    - Dominant and sub-dominant species: *Leersia hexandra, Ischaemum fasciculatum.*
    - Moderately abundant species: *Juncus lomatophyllus, Pycreus polystachyos.*
    - Low abundant species: *Persicaria attenuata, Ludwigia Octovalvis, Centella asiatica.*

<u>SW-Transitional River-471 (KwaMazula River)</u>

The SW-Transitional River-471, also known as KwaMazula River, is a perennial river with a substrate dominated by sandy alluvium and scattered bedrock boulders. The instream biotopes observed included riffles, rapids and runs (with cobbles, boulders, and bedrock sheets), as well as pools (with gravel, sand, cobbles, and boulders) and marginal vegetation. The riparian features observed were active channel banks and macro channel banks. The vegetation characteristics associated with the active channel banks and macro channel banks of the SW-Transitional River-471 are listed as follows:

- Macro bank and Flood Terrace:
    - Dominant and sub-dominant species: *Stenotaphrum clandestine, Sporobolus africanus.*
    - Moderately abundant species: *Sesbania punicea, Senna didymobotrya, Ficus sur, Ludwigia octovalvis.*
    - Low abundant species: *Arundinella nepalensis.*
- Active Channel bank:
    - Dominant and sub-dominant species: *Leersia hexandra, Ischaemum fasciculatum.*
    - Moderately abundant species: *Cyperus latifolius.*
    - Low abundant species: *Fimbristylis sp., Pycreus Polystachyos.*

Table 7-27 Transitional River Watercourses

SE-Transitional River-462	 Downstream photo of a reach of SE-Transitional River-462 that is characterised by an alluvial bed.	 Downstream photo of a reach of SE-Transitional River-462 that is characterised by a bedrock bed.

SE-Transitional River-468

Downstream photo of a reach of SE-Transitional River-468 at the location of a causeway road crossing.

Upstream facing photo of SE-Transitional River-468, with impoundment from a road crossing visible in the photograph.

SE-Transitional River-470

Downstream photo of a reach of SE-Transitional River-470 that is characterised by a bedrock bed.

Downstream photo of a reach of SE-Transitional River-470 that is characterised by a bedrock bed.

SE-Transitional River-471

Downstream photo of a reach of SW-Transitional River-471.

Upstream photo of a reach of SW-Transitional River-471.

Upper Foothill Rivers

Three Upper Foothill Rivers were identified in the South Block. Two of the Upper Foothill Rivers were visited during a field survey undertaken by Eco-Pulse. The remaining Upper Foothill River was assessed at a desktop level.

A summary of the key biophysical characteristics of each of the visited Upper Foothill River units is provided in the following sections.

SE-Upper Foothill River-466

The SE-Upper Foothill River-466 is a perennial river with a substrate that is dominated by cobbles and boulders, however sandy alluvium occurs in the reaches of the river. The instream biotopes observed included riffles, rapids and runs (with cobbles, boulders, and bedrock sheets), as well as pools (with gravel, sand, cobbles, and boulders) and marginal vegetation. The observed riparian features of this river unit were active channel banks and macro channel banks. The vegetation characteristics associated with the active channel banks and macro channel banks of the Upper Foothill River-466 are listed as follows:

- Macro bank and Flood Terrace:
    - Dominant and sub-dominant species: *Stenotaphrum clandestine*, *Sporobolus africanus*.
    - Moderately abundant species: *Sesbania punicea*, *Senna didymobotrya*, *Ficus sur*, *Ludwigia octovalvis*.
    - Low abundant species: *Arundinella nepalensis.*
- Active Channel bank:
    - Dominant and sub-dominant species: *Leersia hexandra*, *Ischaemum fasciculatum*.
    - Moderately abundant species: *Cyperus latifolius*.
    - Low abundant species: *Fimbristylis sp., Pycreus Polystachyos.*

Selected photos of the Upper Foothill River-466 are shown in Table 7-28 below.

Table 7-28 Selected Photos of Upper Foothill River-466

Upstream overview of a reach of SE-Upper Foothill River-466.

Upstream view of the channel for a reach of SE-Upper Foothill River-466.

SW-Upper Foothill River-457

The SW-Upper Foothill River-457 is a perennial river with a substrate that is dominated by gravel and stones with certain reaches of the river being dominated by sand. Scattered cobbles and boulders were also evident during the field survey. The instream biotopes observed included riffles, rapids and runs (with cobbles, boulders, and bedrock sheets), as well as pools (with gravel, sand, cobbles, and boulders) and marginal vegetation. The occurrence of active channel banks and macro channel banks were observed for during the field survey. The vegetation characteristics associated with the active channel banks and macro channel banks of the Upper Foothill River-466 466 are listed as follows:

- Macro bank and flood terrace:
  - Dominant and sub-dominant species: *Syzigium cordatum, Biancaea decapetala.*
  - Moderately abundant species: *Lantana camara, acacia sp.*
  - Low abundant species: *Psidium guajava.*
- Active channel bank:
  - Dominant and sub-dominant species: *Cyperus latifolius, Commelina benghalensis.*
  - Moderately abundant species: *Ischaemum fasciculatum.*
  - Low abundant species: *Centella asiatica.*

Selected photos of the SW-Upper Foothill River-457 are shown in Table 7-29 below.

Table 7-29 Selected Photos of SW-Upper Foothill River-457

	
Upstream overview of a reach of SE-Upper Foothill River-467.	Upstream view of the channel for a reach of SE-Upper Foothill River-467

<u>SW-Upper Foothill River-456</u>

The biophysical characteristics of the SW-Upper Foothill River-456 was based on the extrapolation of data obtained from the visited Upper Foothill Rivers and through desktop level assessments by Eco-Pulse. In summary, the SW-Upper Foothill River-456 is a perennial river which has gravel and stones as the dominant substrate. In certain reaches of the river, the substrate would be dominated by sand. Scattered cobbles and boulders are also expected throughout the SW-Upper Foothill River-456. The assumed instream biotopes are riffles, rapids, and streams; pools and marginal vegetation. The assumed riparian features are both active channel banks and macro channel banks.

Lowland River – Mhlathuze River

The Lowland River (Mhlathuze River) has a perennial flow with substrate dominated by sand, gravel, and stones with scattered cobbles and boulders. Instream biotopes observed during the field survey included riffles and runs (with cobbles and boulders), pools (with gravel, sand, cobbles, and boulders), as well as marginal vegetation. Riparian features included active channel banks and macro channel banks. Vegetation characteristics varied between the macro bank and flood terrace, where dominant and sub-dominant species included *Stenotaphrum clandestine* and *Sporobolus africanus*, and moderately abundant species included *Sesbania punicea, Senna didymobotrya, Ficus sur,* and *Ludwigia octovalvis,* while *Arundinella nepalensis* was found to be a low-abundance species. The active channel had dominant and sub-dominant species such as *Leersia hexandra* and *Ischaemum fasciculatum*, with moderately abundant species including *Cyperus latifolius.*

Selected photos of the Mhlathuze River are shown in Table 7-30.

Table 7-30 Selected Photos of the Lowland River (Mhlathuze River) (SW-Lowland River-461)

Downstream view of the channel for a reach of SW-Lowland River-461.

Upstream view of the channel for a reach of SW-Lowland River-461.

Seep Wetlands

Twelve Seep Wetlands were mapped and divided into three different process unit groups:

- Wetland Process Unit Group 01 (comprising 7 units);
- Wetland Process Unit Group 02 (comprising 2 units); and
- Wetland Process Unit Group 03 (comprising 3 units).

Wetlands from two process unit groups were visited and assessed during the field visit undertaken by Eco-Pulse.

Wetland Process Unit 01

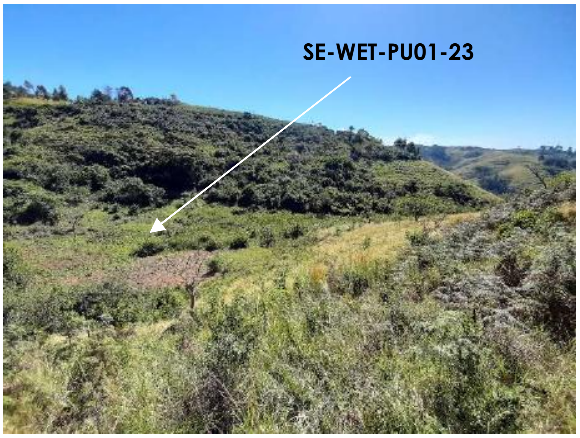
Units comprising the Wetland Process Unit Group 01 are described as cultivated headwater seep wetlands which are located in a catchment with scattered houses and degraded secondary grassland (due to overgrazing). Scattered woody invasive alien plants are also evident in the catchment. The dominant wetness zone is temporary or seasonal with diffuse sub-surface flow being the primary water input. The low pattern flow is also characterised by diffuse sub-surface flow. An overview of the general soil and vegetation characteristics for Wetland Process Unit Group 01 are listed as follows:

- General vegetation characteristics:
  - Dominant: Various subsistence crops including *Colocasia esculenta*, spinach and potatoes.
  - Moderately abundant: *Ageratum houstonianum, Cyperus latifolius, Ludwigia octovalvis.*
  - Low abundance: *Cyclosorus interruptus, Psidium guajava.*
- General soil characteristics:
  - Temporary Soils
    - 0-10 cm: Grey-brown clay loam (7.5YR 4/2). No soil mottles.
    - 40-50 cm: Grey-brown clay loam (7.5YR 4/2). Low abundance of orange soil mottles.
  - Seasonal Soils

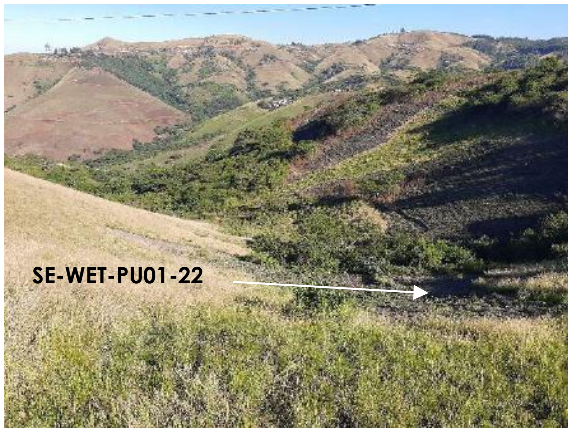
- 0-50 cm: Grey-brown clay loam (7.5YR 4/1). Abundant orange mottles.

Selected photographs of watercourses from Wetland Process Unit 01 are shown in Table 7-31.

Table 7-31 Selected Photos of the Watercourses from Wetland Process Unit 01



Overview of watercourse unit SE-WET-PU01-23 which is being heavily utilised for subsistence agriculture.



Overview of watercourse unit SE-WET-PU01-22 which is being heavily utilised for subsistence agriculture.

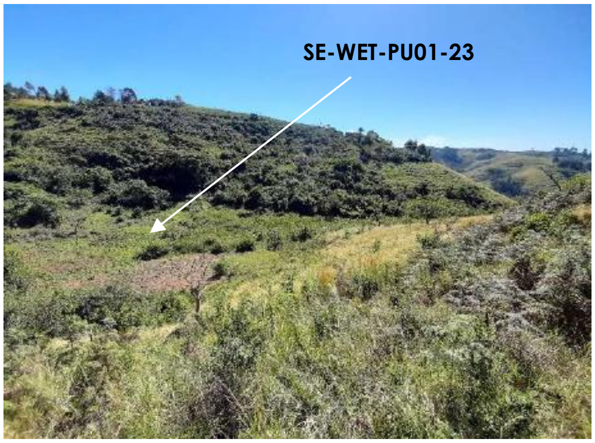
<u>Wetland Process Unit Group 03</u>

Units comprising the Wetland Process Unit 03 are described as previously cultivated and disturbed seep wetlands that have been colonized by dense woody and herbaceous invasive alien plants. It is located in a catchment with scattered houses and degraded secondary grassland (due to over grazing), with scattered woody invasive alien plants. The wetness zone is characterized as temporary or seasonal, with diffuse sub-surface flow as the dominant water input and low flow pattern. An overview of the general soil and vegetation characteristics for Wetland Process Unit 03 is listed as follows:

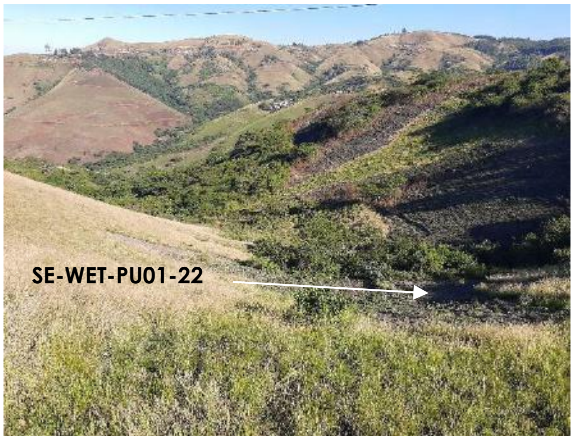
- General vegetation characteristics:
  - Temporary Zone: Dominated by woody and herbaceous invasive alien plants.
  - Seasonal Zone: Dominated by Cyperus latifolius and other facultative (wet) sedge species.
- General soil characteristics:
  - Temporary Soils
    - 0-10 cm: Grey-brown clay loam (7.5YR 4/2). No soil mottles.
    - 40-50 cm: Grey-brown clay loam (7.5YR 4/2). Low abundance of orange soil mottles.
  - Seasonal Soils
    - 0-50 cm: Grey-brown clay loam (7.5YR 4/1). Abundant orange mottles.

Selected photographs of watercourses from Wetland Process Unit 03 are shown in Table 7-32.

Table 7-32 Selected Photos of the Watercourses from Wetland Process Unit 03



Overview of watercourse unit SE-WET-PU01-23 which is being heavily utilised for subsistence agriculture.



Overview of watercourse unit SE-WET-PU01-22 which is being heavily utilised for subsistence agriculture.

Wetland Process Unit 02

The biophysical description of Wetland Process Unit 02, which comprises of 2 stream units was assumed based on desktop information and extrapolation of data collected from the other wetland process units which were visited. The Wetland Process Unit 02 is considered a seep wetland unit with hygrophilous grassland and degraded secondary grassland with scattered woody invasive alien plants. The assumed dominant wetness zone is temporary, with diffuse sub-surface flow as the assumed dominant water input and low flow pattern.

Unchanneled Valley Bottom Wetlands:

Eleven Unchanneled Valley Bottom Wetlands (UVB) were mapped and divided into two different process unit groups:

- Wetland Process Unit 04 (comprising 7 units); and
- Wetland Process Unit 05 (comprising 4 units).

Only wetlands from Wetland Process Unit Group 04 were visited and assessed during the field visit undertaken by Eco-Pulse. The key features of Wetland Process Unit 04 and assumed key features of Wetland Process Unit 05 are provided.

Wetland Process Unit 04

Wetland Process Unit 04 is a narrow UVB wetland which is subjected to notable edge pressure from invasive alien plants. The catchment area is characterized by scattered houses and degraded secondary grassland due to overgrazing, with scattered woody invasive alien plants. The dominant wetness zone is seasonal, and the dominant water input and low flow pattern is diffuse sub-surface flow. An overview of the general soil and vegetation characteristics for Wetland Process Unit 04 is listed as follows:

- General vegetation characteristics:
    - Temporary Zone: Dominated by woody and herbaceous invasive alien plants (*ageratum Houstonian*, *Lantana camara*, *Acacia mearnsii*) and grass species (*Eragrostis plana*, *Paspalum urvillei*, *Sporobolus africanus*).
    - Seasonal Zone: Dominated by *Cyperus latifolius* and other facultative (wet) sedge species.
- General soil characteristics:

  - Temporary Soils
    - 0-10 cm: Grey-brown clay loam (7.5YR 4/2). No soil mottles.
    - 40-50 cm: Grey-brown clay loam (7.5YR 4/2). Low abundance of orange soil mottles.
  - Seasonal Soils
    - 0-50 cm: Grey-brown clay loam (7.5YR 4/1). Abundant orange mottles.

Table 7-33 Selected Photos of the Watercourses from UVB Wetland Process Unit 04

Downstream view of watercourse unit SE-WET-PU04-10

Overview of watercourse unit SE-WET-PU04-11

<u>Wetland Process Unit 05</u>

The four wetland units comprising Wetland Process Unit 05 were dominated by broad valley bottom wetlands which are subjected to notable edge pressure from invasive alien plants. The general catchment area is characterized by scattered houses, degraded secondary grassland due to overgrazing, and scattered woody invasive alien plants. The dominant wetness zone is permanent, and the dominant water input is diffuse sub-surface flow with a low flow pattern that exhibits diffuse surface flow. An overview of the general soil and vegetation characteristics assumed for Wetland Process Unit 05 are listed as follows:

- General vegetation characteristics:
  - Temporary Zone: Dominated by woody and herbaceous invasive alien plants and grass species.
  - Seasonal and Permanent Zone: facultative wet sedge species.
- General soil characteristics:
  - Temporary Soils
    - 0-10 cm: Grey-brown clay loam (7.5YR 4/2). No soil mottles.
    - 40-50 cm: Grey-brown clay loam (7.5YR 4/2). Low abundance of orange soil mottles.
  - Seasonal Soils
    - 0-50 cm: Grey-brown clay loam (7.5YR 4/1). Abundant orange mottles.
  - Permanent Soils:
    - 0-50cm: Grey clay loam (7.5YR 5/1). No mottles.

RIVERS AND STREAMS – CURRENT STATUS

Present Ecological State (PES) Assessment

A Present Ecological State (PES) assessment for the river and stream units located within the South Block was undertaken. The PES assessment comprised of Index of Habitat Integrity (IHI), in-situ and laboratory water quality analyses, aquatic macroinvertebrate surveys (SASS5 methodology) and fish surveys. IHI Assessments were undertaken for all process unit groups (Mountain Headwater Streams and Mountain Streams) and for all individually assessed watercourse units (Transitional Rivers, Upper Foothill Rivers, and Lowland Rivers). The IHI assessments were supplemented by in-situ and laboratory water quality analyses in-situ and laboratory water quality analyses, aquatic macroinvertebrate surveys and fish surveys for selected perennial river systems. These perennial river systems were SW-Lowland River-461 (Mhlatuze River); SW-Transitional River-471 (KwaMazula River); SE Transitional River-470; SE-Upper Foothill River-466 and SW-Upper Foothill River-457. The PES assessment was undertaken at upstream, middle, and downstream sites of the Mhlatuze River (SW-Lowland River-461). The location of the water quality analyses, SASS5 and fish survey sites is shown in Figure 7-17.

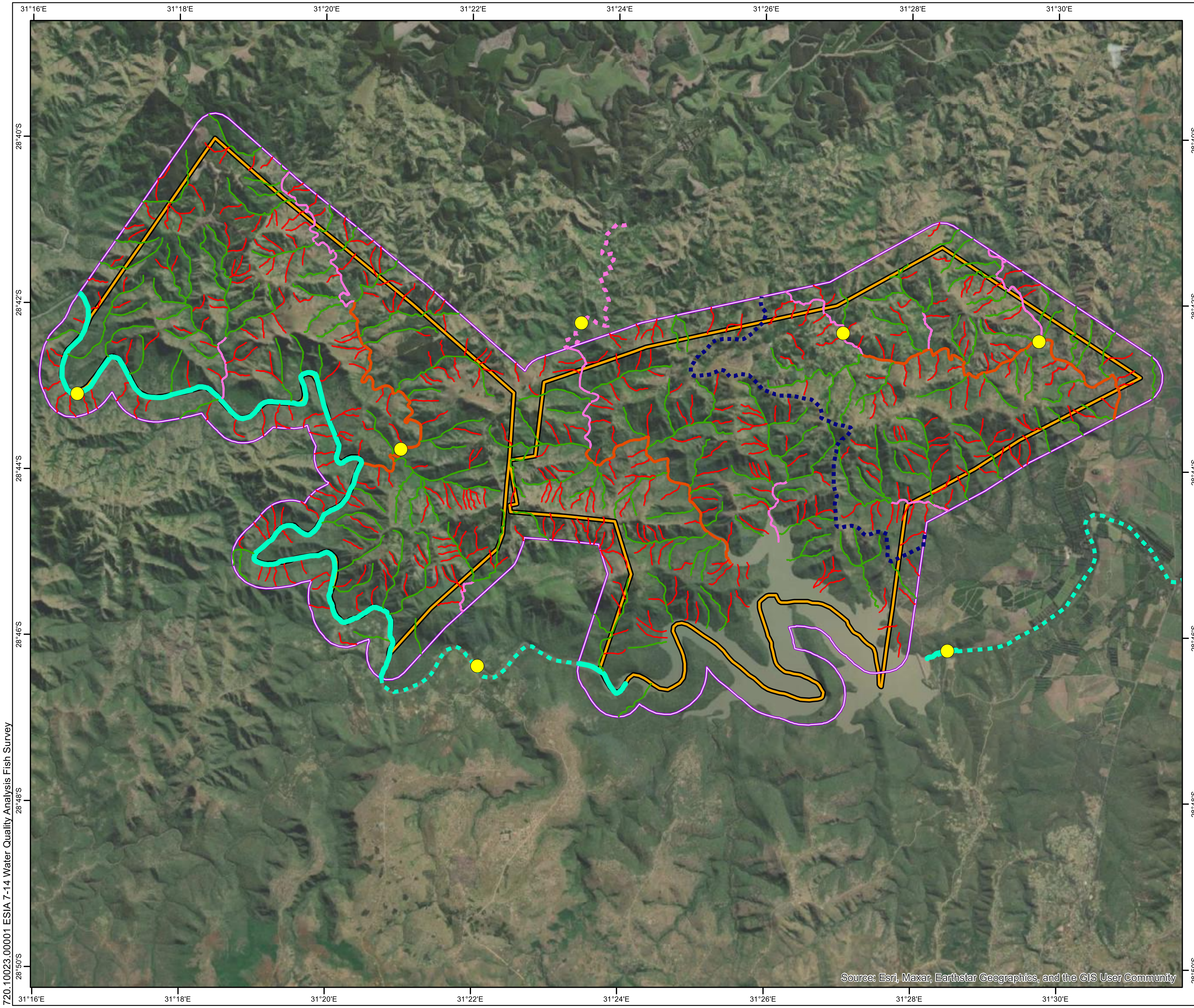
Water Quality Analysis

Detailed water quality results for each monitoring site are provided in the Wetland and Aquatic Ecosystem Impact Assessment (Eco-Pulse Consulting, 2023), which has been included as Appendix H. A brief summary of the notable outcomes is provided in Table 7-34.

Table 7-34 Water Quality Analysis

Watercourse	Water Quality Analysis
SW-Lowland River-461 (Mhlatuze River)	Water quality samples were taken at three locations along the reach of the Mhlatuze River that runs along the South Block. This included two sites upstream of the Goedertrouw Dam (SW-Lowland River-461-01 and SW-Lowland River-461-02) and a single site immediately downstream on the Goedertrouw Dam wall (SW-Lowland River-461-03). The outcomes of the water quality analyses along the Mhlatuze River indicate that water quality was 'good' at the time of sampling with no sampled determinants being of concern. There are no notable differences in any determinants between the three (3) sites along the Mhlatuze River, indicating that there are no land uses or point source activities within the South Block that are contributing to a notable reduction in water quality along the Mhlatuze River system. Minimal quantities of *E. coli* were, however, noted at each sample site. The presence of *E. coli* is most likely associated with the use of the river a source of water for cattle belonging to local communities. The low *E. coli* levels are not considered problematic for aquatic ecosystem health.
SW-Transitional River-471	A sample was taken at a single location along the middle reach of SW-Transitional River-471. Due to access constraints the sample site was upstream of the northern boundary of the South Block. The water quality analysis at this site suggests that water quality along the river was generally 'good' at the time of sampling. The only notable determinant was the slightly elevated Nitrate / Nitrite level (1.13 mg N/ℓ). In South Africa, inorganic nitrogen concentrations in unimpacted surface water systems are usually below 0.5 mg N/ℓ (DWAF, 1996). Elevated nitrogen level in surface water systems is typically a concern as it promotes rapid plant and algal growth which can lead to eutrophic conditions and ecological degradation. 1.13 mg N/ℓ is considered mesotrophic by the South Africa water quality guidelines for aquatic ecosystems (DWAF, 1996). Mesotrophic surface water systems are usually productive systems with high biotic diversity, but which experience

	nuisance aquatic plant growth and algal blooms. The source of nutrients along this river is likely to be a small rural community located 900 m upstream of the sample site which make regular use of the river.
SE-Transitional River-470	A sample was taken at a single location along the lower reach of SE-Transitional River-470. The water quality analysis at this site suggests that water quality along this river was ‘good’ at the time of sampling with no sampled determinants being of concern.
SE-Upper Foothills River-466	A sample was taken at a single location along the lower reach of SE-Upper Foothills River-466. This site is downstream of the sample site along SE-Transitional River-470. The water quality analysis at this site suggests that water quality along this reach was ‘good’ at the time of sampling with no sampled determinants being of concern. There is no notable change in any sampled determinant between SE-Transitional River-470 and SE-Upper Foothills River-466. This suggests that there are no land uses or point source activities within the catchment of this watercourse that are contributing to a notable reduction in water quality.
SW-Upper Foothill River-457	A sample was taken at a single location along the lower reach of SE-Upper Foothills River-456. The water quality analysis at this site suggests that water quality along this river was ‘good’ at the time of sampling with no sampled determinants being of concern.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

▭	Proposed South Block Mining Right Area
▭	South Block 500m Buffer

Eco-Pulse South Block Rivers

🟥	Mountain HW Stream
🟩	Mountain Stream
▨	Transitional River
🟧	Upper Foothill River
▨	Lowland River
┅	Transitional River - Outside South Block
┅	Lowland River - Outside South Block
┅	South East / South West Divide
●	WQ, SASS5 and Fish Survey Sites

N

0 1 2
KM

Scale: 1:80 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

JINDAL IRON ORE (PTY) LTD

FIGURE 7-17
LOCATION OF THE WATER QUALITY ANALYSIS, SASS5 AND FISH SURVEY SITES (ECO-PULSE CONSULTING, 2023)

SLR

PO BOX 1596
CRAMERVIEW
JOHANNESBURG
2060

T: +27 (11) 467-0945
www.slrconsulting.com

Project No: 720.10023.00001
Prepared By: BG
Map Ref No: ESIA 7-14
Date: 17/06/2023

720.10023.00001 ESIA 7-14 Water Quality Analysis Fish Survey

SASS5: Aquatic Macroinvertebrate Assessment

The outcomes of the SASS5 assessments are summarized in Table 7-35. A list of aquatic macroinvertebrates noted at each of the sample sites is presented in the Wetland and Aquatic Ecosystem Impact Assessment (Eco-Pulse Consulting, 2023) (Appendix H).

Table 7-35 Results of the SASS5 Assessment for the Assessed Rivers

	Site	No. Taxa	SASS5 Score	ASPT	Ecological Category (Dallas, 2007)
North-Eastern Uplands Ecoregion – Lower Geomorphic Zone					
Mhlatuze River	SW-Lowland River-461-01	17	108	6.35	B: Good Largely natural with few modifications
	SW-Lowland River-461-02	19	123	6.47	A: Natural Unmodified
	SW-Lowland River-461-03	14	99	7.07	B: Good Largely natural with few modifications
North-Eastern Uplands Ecoregion – Upper Geomorphic Zone					
KwaMazula River	SW-Transitional River-471	24	159	6.63	B: Good Largely natural with few modifications
	SE-Transitional River-470	24	160	6.67	B: Good Largely natural with few modifications
	SE-Upper Foothills River-466	26	179	6.88	B: Good Largely natural with few modifications
	SW-Upper Foothills River-456	24	159	6.63	B: Good Largely natural with few modifications

SW-Lowland River-461 (Mhlatuze River)

According to the Dallas (2007) SASS5 data interpretation guidelines, the upstream (SW-Lowland River-461-01) and downstream (SW-Lowland River-461-03) Mhlatuze River sample sites fall within the 'B: Good' ecological category for the North-Eastern Uplands Ecoregion – Lower Geomorphic Zone. The middle sample site (SW-Lowland River-461-02) falls within the 'A: Natural' ecological category. These outcomes emphasize that the water quality conditions along the sampled length of the Mhlatuze River are good with the system being able to host several highly sensitive aquatic macroinvertebrate taxa. The only notable trend emerging from the SASS5 assessment results is a decline in the number of taxa noted at the downstream site (SW-Lowland River-461-03). This is likely due to reduction in sampled biotope diversity immediately downstream of the Goedertrouw Dam outlet, which was releasing water at the time of the assessment. The high flows associated with the dam release meant that sampling the full range of available biotopes at this site was difficult and dangerous. The average sensitivity score per taxon (ASPT) noted at this site is, however, above 7 (out of a possible 15). This shows the site is suitable to play host to sensitive taxa.

Transitional and Upper Foothill Rivers

Each of the sampled Transitional and Upper Foothill Rivers fall within the 'B: Good' Dallas (2007) ecological category for the North-Eastern Uplands Ecoregion – Upper Geomorphic Zone. These outcomes emphasize that the water quality conditions along the sampled rivers is of good quality with the sampled systems being able to host several highly sensitive aquatic macroinvertebrate taxa. A notable trend from the Transitional and Upper Foothill River SASS5 assessments was that there was little difference in the SASS5 indices of sample sites SE-Transitional River-470 and SE-Upper Foothills River-466, which are hydrologically linked (Figure 7-17).

Fish Survey

During a once-off field survey, nine fish species were observed across all sites. A full list containing individual fish species and their respective sensitivities, as recorded during the survey, is provided in the Wetland and Aquatic Ecosystem Impact Assessment (Eco-Pulse Consulting, 2023) (Appendix H).

Among the recorded species, *Labeo molybdinus, Enteromius gurneyi, Labeobarbus natalensis,* and *Marcusenius caudisquamatus* were found to be the most sensitive. These species are classified as 'Moderately Intolerant' due to their high sensitivity to modified physio-chemical water quality or 'no-flow' conditions. Although they can breed under moderately modified physio-chemical conditions, they are unable to breed under largely to seriously modified physio-chemical conditions. Additionally, these species require flow during certain phases of their life cycles for breeding activities, migration, or nursery habitats. These species have evolved a preference for well-aerated river reaches with flowing water within their ranges. In addition to the species recorded during fish surveys, *Micropanchax myaposae* was identified by DWS (2014) as occurring within the lower Mhlatuze sub-quaternary river reach. *M. myaposae* is regarded as 'Moderately Intolerant' (High Sensitivity) to modified water quality and 'Moderately Tolerant' (moderate sensitivity) to 'no-flow' conditions. Most of the recorded fish species are classified as Least Concern (LC) by the International Union for Conservation of Nature (IUCN). However, *Oreochromis mossambicus* and *Enteromius gurneyi* are classified as 'Vulnerable,' and *Marcusenius caudisquamatus* is classified as 'Endangered.' Notably, *M. caudisquamatus* was recently named as a new species of *Marcusenius* by Maake *et al.* (2014) and is recorded as being limited to the Mhlatuze and Nseleni river systems. This species was recorded at two of the sample sites along Mhlatuze River sites (SW-Lowland River-461-01 and SW-Lowland River-461-02) and one of the tributary sites (SW-Transitional River-471).

Index of Habitat Integrity (IHI) Assessment

The IHI assessment tool was applied at a process unit group level for all Mountain Headwater Streams and all Mountain Streams. Individual IHI assessments were completed for all Transitional Rivers, Upper Foothill Rivers, and Lowland Rivers (Mhlatuze River). Where possible the IHI assessments were supplemented by data collected during site visits, including infield observations, water quality data, aquatic macroinvertebrate (SASS5) surveys, and fish surveys. In the case of the Mhlatuze River (SW-Lowland River-461), a single IHI assessment was completed for the full reach of the river (which occurs within the South Block). This IHI assessment therefore considered the water quality analyses, macroinvertebrate (SASS5) survey, and fish survey results from the three sample sites. The results of the IHI assessment are presented in Table 7-36, including a short comment on notable features influencing the IHI scores.

Table 7-36 Summary of the IHI (habitat) Assessment Outcomes for the South Block

Watercourse(s)	Sampling procedures used to inform IHI	Instream Habitat Score	Riparian Habitat Score	Overall, PES Score	Overall Ecological Category (EC)	Comment
Stream Process Unit 01 (Mountain HW Streams)	Visual observations of selected units. Extrapolation of information to other applicable units. Desktop analysis of catchment impacts	0.31	0.30	0.31	**A: Natural**	Largely natural catchment with no / limited direct impacts to watercourse units. Stream processes and morphology are therefore generally intact.
Stream Process Unit 07 (Mountain HW Streams)		1.81	2.89	2.24	**C: Fair**	Catchment dominated by commercial plantation. Notable encroachment of invasive tree and shrub species into the riparian zone. Altered catchment runoff process associated with forestry, leading to altered stream flow and channel characteristics. Watercourses regularly crossed by forestry roads, causing direct impacts.
Stream Process Unit 02 (Mountain HW Streams)		1.18	2.94	1.88	**B: Largely Natural**	Catchment contains high levels of woody and herbaceous invasive alien plant species, likely linked to historic ploughing and forestry, or present-day overgrazing and frequent burning. Watercourse processes remain largely intact but riparian vegetation has experienced the encroachment of IAPs. Some signs of altered channel morphology.
Stream Process Unit 03 (Mountain HW Streams)		2.05	2.23	2.12	**C Fair**	Catchment dominated by rural settlements and homesteads. Catchment vegetation dominated by woody and herbaceous invasive alien plant species. Frequent signs of channel incision and high levels of invasive alien plant encroachment into the riparian zone. Clearing of indigenous trees from riparian zone is common.
Stream Process Unit 04 (Mountain Streams)		0.31	0.30	0.31	**A: Natural**	Steep streams with small catchments areas. Frequent signs of channel incision and high levels of invasive alien plant encroachment into the riparian zone. Clearing of indigenous trees from riparian zone is common.
Stream Process Unit 08 (Mountain Streams)		1.181	2.76	2.19	**C: Fair**	Catchment dominated by commercial plantation. Notable encroachment of invasive tree and shrub species into the riparian zone. Altered catchment runoff process associated with forestry, leading to altered stream flow and channel characteristics. Watercourses regularly crossed by forestry roads, causing direct impacts.
Stream Process Unit 05 (Mountain Streams)		1.18	2.94	1.88	**B: Largely Natural**	Catchment contains high levels of woody and herbaceous invasive alien plant species, likely linked to historic ploughing and forestry, or present-day overgrazing and frequent burning. Watercourse processes remain largely intact but riparian vegetation has experienced the encroachment of IAPs. Some signs of altered channel morphology.
Stream Process Unit 06 (Mountain Streams)		2.22	2.37	2.28	**C Fair**	Catchment dominated by rural settlements and homesteads. Catchment vegetation dominated by woody and herbaceous invasive alien plant species. Frequent signs of channel incision and high levels of invasive alien plant encroachment into the riparian zone. Clearing of indigenous trees from riparian zone is common.
SE-Transitional River-455	Extrapolation of data collected from similar sampled river systems Desktop analysis of catchment impacts	1.54	1.76	1.63	**B: Largely Natural**	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics. Reaches of the river in the vicinity of homesteads have experienced vegetation clearing and IAP encroachment.
SE-Transitional River-462	Visual observations Desktop analysis of catchment impacts	1.54	1.76	1.63	**B: Largely Natural**	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics. Reaches of the river in the vicinity of homesteads have experienced vegetation clearing and IAP encroachment.
SE-Transitional River-468	Visual observations Desktop analysis of catchment impacts	1.80	1.86	1.82	**B: Largely Natural**	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics. Reaches of the river in the vicinity of homesteads have experienced vegetation clearing and IAP encroachment.
SE-Transitional River-469	Extrapolation of data collected from similar sampled river systems Desktop analysis of catchment impacts	1.80	1.81	1.81	**B: Largely Natural**	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics. Reaches of the river in the vicinity of homesteads have experienced vegetation clearing and IAP encroachment.

Watercourse(s)	Sampling procedures used to inform IHI	Instream Habitat Score	Riparian Habitat Score	Overall, PES Score	Overall Ecological Category (EC)	Comment
SE-Transitional River-470	Water quality analysis SASS5 survey Fish survey Visual observations Desktop analysis of catchment impacts	1.80	1.86	1.82	**B: Largely Natural**	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics. Reaches of the river in the vicinity of homesteads have experienced vegetation clearing and IAP encroachment. Water quality along the assessed reach is 'good', and instream biotopes are largely uninterrupted allowing this reach to host sensitive aquatic fauna.
SW-Transitional River-463	Extrapolation of data collected from similar sampled river systems Desktop analysis of catchment impacts	1.56	1.65	1.60	**B: Largely Natural**	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics. Reaches of the river in the vicinity of homesteads have experienced vegetation clearing and IAP encroachment.
SW-Transitional River-467	Extrapolation of data collected from similar sampled river systems Desktop analysis of catchment impacts	1.46	1.35	1.41	**B: Largely Natural**	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics. Limited disturbance from homesteads, but potential historic impacts to watercourse associated with ceased agriculture.
SW-Transitional River-471	Water quality analysis SASS5 survey Fish survey Visual observations Desktop analysis of catchment impacts	1.80	1.86	1.82	**B: Largely Natural**	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics. Reaches of the river in the vicinity of homesteads have experienced vegetation clearing and IAP encroachment. Water quality along the assessed reach is 'good', and instream biotopes are largely uninterrupted allowing this reach to host sensitive aquatic fauna.
SW-Transitional River-502	Extrapolation of data collected from similar sampled river systems Desktop analysis of catchment impacts	2.43	1.87	2.20	**D: Poor**	Upper reaches of watercourse reach are unimpacted by catchment or direct activities. Lower reach of the watercourse inundated by the Goedertrouw Dam when the dam is full. This has drastically altered the natural channel and flow characteristics of an approximately 800m long reach of this river unit. This is more than half the length of the assessed reach.
SW-Transitional River-544	Extrapolation of data collected from similar sampled river systems Desktop analysis of catchment impacts	1.24	0.89	1.10	**B: Largely Natural**	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics. Reaches of the river in the vicinity of homesteads have experienced vegetation clearing and IAP encroachment.
SE-Upper Foothill River-466	Water quality analysis SASS5 survey Fish survey Visual observations Desktop analysis of catchment impacts	2.25	2.14	2.21	**C: Fair**	High number of rural homesteads located along the length of this river. Water quality and aquatic faunal surveys suggest that there has been limited impacts to water quality or biotope diversity, but visual observations of the reach revealed that long reach of the river have experienced vegetation removal and IAP encroachment. Several informal or poorly designed road crossings along the length of this watercourse reach are having a localised impact of flow patterns.
SW-Upper Foothill River-456	Water quality analysis SASS5 survey Fish survey Visual observations Desktop analysis of catchment impacts	1.87	1.89	1.88	**B: Largely Natural**	Upper reaches of watercourse reach are unimpacted by catchment or direct activities. Lower reach of the watercourse inundated the Goedertrouw Dam when the dam is full. This has drastically altered the natural channel and flow characteristics of an approximately 900m long reach of this river unit. The total length of the river is however approximately 6km, with much of the watercourse being in a largely natural state.
SW-Upper Foothill River-457	Extrapolation of data collected from similar sampled river systems Desktop analysis of catchment impacts	1.82	1.41	1.66	**B: Largely Natural**	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics. Reaches of the river in the vicinity of homesteads have experienced vegetation clearing and IAP encroachment. Water quality along the assessed reach is 'good', and instream biotopes are largely uninterrupted allowing this reach to host sensitive aquatic fauna.
SW-Lowland River-461 (Mhlatuze River)	Water quality analysis (3 x sites) SASS5 survey (3 x sites) Fish survey (3 x sites) Visual observations (3 x sites) Desktop analysis of catchment impacts	1.83	2.00	1.90	**B: Largely Natural**	Major impacts to the assessed reach of the Mhlatuze River are the impoundment and inundation of a section of the watercourse by the Goedertrouw Dam. The infield sampling did however indicate that there has been limited water quality modification along the assessed reach. IAP encroachment is impacting natural riparian vegetation, most notably in the vicinity of the rural settlements where vegetation removal is an ongoing issue.

Ecological Importance & Sensitivity (EIS) Assessment

Ecological Importance refers to the significance of aquatic resources for maintaining biological diversity and ecological functioning on local and wider scales. Ecological Sensitivity describes the ability of a system to resist disturbance and recover from it. A detailed description of the Ecological Importance and Sensitivity (EIS) assessment scores and rating is provided in Appendix H. A summary of the EIS ratings is described below.

Mountain Headwater Streams and Mountain Streams

All Mountain Headwater and Mountain Streams (Process Units 01 –08) are rated as being of Low EIS, based on the following considerations:

- The Mountain Headwater and Mountain Streams are considered Least Threatened in terms of conservation threat status of the NBA and are not considered FEPAs.
- These streams units do not host important or sensitive taxa and provide only limited refugia for biota due to their ephemeral / seasonal flow.
- The stream units are likely to be moderately sensitive to flow related changes and changes in water quality due to their prevailing ephemeral / seasonal flow conditions.
- Despite the low diversity of instream habitat and absence of sensitive/intolerant biota, these stream units have relatively high levels of connectivity with the downstream watercourses. This makes these watercourses important wildlife corridors.

Transitional and Upper Foothill Rivers

All Transitional and Upper Foothill rivers were rated as being of Moderate EIS, based on the following considerations:

- The Transitional and Upper Foothill rivers are considered Least Threatened in terms of conservation threat status of the NBA and are not considered FEPAs.
- The rivers are likely to play host to a range of aquatic fauna that rely on the year-round presence of water for them to survive and breed due to their perennial flow.
- These rivers likely provide vital refugia to aquatic fauna, especially during times of environmental stress such as low flow / drought periods. The species relying on this system are therefore likely to be sensitive to reductions in flow.
- The SASS5 and fish surveys revealed that several intolerant macro-invertebrate and fish species rely on these river systems, with these species likely using the available habitat to breed and complete their life cycles.
- These river systems have the potential to host *M. caudisquamatus* (Endangered on the IUCN List), *O. mossambicus* (Endangered on the IUCN List) and *E. gurneyi* (Endangered on the IUCN List).
- These river systems host *M. caudisquamatus*, which was described as a new species of the genus *Marcusenius* by Maake et al. (2014). The species' range is recorded as being limited to only the Mhlatuze and Nseleni river systems. This species was recorded at SW-Upper Foothills River-456. The presence of this unique and range restricted species within the rivers makes these systems important habitat.
- The diversity of instream habitat available to aquatic fauna makes these rivers ecologically important.

Lowland River – Mhlatuze

The assessed reach of the Mhlatuze River (SW-Lowland River-461) was rated as being of High EIS, based on the following considerations:

- The rivers located within the South Block are considered Least Threatened in terms of conservation threat status of the NBA and are not considered FEPAs.
- The diversity of instream habitat types and the perennial nature of flow along river reach R01 means that the unit is well suited to provide good quality refugia for aquatic biota during time of environmental stress.
- The importance of instream and riparian habitat of the reach R01 is further supported by high levels of connectivity of habitat, both laterally and longitudinally, with the buffer around this river remaining largely intact. This suggests that the assessed reach of the Mhlatuze River serves as an important corridor that supports the movement of local wildlife.
- There are several intolerant macro-invertebrate and fish species rely on the assessed reach, with these species likely using the available habitat to breed and complete their life cycles.
- This river systems hosts *M. caudisquamatus* (Endangered on the IUCN List), *O. mossambicus* (Endangered on the IUCN List) and *E. gurneyi* (Endangered on the IUCN List).
- This river systems hosts *M. caudisquamatus*, which was described as a new species of the genus *Marcusenius* by Maake et al. (2014). The species' range is recorded as being limited to only the Mhlatuze and Nseleni river systems. The presence of this unique and range restricted species within the rivers of makes these systems important habitat.
- The high flow volume of the system means it can buffer minor changes in flow condition and water quality, without incurring major impacts to habitat and biota.

WETLANDS – CURRENT STATUS

Present Ecological State Assessment

The PES Assessment for wetlands assessed in the South Block are summarised in Table 7-37. The PES was completed at a process unit level using the WET-Health assessment tool.

Table 7-37 Summary of the PES Assessment Results for the Wetland Process Unit Groups in the South Block

Wetland Process Unit	HGM Type	Hydrology PES Category	Geomorphology PES Category	Vegetation PES Category	Overall, PES Category	Key Impact(s)
Wetland Process Unit Group 01	Seep	D	C	D	D: Largely Modified	• Vegetation - Wetlands belonging to this group were heavily utilized for subsistence farming, with most of the wetland area being planted to crops, mostly *Colocasia esculenta*. • Hydrology - Reduced runoff to wetland due to woody IAPs within catchment areas. Increased on site water use due to presence of crops and woody IAPs within wetland area. Altered flow through wetland due to drainage and cultivation. • Geomorphology – Altered wetland geomorphic structure due to regular cultivation. Sediment loss from wetland area due to drainage and entrainment of bare cultivated areas.
Wetland Process Unit Group 02		C	C	C	C: Moderately Modified	• Vegetation - Encroachment of woody IAPs into wetland area. Altered hygrophilous grassland composition due to overgrazing and burning. • Hydrology – Increased runoff volumes and velocities due to reduced wetland and catchment basal cover (overgrazing and burning). • Geomorphology – Increased sediment inputs associated with reduced catchment basal cover.
Wetland Process Unit Group 03		D	C	D	C: Moderately Modified	• Vegetation - intense encroachment of woody IAPs into wetland area. • Hydrology – Increased runoff volumes and velocities due to reduced wetland and catchment basal cover (overgrazing and burning). • Geomorphology – Increased sediment inputs associated with reduced catchment basal cover.
Wetland Process	Unchanneled Valley Bottom	C	C	C	C: Moderately Modified	• Vegetation - Encroachment of woody IAPs into wetland area. Altered hygrophilous grassland composition due to overgrazing and burning. Central, permanently inundated wetland areas remain largely intact.

Wetland Process Unit	HGM Type	Hydrology PES Category	Geomorphology PES Category	Vegetation PES Category	Overall, PES Category	Key Impact(s)
Unit Group 04						• Hydrology – Increased runoff volumes and velocities due to reduced wetland and catchment basal cover (overgrazing and burning). Geomorphology – increased sediment inputs associated with reduced catchment basal cover.
Wetland Process Unit Group 05		C	C	C	C: Moderately Modified	• Vegetation - Encroachment of woody IAPs into wetland area. Altered hygrophilous grassland composition due to overgrazing and burning. Central, permanently inundated wetland areas remain largely intact. • Hydrology - Increased runoff volumes and velocities due to reduced wetland and catchment basal cover (overgrazing and burning). • Geomorphology – increased sediment inputs associated with reduced catchment basal cover.

Wetlands Ecosystem Services Assessment

An assessment of wetland ecosystem services (i.e., wetland functionality) was conducted using the WET-Ecoservices tool across two themes: Regulating Services and Provisioning and Cultural Services.

Regulating Services

The most important regulating service provided by wetlands belonging to each of the three seep wetland process unit groups is carbon storage (Table 7-38). This service refers to the trapping of carbon in waterlogged wetland soils, principally as organic matter, thereby contributing positively as a carbon sink, which is of significance for global climate change. The seasonally saturated soils that occur within the wettest parts of the South Block seep wetlands makes these units reasonably well suited to supply this service. The generally small seep wetland size, modified nature, and the lack of demand for regulating services in the context of the South Block means that seep wetlands are not of notable regulatory importance for other assessed services.

The unchanneled valley bottom wetlands within the South Block are of Very High importance for carbon storage services. These wetlands were largely dominated by permanently saturated soils which are characterised by nominal decomposition rates for accumulated organic matter. The valley bottom wetlands are also larger in size than the seeps and therefore have the capacity to act as carbon sinks on a larger scale than the small seep units. Another important regulatory service provided by the valley bottom wetlands is sediment trapping. These wetlands are well placed to provide this service as they are robustly vegetated and are characterised by diffuse flow patterns, creating favourable conditions for sediment accumulation.

Table 7-38 Regulating Services Importance Scores and Overall Importance Rating

	Regulating Services Scores (0-4)								
Wetland Process Unit Groups	**Flood attenuation**	**Streamflow regulation**	**Sediment trapping**	**Erosion control**	**Phosphate removal**	**Nitrate removal**	**Toxicant removal**	**Carbon storage**	**Importance Rating**
01 (Seep)	0.0	0.8	1.0	0.6	0.6	0.4	0.3	1.7	**Moderate**
02 (Seep)	0.0	1.3	1.0	0.2	0.6	0.5	0.3	1.8	**Moderate**
03 (Valley Bottom)	0.1	0.5	1.0	0.8	0.6	0.4	0.3	2.1	**Moderate**
04 (Valley Bottom)	0.1	1.3	2.4	1.1	2.0	1.8	1.4	3.3	**Very High**
05 (Valley Bottom)	0.1	1.5	2.4	1.1	2.0	1.9	1.5	3.4	**Very High**

Provisioning and Cultural Services:

Seeps belong to Process Unit Group 01 are of Moderately-High provisioning importance. This rating is a result of these wetlands being used for the cultivation of subsistence crops, and the reasonably high dependence of local households on the food grown within these wetlands given the isolated and low-income nature of the study area.

Seep wetlands belonging to Process Unit Groups 02 and Process Unit Group 03 are of Moderately-Low cultural and provisioning importance.

The valley bottom wetlands within the South Block are of Moderate provisioning importance due to the permanent diffuse flow along the valley bottom wetlands, which could serve as an important water source for local communities. The demand for water abstraction from wetlands for drinking or agriculture is considered low due to the difficulties with accessing water from the wetlands, and the use of boreholes as a primary water abstraction method by local communities in the South Block.

Table 7-39 Provisioning and Cultural Services Importance Scores and Overall Importance Rating

	Provisioning & Cultural Services Scores (0-4)							
Wetland Process Units	**Water supply**	**Harvestable natural resources**	**Food for livestock**	**Cultivated foods**	**Tourism and recreation**	**Education and research**	**Cultural and spiritual**	**Overall Rating**
01 (Seep)	0.5	0.7	0.0	2.5	0.0	0.0	1.0	**Moderately-High**
02 (Seep)	0.0	0.0	1.3	1.5	0.0	0.0	1.0	**Moderately-Low**
03 (Valley Bottom)	0.0	1.2	0.0	1.5	0.0	0.0	1.0	**Moderately-Low**
04 (Valley Bottom)	1.7	1.2	0.0	1.8	0.0	0.0	1.0	**Moderate**
05 (Valley Bottom)	1.7	1.2	0.0	1.3	0.0	0.0	1.0	**Moderate**

Wetland EIS Assessments

Wetland EIS Assessments were conducted for all wetland process unit groups. The wetland EIS assessment involved rating four major components, namely ecological importance in terms of biodiversity maintenance (from ecosystem services assessment); cultural and provisions functions (from ecosystem services assessment); regulating functions (from ecosystem services assessment) and ecological sensitivity. A summary of the EIS assessment is provided in Table 7-40. An EIS of **Moderate** was assigned for the Wetland Process Unit Group 01, Wetland Process Unit Group 04, Wetland Process Unit Group 05. An EIS of **Low** was assigned to Wetland Process Group 02 and Wetland Process Group 03. The EIS assessments were based on the following considerations:

- Wetlands belonging to Process Unit Group 01 are considered important as they are associated with food provision in the form of subsistence cultivation. These seep wetlands were, however, not considered ecologically sensitive.
- Wetlands belonging to Process Group 02 and Process Group 03 are both of low ecological importance as they provide limited vital ecosystem services. These wetlands were not considered ecologically sensitive.
- Wetlands belonging to Process Unit Group 04 and Process Unit Group 05 are considered ecologically important because of the role they play as carbon sinks. These wetlands are also considered ecologically sensitive to changes in flow and sediment inputs as they rely on aggradational processes and permanent diffuse flow for their functioning and evolution.

Table 7-40 EIS Scores and Overall EIS Rating for the South Block Wetland Process Unit Groups

	Rating (out of 4)			
Wetland Process Units	**Ecological Importance**	**Ecological Sensitivity**	**Overall EIS Score**	**Overall EIS Rating**
01 (Seep)	2.50	1.10	2.05	Moderate
02 (Seep)	1.50	1.10	1.05	Low
03 (Valley Bottom)	1.50	1.10	1.05	Low
04 (Valley Bottom)	2.20	2.20	2.30	Moderate
05 (Valley Bottom)	2.20	2.20	2.30	Moderate

Recommended Ecological Categories and Recommended Management Objectives

The Recommended Ecological Category (REC) for resource units is the target or desired state of resources to achieve water resource management objectives and quality targets. The determination of REC is based on the consideration of physical, ecological, and social factors, as well as opportunities to improve these, driven by the context and setting. The approach of DWAF's Directorate: Resource Directed Measures (RDM) is to improve the condition of the river if the EIS is high or very high, considering the related causes to determine whether improvement is realistic and attainable. If the EIS is moderate or low, the aim should be to maintain the river in its PES. Ecological Categories A to D can be recommended as future states depending on the EIS and PES, while Ecological Categories E and F PES are regarded as ecologically unacceptable, and remediation is needed if possible. A generic matrix for determining RECs and Recommended Management Objectives (RMO) for water resources is provided in Table 7-41.

Table 7-41 Generic Matrix for the Determination of REC and RMO for Water Resources (based on Kleynhans and Louw, 2007)

			EIS			
			Very high	High	Moderate	Low
PES	A	Pristine/Natural	A Maintain	A Maintain	A Maintain	A Maintain
	B	Largely Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Fair	B Improve	B/C Improve	C Maintain	C Maintain
	D	Poor	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Very Poor	D Improve	E/F Improve	E/F Improve	E/F Improve

Based on the matrix in Table 7-42 the minimum RMO for all watercourses in the South Block study area, except for SW-Lowland River-461 (Mhlatuze River) is to maintain the current PES (Table 7-42). The RMO for the assessed reach of the Mhlatuze River would be to improve its current PES to sustain and improve the important ecological functions it provides.

Table 7-42 REC and RMO for the Delineated Watercourse Units Based on their PES and EIS Ratings

Watercourse Units	PES	EIS	REC	RMO
Rivers & Streams				
Stream Process Unit 01 (Mountain HW Streams)	A: Natural	**D: Low**	A	Maintain PES
Stream Process Unit 07 (Mountain HW Streams)	C: Fair	D: Low	C	Maintain PES
Stream Process Unit 02 (Mountain HW Streams)	B: Largely Natural	D: Low	B	Maintain PES
Stream Process Unit 03 (Mountain HW Streams)	C: Fair	D: Low	C	Maintain PES
Stream Process Unit 04 (Mountain Streams)	A: Natural	D: Low	A	Maintain PES
Stream Process Unit 08 (Mountain Streams)	C: Fair	D: Low	C	Maintain PES
Stream Process Unit 05 (Mountain Streams)	B: Largely Natural	D: Low	B	Maintain PES
Stream Process Unit 06 (Mountain Streams)	C Fair	D: Low	C	Maintain PES
SE-Transitional River-455	B: Largely Natural	C: Moderate	B	Maintain PES
SE-Transitional River-462	B: Largely Natural	C: Moderate	B	Maintain PES
SE-Transitional River-468	B: Largely Natural	C: Moderate	B	Maintain PES
SE-Transitional River-469	B: Largely Natural	C: Moderate	B	Maintain PES
SE-Transitional River-470	B: Largely Natural	C: Moderate	B	Maintain PES
SW-Transitional River-463	B: Largely Natural	C: Moderate	B	Maintain PES
SW-Transitional River-467	B: Largely Natural	C: Moderate	B	Maintain PES
SW-Transitional River-471 (KwaMazula River)	B: Largely Natural	C: Moderate	B	Maintain PES
SW-Transitional River-502	D: Poor	C: Moderate	D	Maintain PES
SW-Transitional River-544	B: Largely Natural	C: Moderate	B	Maintain PES
SE-Upper Foothill River-466	C: Fair	C: Moderate	C	Maintain PES
SW-Upper Foothill River-456	B: Largely Natural	C: Moderate	B	Maintain PES
SW-Upper Foothill River-457	B: Largely Natural	C: Moderate	B	Maintain PES
SW-Lowland River-461 (Mhlatuze River)	B: Largely Natural		A/B	Improve PES
Wetlands				
Wetland Process Unit Group 01	D: Poor	C: Moderate	D	Maintain PES
Wetland Process Unit Group 02	C: Fair	D: Low	C	Maintain PES
Wetland Process Unit Group 03	C: Fair	D: Low	C	Maintain PES
Wetland Process Unit Group 04	C: Fair	C: Moderate	C	Maintain PES
Wetland Process Unit Group 05	C: Fair	C: Moderate	C	Maintain PES

7.4.8.2 North Block

FRESHWATER ECOSYSTEM CONSERVATION CONTEXT

The conservation context for the North Block is the same as for the South Block.

WATERCOURSE CLASSIFICATION AND HABITAT CHARACTERISTICS

The Process Unit Grouping has not been completed for watercourses in the North Block due to baseline assessment being focussed largely on areas where mining has already been planned, i.e., the South Block. However, the desktop findings are included in the following sections.

Mountain Headwater Streams

The 253 Mountain Headwater Streams mapped in the North Block were divided into four different process unit groups as follows:

- Process Unit Group 01 (94 stream units);
- Process Unit Group 02 (30 stream units);
- Process Unit Group 03 (119 stream units); and
- Process Unit Group 07 (10 stream units).

All process units identified within the Mountain Headwater Stream classification are ephemeral in nature with flows expected for short periods of time following heavy rainfall events. All units are identified as steep streams with small catchment areas and display varying degree of modification between process units. The streams are characterised by alluvial soils (substrate) and generally dry alluvial stream beds (instream biotopes). Riparian features of streams in this classification are associated with macro-channels.

Mountain Streams

The 62 Mountain Streams mapped in the North Block were divided into four different process unit groups as follows:

- Process Unit Group 04 (10 units);
- Process Unit Group 05 (6 units);
- Process Unit Group 06 (38 units); and
- Process Unit Group 08 (8 units).

All process units identified within the Mountain Stream classification have a seasonal flow with mixed bedrock and alluvial substrates. All units are identified as moderately steep streams with small catchment areas. The catchment areas display varying degree of modification between process units. The general instream biotopes include pools, riffles and runs. Riparian features of streams in this classification are associated with both macro channel and active channel banks, however the expected riparian vegetation varies between process units.

Transitional Rivers

Twelve Transitional Rivers were identified and reported on within the North Block:

- N - Transitional River – 1;
- N - Transitional River – 274;
- N - Transitional River – 276;
- N - Transitional River – 277;
- N - Transitional River – 278;
- N - Transitional River – 279;
- N - Transitional River – 280;
- N - Transitional River – 281;
- N - Transitional River – 282;
- N - Transitional River – 283;

- N - Transitional River – 284; and
- N - Transitional River – 331.

The biophysical characteristics of these rivers were based on desktop level assessments. It is assumed that all 12 rivers exhibit a seasonal to perennial flow. The substrate is likely dominated by bedrock and sandy alluvium. The assumed instream biotopes are riffles, rapids, and streams; pools and marginal vegetation. The assumed riparian features of these rivers are both active and macro channel banks.

Upper Foothill Rivers

The following two Upper Foothill Rivers were identified in the North Block:

- N-Upper Foothill River-275
- N-Upper Foothill River-297

The biophysical characteristics of these rivers were based on desktop level assessments. It is assumed that both rivers exhibit a perennial flow, with a dominant substrate of gravel and stones, with the scattered occurrence of cobble and boulders. It is also assumed that certain reaches of these rivers are dominated by sand. The assumed instream biotopes are riffles and runs (cobbles, boulders, and bedrock sheets); pools (gravel, sand, cobbles, boulders, and bedrock sheets) and marginal vegetation. The assumed riparian features of these rivers are both active and macro channel banks.

Lowland Foothill River – Middle Mfule River

One Lowland Foothill River occurs within the North Block and was labelled as N-Lower Foothills River-285 (Middle Mfule River). The biophysical characteristics of the N - Lower Foothills River - 285 (Middle Mfule River) was based on desktop level assessments, as such, the biophysical characteristics are assumed. It is assumed that N-Lower Foothills River-285 is a perennial river with a gravel and stones being the dominant substrate, with scattered occurrence of cobble and boulders. Certain reaches of the river are assumed to be dominated by sand. The expected instream biotopes are riffles and runs (cobbles and boulders), pools (gravel, sand, cobbles, boulders) and marginal vegetation. The river is assumed to have both active channel banks and macro channel banks. The macro bank is assumed to have a wooded riparian zone with some alien invasive plant species, and the active channel is expected to have some herbaceous marginal vegetation.

Lowland River – Lower Mfule River

The Lower Mfule River was reported to occur within the North Block labelled N-Lowland River-286 (Lower Mfule River). The biophysical characteristics of the N-Lowland River-286 was based on desktop level assessments, as such, the biophysical characteristics are assumed. It is assumed that N-Lowland River-286 is a perennial river a dominant substrate comprised of by sand, gravel, and stones, with scattered occurrence of cobble and boulders. The expected instream biotopes are riffles and runs (cobbles and boulders), pools (gravel, sand, cobbles, boulders) and marginal vegetation. The river is assumed to have both active channel banks and macro channel banks. The macro bank is assumed to have a wooded riparian zone with some alien invasive plant species, and the active channel is expected to have some herbaceous marginal vegetation.

Seep Wetlands

There were 69 Seep Wetlands mapped and assessed at a desktop level. The 69 Seep Wetlands were divided into three different process unit groups:

- Wetland Process Unit Group 01 (comprising 8 units);
- Wetland Process Unit Group 02 (comprising 18 units); and
- Wetland Process Unit Group 03 (comprising 43 units).

Wetland Process Unit 01

Wetland Process Unit 01 is assumed to comprise of previously cultivated headwater seep wetlands which are located in a catchment characterised by scattered houses and degraded secondary grassland (due to over grazing). The catchment is also assumed to have scattered woody invasive alien plants. The wetness zone is characterized as temporary or seasonal, with diffuse sub-surface flow as the dominant water input and low flow pattern. Various subsistence crops are assumed to be the dominant vegetation in this process unit group.

Wetland Process Unit Group 02

Wetland Process Unit 02 is assumed to comprise of hygrophilous grassland seep wetlands which are located in a catchment characterised by scattered houses and degraded secondary grassland (due to over grazing). The catchment is also assumed to have scattered woody invasive alien plants. The wetness zone is assumed to be temporary, with diffuse sub-surface flow as the dominant water input and low flow pattern. It is assumed that the vegetation is comprised of Hygrophilous grassland species and moderately abundant facultative (wet) sedge species.

Wetland Process Unit Group 03

Wetland Process Unit 03 is assumed to comprise of previously cultivated and/or disturbed seeps that have been colonized by dense woody and herbaceous invasive and alien plants species. The catchment is assumed to be characterised by scattered houses and degraded secondary grassland (due to over grazing) and scattered woody invasive alien plants. The wetness zone is assumed to be temporary or seasonal, with diffuse sub-surface flow as the dominant water input and low flow pattern. It is assumed that the vegetation within the Temporary Zone is dominated by woody and herbaceous invasive and alien plants species. The Seasonal Zone is assumed to be dominated by *Cyperus latifolius* and other facultative (wet) sedge species.

Unchanneled Valley Bottom Wetlands

UVB Wetlands (40) were mapped and were assessed at a desktop level. The 40 UVB Wetlands were divided into two different process unit groups:

- Wetland Process Unit Group 04 (comprising 17 units); and
- Wetland Process Unit Group 05 (comprising 23 units).

UVB Wetland Process Unit 04

It is assumed that Wetland Process Unit 04 is a narrow UVB wetland which is subject to notable edge pressure from invasive alien plants. The catchment area is characterized by scattered houses and degraded secondary grassland due to overgrazing, with scattered woody invasive alien plants. The dominant wetness zone is seasonal, and the dominant water input and low flow pattern is diffuse sub-surface flow. It is assumed that the vegetation within the Temporary Zone is dominated by woody and herbaceous invasive and alien plants species. The Seasonal and Permanent Zone is assumed to be dominated by Sedgeland.

UVB Wetland Process Unit 05

It is assumed that Wetland Process Unit 05 is a broad UVB wetland which is subject to notable edge pressure from invasive alien plants. The catchment area is characterized by scattered houses and degraded secondary grassland due to overgrazing, with scattered woody invasive alien plants. The dominant wetness zone is permanent, and the dominant water input and low flow pattern is diffuse sub-surface flow. It is assumed that the vegetation within the Temporary Zone is dominated by woody and herbaceous invasive and alien plants species and grass species. The vegetation in the Seasonal and Permanent Zone is assumed to comprise of facultative wet sedge species.

RIVERS AND STREAMS

Present Ecological State Assessment

A desktop Present Ecological State (PES) assessment for the river and stream units located within the North Block area was undertaken for all process unit groups (Mountain Headwater Streams and Mountain Streams) and for all individually assessed watercourse units (Transitional Rivers, Upper Foothill Rivers, Lower Foothill Rivers, and Lowland Rivers).

Index of Habitat Integrity (IHI) Assessment

The IHI assessment tool was applied at a process unit group level for all Mountain Headwater Streams and all Mountain Streams. Individual IHI assessments were completed for all Transitional Rivers, Upper Foothill Rivers, and Lowland Rivers. The IHI assessment was undertaken at desktop level and was based on aerial imagery and the specialist's professional expertise and understanding of rivers in similar environments. The results of the desktop level IHI assessment are presented in Table 7-43.

Ecological Importance and Sensitivity Assessment

Ecological Importance refers to the significance of aquatic resources for maintaining biological diversity and ecological functioning on local and wider scales. Ecological Sensitivity describes the ability of a system to resist disturbance and recover from it. The EIS of rivers and streams in the North Block was assessed at a desktop level and was based on aerial imagery and the specialist's professional expertise and understanding of rivers in similar environments. In terms of EIS the Mountain Headwater and Mountain Streams were assessed to be Low, the Transitional Streams and Upper Foothill River was assessed to be Moderate and the Lower Foothill River was High. The results of the desktop level EIS assessment are presented in Appendix H.

Table 7-43 Summary of the Desktop Level IHI (Habitat) Assessment for the North Block

Watercourse(s)	Instream Habitat Score	Riparian Habitat Score	Overall, PES Score	Overall Ecological Category (EC)	Comment
Stream Process Unit 01 (Mountain HW Streams)	0.31	0.30	0.31	A: Natural	Largely natural catchment with no / limited direct impacts to watercourse units. Stream processes and morphology are therefore generally intact.
Stream Process Unit 07 (Mountain HW Streams)	1.81	2.89	2.24	C: Fair	Catchment dominated by commercial plantation. Notable encroachment of invasive tree and shrub species into the riparian zone. Altered catchment runoff process associated with forestry, leading to altered stream flow and channel characteristics. Watercourses regularly crossed by forestry roads, causing direct impacts.
Stream Process Unit 02 (Mountain HW Streams)	1.18	2.94	1.88	B: Largely Natural	Catchment contains high levels of woody and herbaceous invasive alien plant species, likely linked to historic ploughing and forestry, or present-day overgrazing and frequent burning. Watercourse processes remain largely intact but riparian vegetation has experienced the encroachment of IAPs. Some signs of altered channel morphology.
Stream Process Unit 03 (Mountain HW Streams)	2.05	2.23	2.12	C Fair	Catchment dominated by rural settlements and homesteads. Catchment vegetation dominated by woody and herbaceous invasive alien plant species. Frequent signs of channel incision and high levels of invasive alien plant encroachment into the riparian zone. Clearing of indigenous trees from riparian zone is common.
Stream Process Unit 04 (Mountain Streams)	0.31	0.30	0.31	A: Natural	Steep streams with small catchments areas. Frequent signs of channel incision and high levels of invasive alien plant encroachment into the riparian zone. Clearing of indigenous trees from riparian zone is common.
Stream Process Unit 08 (Mountain Streams)	1.181	2.76	2.19	C: Fair	Catchment dominated by commercial plantation. Notable encroachment of invasive tree and shrub species into the riparian zone. Altered catchment runoff process associated with forestry, leading to altered stream flow and channel characteristics. Watercourses regularly crossed by forestry roads, causing direct impacts.

Watercourse(s)	Instream Habitat Score	Riparian Habitat Score	Overall, PES Score	Overall Ecological Category (EC)	Comment
Stream Process Unit 05 (Mountain Streams)	1.18	2.94	1.88	B: Largely Natural	Catchment contains high levels of woody and herbaceous invasive alien plant species, likely linked to historic ploughing and forestry, or present-day overgrazing and frequent burning. Watercourse processes remain largely intact but riparian vegetation has experienced the encroachment of IAPs. Some signs of altered channel morphology.
Stream Process Unit 06 (Mountain Streams)	2.22	2.37	2.28	C Fair	Catchment dominated by rural settlements and homesteads. Catchment vegetation dominated by woody and herbaceous invasive alien plant species. Frequent signs of channel incision and high levels of invasive alien plant encroachment into the riparian zone. Clearing of indigenous trees from riparian zone is common.
N - Transitional River - 1	1.54	1.76	2.63	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N - Transitional River - 274	1.24	0.89	1.10	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N - Transitional River - 276	2.69	1.87	2.36	C Fair	Watercourse catchment dominated by commercial forestry. The instream and riparian ecological integrity have likely been impacted due to this land use.
N - Transitional River - 277	2.14	1.74	1.98	C Fair	Watercourse catchment dominated by commercial forestry. The instream and riparian ecological integrity have likely been impacted due to this land use.
N - Transitional River - 278	1.54	1.86	1.67	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N - Transitional River - 279	1.56	1.65	1.60	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N - Transitional River - 280	1.80	1.81	1.80	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N - Transitional River - 281	1.80	1.86	1.82	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.

Watercourse(s)	Instream Habitat Score	Riparian Habitat Score	Overall, PES Score	Overall Ecological Category (EC)	Comment
N - Transitional River - 282	1.80	1.86	1.82	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N - Transitional River - 283	1.54	1.76	1.63	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N - Transitional River - 284	1.82	1.41	1.66	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N - Transitional River - 331	1.54	1.76	1.63	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N-Upper Foothill River-275	1.83	2.00	1.90	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N-Upper Foothill River-297	1.83	2.00	1.90	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N - Lower Foothills River-285 (Middle Mfule River)	1.71	1.84	1.76	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.
N - Lowland River – 286 (Lower Mfule River)	1.71	1.84	1.76	B: Largely Natural	Watercourse processes remain largely intact, with limited alterations to channel morphology and characteristics.

WETLANDS

Present Ecological State Assessment

A desktop PES assessment for the wetlands located within the North Block area was undertaken at process unit level. The results of the desktop level PES are summarised in Table 7-44.

Table 7-44 PES Assessment Results for the Wetland Process Unit Groups in the North Block

Wetland Process Unit	HGM Type	Hydrology PES Category	Geomorphology PES Category	Vegetation PES Category	Overall, PES Category	Likely Key Impact(s)
Wetland Process Unit Group 01	Seep	D	C	D	D: Largely Modified	• Vegetation - Heavily utilized for subsistence farming. • Hydrology - Reduced runoff to wetland due to woody IAPs within catchment areas. Increased on site water use due to presence of crops and woody IAPs within wetland area. Altered flow through wetland due to drainage and cultivation. • Geomorphology – Altered wetland geomorphic structure due to regular cultivation. Sediment loss from wetland area due to drainage and entrainment of bare cultivated areas.
Wetland Process Unit Group 02		C	C	C	C: Moderately Modified	• Vegetation - Encroachment of woody IAPs into wetland area. Altered hygrophilous grassland composition due to overgrazing and burning. • Hydrology – Increased runoff volumes and velocities due to reduced wetland and catchment basal cover (overgrazing and burning). • Geomorphology – Increased sediment inputs associated with reduced catchment basal cover.
Wetland Process Unit Group 03		D	C	D	C: Moderately Modified	• Vegetation - intense encroachment of woody IAPs into wetland area. • Hydrology – Increased runoff volumes and velocities due to reduced wetland and catchment basal cover (overgrazing and burning). • Geomorphology – Increased sediment inputs associated with reduced catchment basal cover.
Wetland Process Unit Group 04	Unchanneled Valley Bottom	C	C	C	C: Moderately Modified	• Vegetation - Encroachment of woody IAPs into wetland area. Altered hygrophilous grassland composition due to overgrazing and burning. Central, permanently inundated wetland areas remain largely intact. • Hydrology – Increased runoff volumes and velocities due to reduced wetland and catchment basal cover (overgrazing and burning). • Geomorphology – increased sediment inputs associated with reduced catchment basal cover.

Wetland Process Unit	HGM Type	Hydrology PES Category	Geomorphology PES Category	Vegetation PES Category	Overall, PES Category	Likely Key Impact(s)
Wetland Process Unit Group 05		C	C	C	C: Moderately Modified	- Vegetation - Encroachment of woody IAPs into wetland area. Altered hygrophilous grassland composition due to overgrazing and burning. Central, permanently inundated wetland areas remain largely intact. - Hydrology – Increased runoff volumes and velocities due to reduced wetland and catchment basal cover (overgrazing and burning). - Geomorphology – increased sediment inputs associated with reduced catchment basal cover.

Wetlands Ecosystem Services Assessment

An assessment of wetland ecosystem services (i.e., wetland functionality) was conducted using the WET-Ecoservices tool.

Regulating Services

The most important regulating service provided by wetlands belonging to each of the three seep wetland process unit groups located within the North Block is carbon storage. Another important regulatory service provided by the valley bottom wetlands is sediment trapping. These wetlands are well placed to provide this service as they are assumed to be robustly vegetated and are characterised by diffuse flow patterns, creating favourable conditions for sediment accumulation.

Table 7-45 Regulating Services Importance Scores and Overall Importance Rating - North Block Wetland Units

	Regulating Services Scores (0-4)								
Wetland Process Unit Groups	Flood attenuation	Streamflow regulation	Sediment trapping	Erosion control	Phosphate removal	Nitrate removal	Toxicant removal	Carbon storage	Importance Rating
01 (Seep)	0.0	0.8	1.0	0.6	0.6	0.4	0.3	1.7	Moderate
02 (Seep)	0.0	1.3	1.0	0.2	0.6	0.5	0.3	1.8	Moderate
03 (Valley Bottom)	0.1	0.5	1.0	0.8	0.6	0.4	0.3	2.1	Moderate
04 (Valley Bottom)	0.1	1.3	2.4	1.1	2.0	1.8	1.4	3.3	Very High
05 (Valley Bottom)	0.1	1.5	2.4	1.1	2.0	1.9	1.5	3.4	Very High

Provisioning and Cultural Services

Seeps belong to Process Unit Group 01 are of Moderately-High provisioning importance. This rating is a result of these wetlands being used for the cultivation of subsistence crops, and the reasonably high dependence of local households on the food grown within these wetlands. Seep wetlands belonging to Process Unit Groups 02 and Process Unit Groups 03 are of Moderately-Low cultural and provisioning importance. The valley bottom wetlands within the North Block are of Moderate provisioning importance, this is due to the permanent diffuse flow along the valley bottom wetlands, which could serve as an important water source for local communities.

Wetland EIS Assessments

As for the South Block Wetland EIS Assessments were conducted for all wetland process unit groups in the North Block. A summary of the EIS assessment is provided in Table 7-40. The EIS for Wetland Process Unit Group 01, Wetland Process Unit Group 04, and Wetland Process Unit Group 05 was assessed as being of **Moderate**. An EIS of **Low** was assigned to Wetland Process Group 02 and Wetland Process Group 03. The EIS assessments were based on the following considerations:

- Wetland belonging To Process Unit Group 01 are considered important as they are associated with food provision in the form of subsistence cultivation. These seep wetlands were, however, not considered ecologically sensitive.
- Wetlands belonging to Process Unit Group 02 and Process Unit Group 03 are both of low ecological importance as they provide limited vital ecosystem services. These wetlands were not considered ecologically sensitive.
- Wetlands belonging to Process Unit Group 04 and Process Unit Group 05 are considered ecologically important because of the role they play as carbon sinks. These wetlands are also considered ecologically sensitive to changes in flow and sediment inputs as they rely on aggradational processes and permanent diffuse flow for their functioning and evolution.

Table 7-46 EIS scores and Overall, EIS Rating for the Wetland Process Unit Groups - North Block

	Rating (out of 4)			
Wetland Process Units	Ecological Importance	Ecological Sensitivity	Overall, EIS Score	Overall, EIS Rating
01 (Seep)	2.50	1.10	2.05	Moderate
02 (Seep)	1.50	1.10	1.05	Low
03 (Valley Bottom)	1.50	1.10	1.05	Low
04 (Valley Bottom)	2.20	2.20	2.30	Moderate
05 (Valley Bottom)	2.20	2.20	2.30	Moderate

Recommended Ecological Categories and Recommended Management Objectives

Based on the generic matrix for determining RECs and RMO for water resources (Table 7-41), the minimum RMO for all watercourses in the North Block study area, N - Lower Foothills River - 285 (Middle Mfule River) and N - Lowland River – 286 (Lower Mfule River) is to maintain the current PES. The REC and RMO for the delineated watercourse units in the North Block, based on their PES and EIS ratings is shown in Table 7-47. The RMO for the N - Lower Foothills River – 285 and N - Lowland River – 286 is to improve PES.

Table 7-47 REC and RMO for the Delineated Watercourse Units Based on their PES and EIS ratings

Watercourse Units	PES	EIS	REC	RMO
Rivers & Streams				
Stream Process Unit 01 (Mountain HW Streams)	A: Natural	D: Low	A	Maintain PES
Stream Process Unit 07 (Mountain HW Streams)	C: Fair	D: Low	C	Maintain PES
Stream Process Unit 02 (Mountain HW Streams)	B: Largely Natural	D: Low	B	Maintain PES
Stream Process Unit 03 (Mountain HW Streams)	C Fair	D: Low	C	Maintain PES
Stream Process Unit 04 (Mountain Streams)	A: Natural	D: Low	A	Maintain PES
Stream Process Unit 08 (Mountain Streams)	C: Fair	D: Low	C	Maintain PES
Stream Process Unit 05 (Mountain Streams)	B: Largely Natural	D: Low	B	Maintain PES
Stream Process Unit 06 (Mountain Streams)	C Fair	D: Low	C	Maintain PES
N - Transitional River - 1	B: Largely Natural	C: Moderate	B	Maintain PES
N - Transitional River - 274	B: Largely Natural	C: Moderate	B	Maintain PES
N - Transitional River - 276	C Fair	C: Moderate	C	Maintain PES
N - Transitional River - 277	C Fair	C: Moderate	C	Maintain PES
N - Transitional River - 278	B: Largely Natural	C: Moderate	B	Maintain PES
N - Transitional River - 279	B: Largely Natural	C: Moderate	B	Maintain PES
N - Transitional River - 280	B: Largely Natural	C: Moderate	B	Maintain PES
N - Transitional River - 281	B: Largely Natural	C: Moderate	B	Maintain PES
N - Transitional River - 282	B: Largely Natural	C: Moderate	B	Maintain PES
N - Transitional River - 283	B: Largely Natural	C: Moderate	B	Maintain PES
N - Transitional River - 284	B: Largely Natural	C: Moderate	B	Maintain PES
N - Transitional River - 331	B: Largely Natural	C: Moderate	B	Maintain PES
N-Upper Foothill River-275	B: Largely Natural	C: Moderate	B	Maintain PES
N-Upper Foothill River-297	B: Largely Natural	C: Moderate	B	Maintain PES
N - Lower Foothills River - 285 (Middle Mfule River)	B: Largely Natural	B: High	A/B	Improve PES
N - Lowland River – 286 (Lower Mfule River)	B: Largely Natural	B: High	A/B	Improve PES
Wetlands				
Wetland Process Unit Group 01	D: Poor	C: Moderate	D	Maintain PES
Wetland Process Unit Group 02	C: Fair	D: Low	C	Maintain PES
Wetland Process Unit Group 03	C: Fair	D: Low	C	Maintain PES
Wetland Process Unit Group 04	C: Fair	C: Moderate	C	Maintain PES
Wetland Process Unit Group 05	C: Fair	C: Moderate	C	Maintain PES

7.4.9 Terrestrial Ecology

The information presented in the sections below was sourced from the Terrestrial Biodiversity Assessment Report (Eco-Pulse , 2023) which has been included as Appendix G.

7.4.9.1 South Block

CONSERVATION CONTEXT

National Threatened Ecosystems

The NEM:BA identifies and lists threatened ecosystems that are currently under threat of being transformed by other land uses. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function, and composition of threatened ecosystems (SANBI, 2011). The NEM:BA provides for listing of threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected. Consideration of listed ecosystems must be taken into account when developing municipal IDPs and SDFs. Listed ecosystems must be managed proactively as required by the NEM:BA. There are also environmental authorisation implications, as well as, monitoring and reporting requirements associated with listed ecosystems.

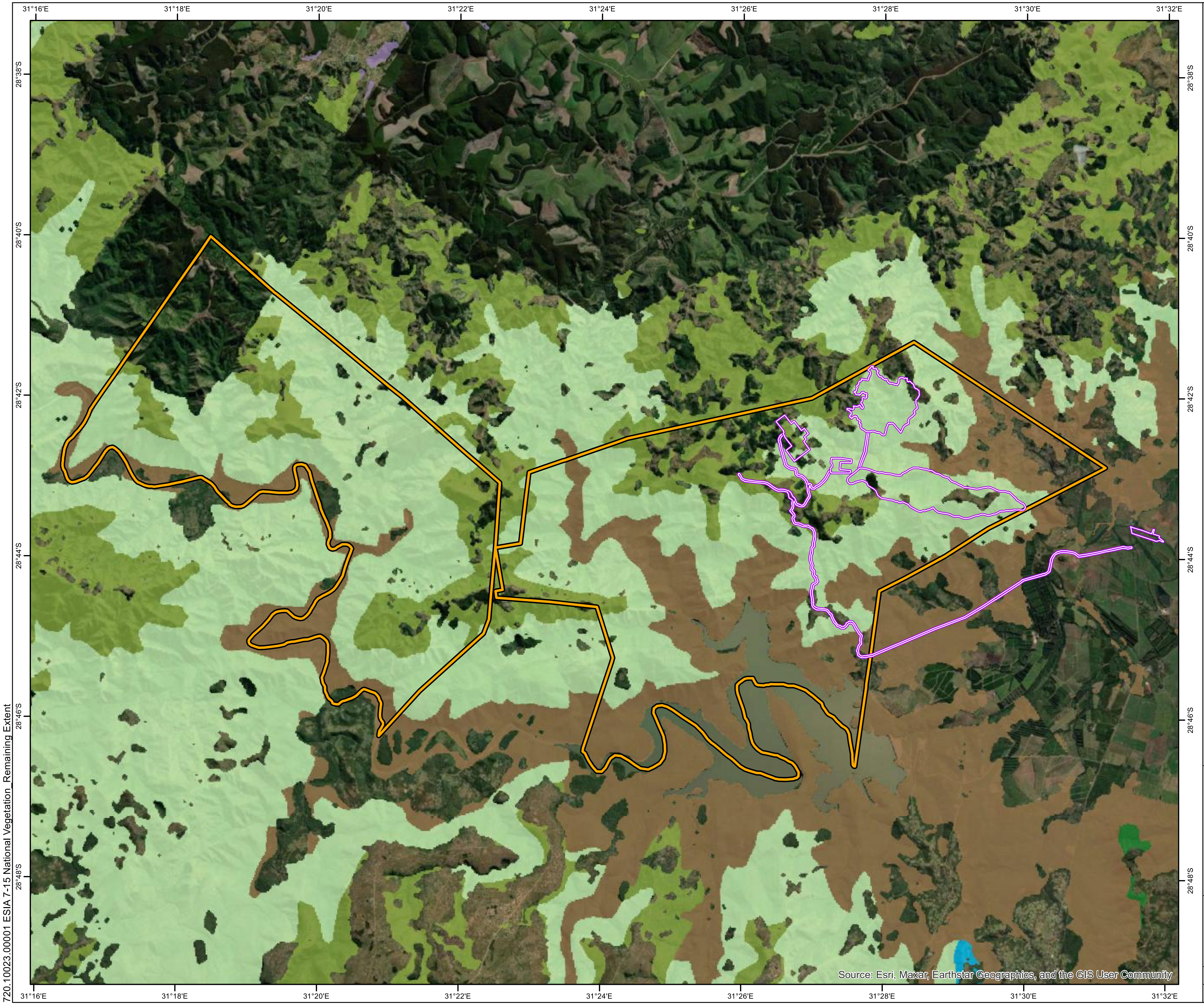
Most of the Project area is classified as Ngongoni Veld (Vulnerable), with the remainder of the area classified as Eastern Valley Bushveld (Least Threatened), Northern Zululand Sourveld (Least Threatened) and Scarp Forest (Least Threatened). Only Ngongoni Veld (Vulnerable) is considered a listed ecosystem.

National Vegetation Map

The vegetation types which occur within the South Block were assessed using the National Vegetation Map as part of the NBA. The vegetation map identifies five vegetation types at a broad national level, including Eastern Valley Bushveld, Moist Coast Hinterland Grassland, Dry Coast Hinterland Grassland, Northern Zululand Sourveld, and Scarp Forest. Small fragments of the South block were affected by land transformation, however, there are still significant contiguous areas of all five vegetation types that remain intact. Figure 7-18 shows the remaining extent (remnants) of the national vegetation types according to the National Biodiversity Assessment (SANBI, 2018), which factors in transformed landcover classes.

National Protected Areas and National Protected Area Expansion Strategy (SANBI, 2010)

No national protected areas are located within the South Block on the National Protected Area Expansion Strategy (NPAES) spatial outputs from SANBI in 2010. However, portions of the South Block have been identified for future formal protection as part of the NPAES. These areas are seen as a crucial link between several protected areas, forming an important ecological corridor.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- ▭ Proposed South Block Mining Right Area
- ▭ Proposed Mine Layout

Vegetation Remnants (SANBI, 2022)

- 🟩 Dry Coast Hinterland Grassland
- 🟫 Eastern Valley Bushveld
- 🟦 KwaZulu-Natal Coastal Belt Grassland
- 🟪 Midlands Mistbelt Grassland
- 🟩 Moist Coast Hinterland Grassland
- 🟩 Zululand Lowveld

N

0 1 2
KM

Scale: 1:82 500 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

JINDAL IRON ORE (PTY) LTD

FIGURE 7-18
LOCATION AND REMAINING EXTENT OF NATIONAL VEGETATION TYPES IN THE SOUTH BLOCK

SLR

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Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 7-15	Date: 04/07/2023

720.10023.00001 ESIA 7-15 National Vegetation_Remaining Extent

PROVINCIAL CONSERVATION DATASETS

Provincial vegetation types and threat status

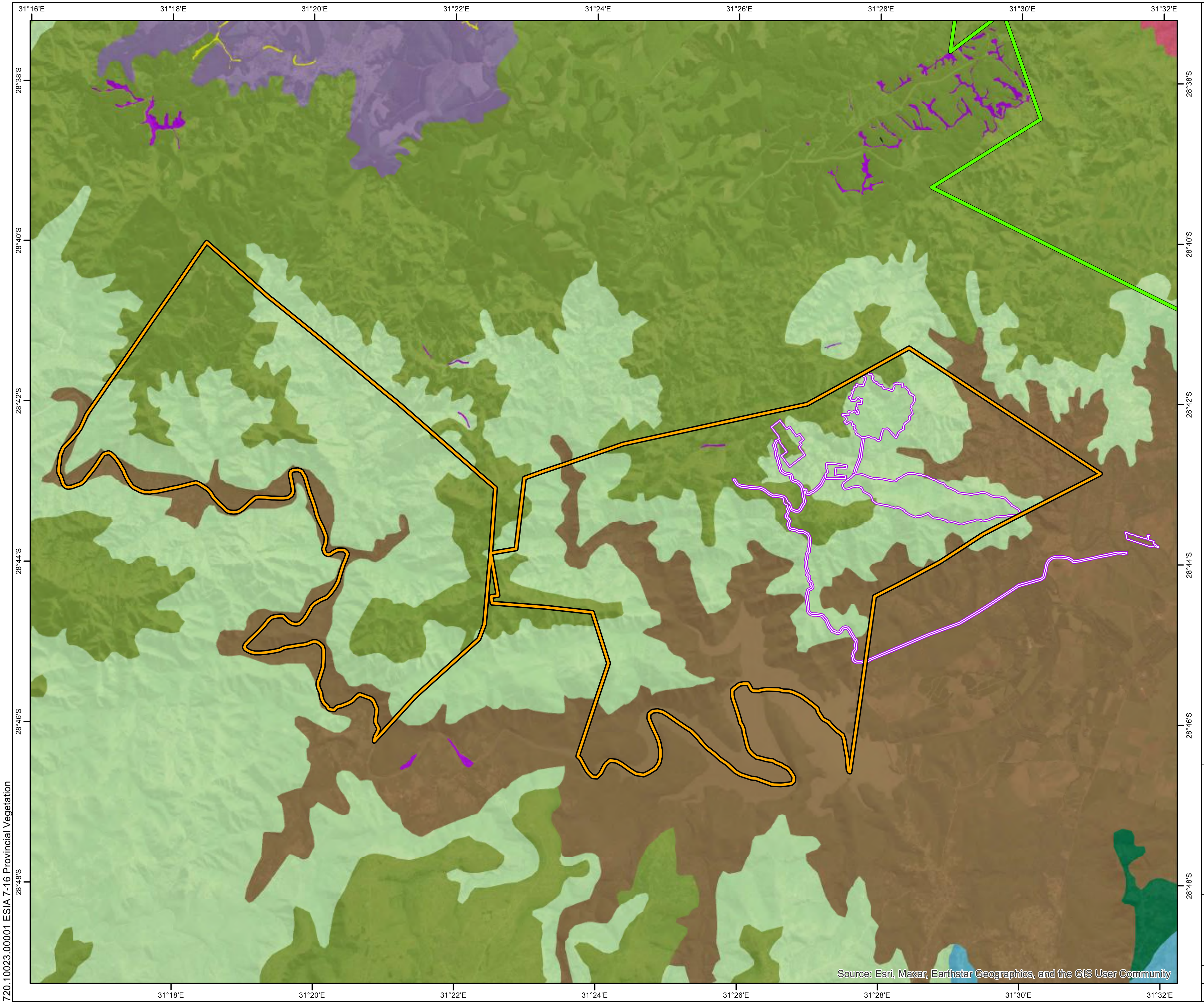
The location and extent of provincial vegetation types in the South Block was identified and mapped using the KZN Vegetation Map. The provincial vegetation types which occur within the South Block are described in Table 7-48 and mapped in Figure 7-19.

Table 7-48 Provincial Vegetation Types that Occur Within the South Block

KZN vegetation type	Conservation target (%)	Ecosystem status	Level of protection	Original extent (ha)	Remaining natural (ha)	Extent on site (ha)		
						South-Western Block	South-Central Block	South-Eastern Block
Dry Coast Hinterland Grassland	25	Vulnerable	Not Protected	276 406	125 199	2792,84	1140.90	2 098
Moist Coast Hinterland Grassland	25	Endangered	Not Protected	437 556	157 573	1459,42	430,80	661
Alluvial Wetlands: Temperate Alluvial Vegetation	24	Critically Endangered	Poorly Protected	207	42	0	0,78	1
Eastern Valley Bushveld	25	Least Threatened	Not Protected	313 748	211 707	582,92	781,70	1753

KZN Biodiversity Sector Plan Local Scale Ecological Corridor

There are no critical linkages in terms of the KZN Biodiversity Sector Plan Local Scale Ecological Corridor located within the South Block.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- ▭ Proposed South Block Mining Right Area
- ▭ Proposed North Block Mining Right Area
- ▭ Proposed Mine Layout

Provincial Vegetation Types (SANBI 2011)

- 🟨 Alluvial Wetlands : Subtropical Alluvial Vegetation
- 🟪 Alluvial Wetlands : Temperate Alluvial Vegetation
- ■ Dry Coast Hinterland Grassland
- 🟫 Eastern Valley Bushveld
- 🟦 KwaZulu-Natal Coastal Belt Grassland
- 🟪 Midlands Mistbelt Grassland
- 🟩 Moist Coast Hinterland Grassland
- 🟥 Northern Zululand Sourveld
- 🟩 Zululand Lowveld

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Scale: 1:82 500 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-19
LOCATION AND EXTENT OF PROVINCIAL VEGETATION TYPES

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Map Ref No: ESIA 7-16	Date: 04/07/2023

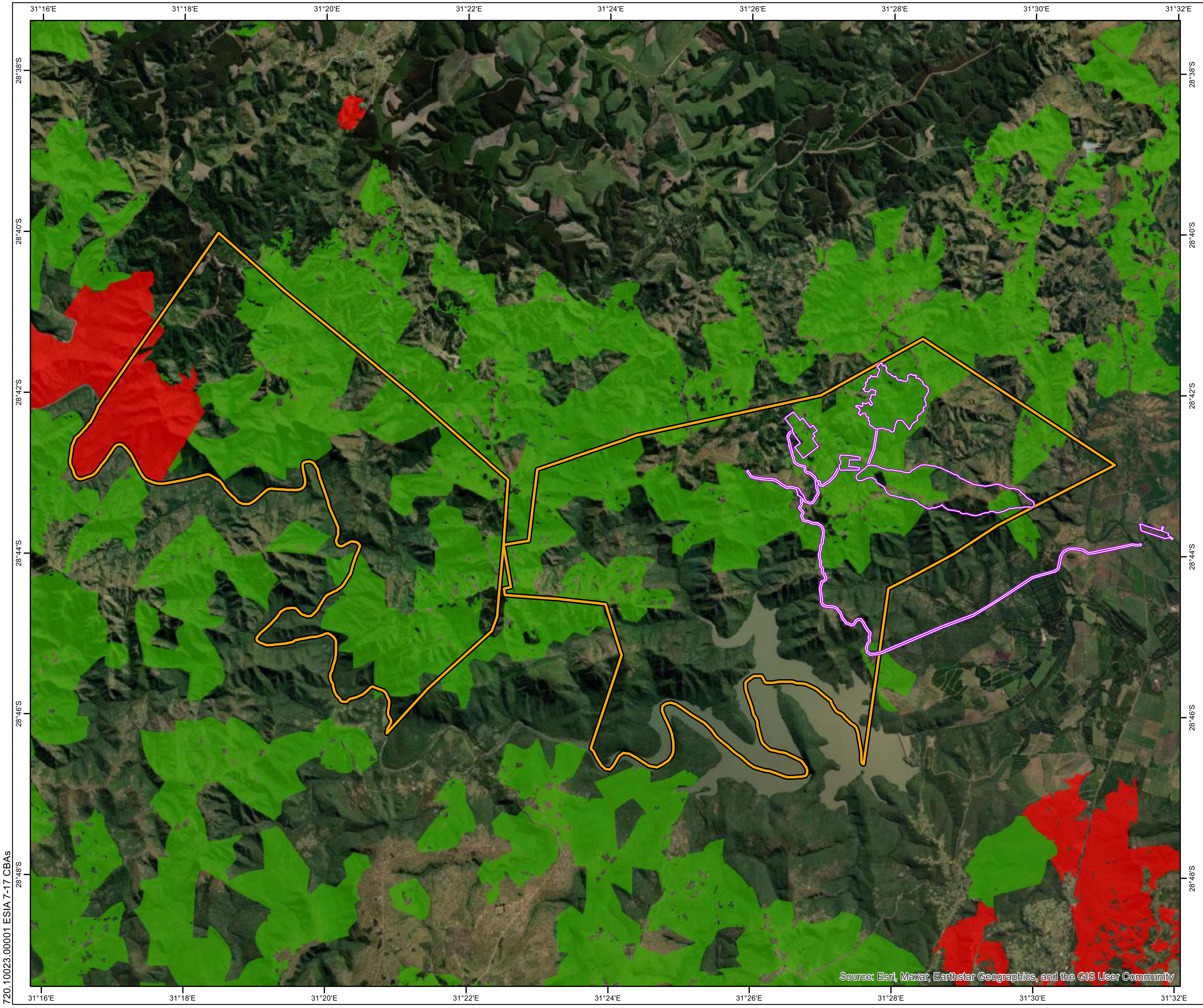
KZN Terrestrial Systematic Conservation Plan and Assessments (EKZNW: 2011, 2016)

The Systematic Conservation Assessments (SCAs) is a strategic conservation plan developed by the Ezemvelo KZN Wildlife (EKZNW), which aims to ensure that representative samples of biodiversity are conserved. The SCAs have three conservation categories for terrestrial conservation, as follows:

- Critical Biodiversity Area (Irreplaceable): Are areas considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of ecosystems.
- Critical Biodiversity Area (Optimal): Are areas that represent an optimised solution to meet the required biodiversity conservation targets while avoiding high-cost areas as much as possible.
- Ecological Support Areas: Are areas which are functional but not necessarily entirely natural terrestrial or aquatic areas that are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs.

More than half of the south-western block is flagged as either CBA: Optimal or CBA: Irreplaceable while approximately half of the south-eastern and central southern blocks have been flagged as CBA: Optimal (Figure 7-20). This suggests that the proposed mining development may have significant negative impacts on provincial conservation planning targets potentially compromising EKZNW's ability to meet these targets. The CBA ratings are assigned in accordance with the vegetation types as well as floral and faunal Species of Conservation Concern (SCC) which are expected to be located within the South Block. These include the following:

- Millipedes: *Patinatius bidentatus simulator*, *Spinotarsus destructus*, *Doratogonus falcatus*, *Spinotarsus maritzburgensis*, *Allawrencius complex*, *Doratogonu peregrinus*, *Doratogonus natalensis*. *Centrolobus bifidus*, *Centrolobus rugulosus*, the insect: *Odontomelus eshowe*.
- Molluscs: *Gulella aliciae*, *Gulella barbarise*, *Gulella separata*, *Gulella euthymia*, *Eunonyma lymnaeformis*, *Edouardia conulus*, and *Trachycystis clifdeni* (Critically Endangered.
- Plants: *Helichrysum woodii* (Rare), *Struthiola anomala* (Vulnerable), *Oxyanthus pyriformis* (Least Concern formerly Near Threatened), *Encephalartos woodii* (Extinct in the Wild), *Dahlgrenodendron natalense* (Endangered) and *Bolusiella maudiae* (Least Concern formerly Data Deficient).
- Vegetation types: Alluvial Wetlands: Temperate Alluvial Vegetation (Critically Endangered), Moist Coast Hinterland Grassland (Endangered), Dry Ngongoni Veld (Vulnerable), Eastern Valley Bushveld (Least Threatened), Northern Zululand Sourveld (Least Threatened) and Eastern Scarp Forests : Northern Coastal Scarp Forest (Least Threatened).



Legend

▭	Proposed South Block Mining Right Area
▭	Proposed Mine Layout

KZN Systematic Conservation Assessment (EKZN, 2016)

🟥	Critical Biodiversity Area : Irreplaceable
🟩	Critical Biodiversity Area : Optimal

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Scale: 1:82 500 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
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FIGURE 7-20
LOCATION AND EXTENT OF THE CBAS ACCORDING TO EKZNW (2016)

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Map Ref No: ESIA 7-17	Date: 04/07/2023

720.10023.00001 ESIA 7-17 CBAs

Provincial Protected Areas and KZN Protected Areas Expansion 20-year Strategy (EKZNW, 2010)

There are no areas near the property which are planned for future conservation under the KZN Protected Areas Expansion 20-year Strategy and no protected areas or forests within the South Block.

Municipal Conservation and Spatial Planning Datasets

The Mthonjaneni LM has conservation planning datasets that inform priorities for protection at the local scale, which are discussed below.

Environmental Management Areas and Terrestrial Minset

According to the Mthonjaneni LM's latest IDP, the value of landscape forms in the municipality should be conserved, and wetlands and grasslands containing habitats of important species need specific environmental management. Grassland and other landcover types, natural bush, thornveld, and active and passive open space have been flagged as priority zones for mapping and inclusion in the spatial development plan. Areas of high biodiversity value, nature reserves, and indigenous forested areas have also been identified as sensitive areas that need to be considered. The Terrestrial (MINSET) Minset identifies a "minimum set" of planning units that will assist in meeting conservation targets, indicates areas that are already protected and areas of biodiversity priority. According to the Minset, large portions of the South Block have been flagged as areas of high biodiversity value/protected areas or indigenous forested areas. Mining in these areas would be in direct conflict with meeting the "minimum set" of conservation targets that need to be met at the local scale by the municipality and therefore these areas should be avoided.

Mthonjaneni LM's Conceptual Plan

Large portions of the South Block have been flagged for future tourism opportunities at the municipal scale (refer to Figure 7-21).

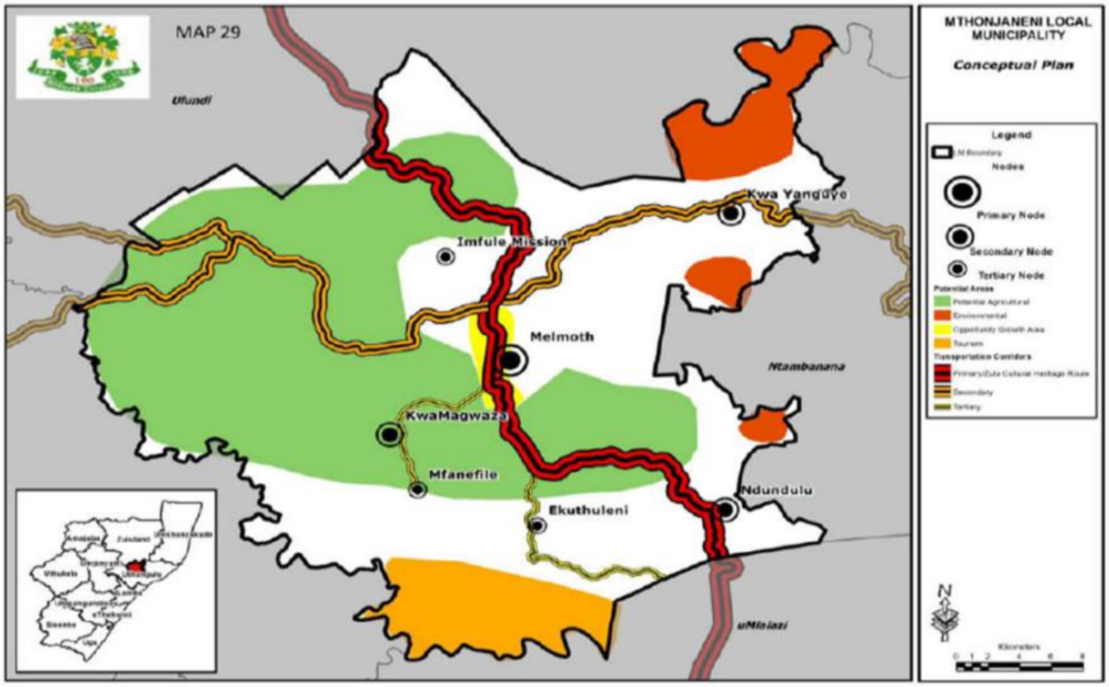


Figure 7-21 Mthonjaneni LM's Conceptual Plan with Tourism and Environmental Areas

BASELINE VEGETATION AND HABITAT ASSESSMENT

A baseline description of the vegetation communities encountered in the South Block are presented in this section. The vegetation communities were separated based on differences in vegetation condition and structure and were assessed through a combination of rapid field verification and desktop mapping. The following terrestrial vegetation communities were identified within the South Block:

- Ngongoni Veld/Eastern Valley Bushveld Open Savannah;
- Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland;
- Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah;
- Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland; and
- Secondary Open Savannah/Thicket/Closed Woodland (includes transformed areas such as existing/historical forestry and cultivated areas, dirt roads, grass tracks, buildings and recently cleared areas).

Ngongoni Veld/Eastern Valley Bushveld Open Savannah

Vegetation cover mapped as part of this community included areas that have not experienced severe anthropogenic disturbances either due to inaccessibility associated with steep topography or as a result of being further removed from human settlement and the road network, thus retaining moderate to high levels of floristic diversity. However, some red-listed species may have been overlooked during the site visit due to seasonal constraints, and additional sampling of open grassland areas will be required in the correct season or as dictated by Project planning. For the purposes of this broad scale assessment this vegetation community includes all open grassland / savannah areas that are either categorised as Moist / Dry Coast Hinterland Grassland or Eastern Valley Bushveld at the provincial level.

An overview of the species encountered during the site survey is provided. It should be noted that the timing of fieldwork fell outside of the recommended sampling period stipulated by EKZNW and in national guidelines. It is very likely that a number of red-listed and protected plant species were either overlooked or under sampled during this rapid baseline assessment. A full list of red-listed species that may occur within the South Block is included as part of the specialist report (Eco-Pulse , 2023) in Appendix G.

Open grassland/savannah in the area was dominated by *Aristida junciformis* (Figure 7-22) with other grass species occurring at moderate to low levels of abundance including *Sporobolus africanus, S. pyramidalis, Eragrostis curvula*, *Monocymbium ceresiiforme, E. capensis, Setaria sphacelata, Cymbopogon nardus* and *Themeda triandra*. Commonly encountered scattered tree cover included a number of *Vachellia species, Heteropyxis natalensis* and *Erythrina latissima*, with the shrubs *Leonotis leonurus, Leonotis intermedia, Lippia javanica* also prevalent with *Lasiosiphon splendens, Psoralea pinnata* and *Eriosema salignum* noted in some areas. Common herbaceous cover observed included *Polygala hottentotta, Tephrosia grandiflora, Thunbergia atriplicifolia, Berkheya insignis, Senecio variabilis, Senecio latifolius* and *Senecio panduriformis* along with the fern *Cyclosorus interruptus*. At lower levels of abundance *Moraea graminicola subsp. graminicola* (Near Threatened, South African Endemic known from only 10 – 20 remaining locations in South Africa) was seen in a specific area. Often associated with rock outcrops in steeper areas; the forbs *Syncolostemon densiflorus, Chlorophytum krookianum* and *Crassula alba*, the tree *Anastrabe integerrima* and the Sensitive Species 191 (Vulnerable) occurred. In addition, what may be *Helichrysum pannosum* (Endangered) scattered in some areas was noted, however, no flowering specimens were encountered on site to confirm this. This vegetation community encompasses areas that still retain some level of floristic diversity which range from natural to moderately modified open grassland/savannah in fair to good ecological condition.

Figure 7-22 Open grassland dominated by Aristida junciformis

Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland

Vegetation within this community comprised a mixture of primary Eastern Valley Bushveld thicket (Figure 7-23) along with, to a smaller degree, Ngongoni Veld closed savannah woodland, which have a larger component of *Vachellia* species and lower levels of woody diversity present. An overview of the species encountered during the site survey is provided in the following sections.

Frequently encountered species in savannah woodland patches included scattered tree cover with *Vachellia natalitia, V. nilotica*, *V. sieberiana*, *V. karroo*, and *Aloe marlothii* dominating while grass cover included *Eragrostis curvula*, *Sporobolus pyramidalis*, *S. africanus*, *Themeda triandra*, *Melinis repens* and *Aristida* species. Dense Eastern Valley Bushveld thicket patches comprised a mixture of diverse tree species including *Combretum molle*, *Vachellia natalitia*, *V. nilotica*, *Tetradenia riparia*, *Dichrostachys cinerea*, *Vangueria infausta*, *Scutia myrtina*, *Cussonia spicata*, *Ziziphus mucronata*, *Dombeya rotundifolia*, *Spirostachys africana*, *Searsia pallens*, *S. pentheri*, *Grewia occidentalis, Senegalia ataxacantha,* and the succulent *Euphorbia ingens*. Undergrowth was dominated by *Asystasia gangetica*, *Hypoestes aristata, Barleria obtusa*, *Brachylaena elliptica* and *Peristrophe cernua* with the occasional climber or creeper observed i.e., *Cissus fragilis*, *Dalbergia obovata*, *Desmodium repandum* and *Smilax anceps*. Less frequently encountered woody and succulent species observed at moderate to low levels of abundance in thicket patches included the following: *Calpurnia aurea*, *Euphorbia tirucalli*, *E. triangularis*, *Schotia brachypetala*, *Sclerocarya birrea*, *Vachellia sieberiana*, *V. tortilis*, *Euclea daphnoides*, *Olea europaea subsp. africana*, *Ximenia caffra*, *Pappea capensis*, *Vepris lanceolata*, *Commiphora harveyi*, *Trichilia emetica*, *Clerodendrum glabrum*, *Scolopia zeyheri*, *Gardenia volkensii*, *Diospyros simii*, *Gymnosporia senegalensis*, *G. maranguensis*, *Ficus glumosa*, *F. burkei*, *F. sur*, *G. buxifolia*, and *Maesa lanceolata*. In addition, *Aloe rupestris*, *Stapelia gigantea*, *Dioscorea cotinifolia*, *Scadoxus puniceus*, *Kalanchoe rotundifolia*, *Plectranthus hadiensis* and *Sansevieria hyacinthoides* were occasionally observed in the undergrowth.

Where this thicket / woodland community adjoined human settlement, edge effects were noted with some alien plant species invasion and firewood harvesting taking place. However, for the most part, the high level of species diversity and heterogeneity observed suggests this vegetation community can be considered natural to moderately modified and can be considered in fair to good ecological condition.

Figure 7-23 Dense Closed Thicket Comprising a Diverse Array of Woody and Herbaceous Species - Southern Edge of the South-Western Block

Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah

Degraded areas of open savannah were situated closer to road networks and associated with less precipitous topography. Overgrazing by livestock and edge effects on grassland patches within this community have collectively lowered the floristic diversity and allowed the invasion of some alien plant species and woody pioneer species.

The dominant grass was *Aristida junciformis* with common forbs species including *Polygala hottentotta, Tephrosia grandiflora, Thunbergia atriplicifolia, Berkheya insignis, Senecio variabilis, S. latifolius* and *S. panduriformis* along with the fern *Cyclosorus interruptus*. Commonly encountered scattered tree cover included a number of *Vachellia* species, *Heteropyxis natalensis* and *Erythrina latissima*, with the shrubs *Leonotis leonurus*, and *L. intermedia*. Scattered alien plant species included *Lantana camara, Psidium guajava, Chromolaena odorata, Bidens pilosa* and *Ageratum conyzoides* amongst others. This community can therefore be considered moderately to severely modified, and in fair to poor condition, depending on the level of alien plant invasion and the grazing and burning regime prevalent, with areas in fair condition potentially retaining some level of forb diversity that would need to be verified through seasonally appropriate sampling (to verify red-listed plant species flagged for the area).

Degraded Eastern Valley Bushveld Thicket / Ngongoni Veld Closed Woodland

Degraded Eastern Valley Bushveld / Closed Ngongoni Woodland had been impacted negatively by edge effects, firewood harvesting, browsing by livestock (primarily goats), clearing of vegetation, and alien plant invasion. Consequently, although retaining some level of floristic diversity this was moderately diminished in comparison to the thicket/closed woodland vegetation community described above. Moreover, weedy/pioneer and alien invasive species were encountered at low to moderate levels of abundance within this vegetation community e.g., *Chromolaena odorata, Lantana camara, Trema orientalis, Cestrum laevigatum, Achyranthes aspera, Opuntia ficus-indica* and *Vachellia natalitia*. This vegetation community is considered to be moderately to severely modified and in fair to poor ecological condition overall.

Secondary Open Savannah/Thicket/Closed Woodland
The Secondary Open Savannah/Thicket/Closed Woodland vegetation suffered disturbance in the past (direct disturbance or disturbance sufficient to facilitate alien plant invasion that notably reduced the plant biodiversity).

Grassland or grassy parts dominated by *Aristida junciformis* or lawn grasses such as *Cynodon dactylon, Dactyloctenium australe* and very few common herbaceous species or weeds of disturbance e.g., *Polygala hottentotta*, *Richardia brasiliensis*. Invasion by pioneer woody or shrubby plants in historically open grassland areas, mainly *Vachellia natalitia* (a pioneer species, which is often misconceived as an important constituent of some vegetation, when in numbers it is instead an indicator of recent or secondary growth), *Triumfetta pilosa*, and *Lippia javanica*. Remnant or secondary regrowth of common/pioneer woody species along drainage lines including *Trema orientalis*, *Syzigium cordatum*, *Senegalia ataxacantha*, *Harpephyllum caffrum*, *Dalbergia obovata* and *Tetradenia riparia*. Woody or shrubby alien plant invasion, particularly by *Psidium guajava*, *Chromolaena odorata, Lantana camara* and *Tagetes minuta* although a diverse range of alien species occurred (see Annexure A which lists all species noted during the site visit undertaken). The Secondary Open Savannah/Thicket/Closed Woodland vegetation can be considered severely to critically modified, in poor ecological condition and no longer representative of reference vegetation types mapped for the South Block.

7.4.9.2 North Block

NATIONAL CONSERVATION CONTEXT

National Threatened Ecosystems
Most of the Project area is classified as Ngongoni Veld (Vulnerable), with the remainder of the area classified as Eastern Valley Bushveld (Least Threatened), Northern Zululand Sourveld (Least Threatened) and Scarp Forest (Least Threatened). Only Ngongoni Veld (Vulnerable) is considered a listed ecosystem.

National Vegetation Map
The vegetation types which occur within the South Block were assessed using the National Vegetation Map as part of the NBA. The vegetation map identifies five vegetation types at a broad national level, including Eastern Valley Bushveld, Moist Coast Hinterland Grassland, Dry Coast Hinterland Grassland, Northern Zululand Sourveld, and Scarp Forest. Small fragments of the South block were affected by land transformation, however there are still significant contiguous areas of all five vegetation types that remain intact. The remaining extent (remnants) of the national vegetation types according to the SANBI (2018) in the North Block.

National Protected Areas and NPE (SANBI, 2010)
There are no national protected areas located within the North Block in terms of the NPAES.

PROVINCIAL CONSERVATION DATASETS

Provincial vegetation types and threat status
The provincial vegetation types which occur within the North Block are described in Table 7-49 and Figure 7-24.

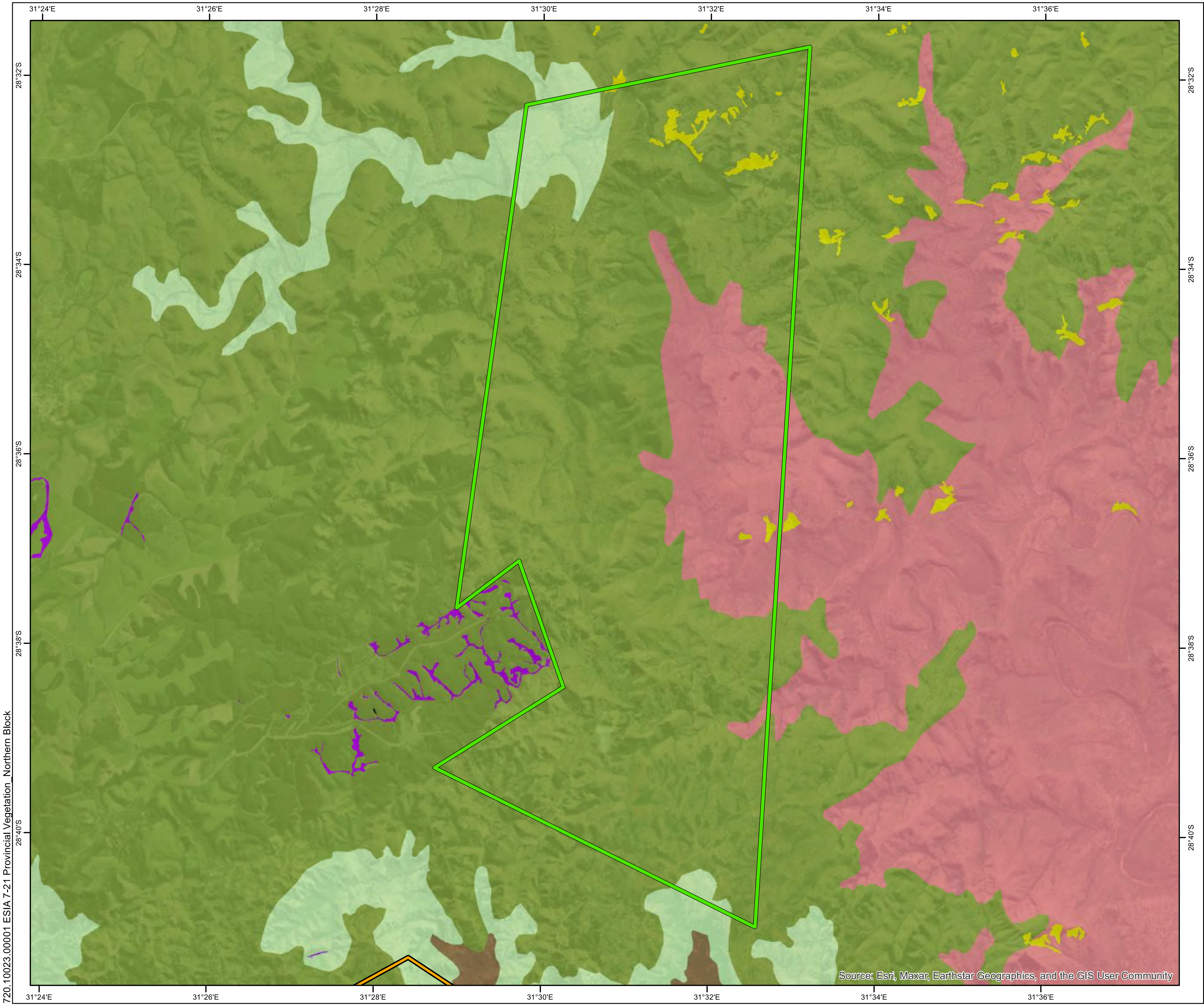
Table 7-49 Provincial Vegetation Types That Occur in the Area

KZN vegetation type	Conservation target (%)	Ecosystem status	Level of protection	Original extent (ha)	Remaining natural (ha)	Extent in Northern Block site (ha)
Dry Coast Hinterland Grassland	25	Vulnerable	Not Protected	276 406	125 199	341
Moist Coast Hinterland Grassland	25	Endangered	Not Protected	437 556	157 573	6 717
Alluvial Wetlands: Temperate Alluvial Vegetation	24	Critically Endangered	Poorly Protected	207	42	0.14
Eastern Valley Bushveld	25	Least Threatened	Not Protected	313 748	211 707	0
Eastern Scarp Forests: Northern Coastal Scarp Forest	61,6	Least Threatened	Moderately Protected	4 889	3 998	72
Northern Zululand Sourveld	19	Least Threatened	Poorly Protected	470 422	306 996	1 336

KZN Terrestrial Systematic Conservation Plan and Assessments (EKZNW: 2011, 2016)
As for the South Block (Section 7.4.9.1).

KZN Biodiversity Sector Plan Local Scale Ecological Corridor
The KZN Local Scale Northern Interior Corridor that falls within the north-eastern corner of the North Block. This area of the Northern Interior Corridor is considered a critical linkage that needs to be maintained to ensure connectivity between the coast and more inland ecosystems.

Provincial Protected Areas and KZN Protected Areas Expansion 20-year Strategy (EKZNW, 2010)
There are no areas near the property which are planned for future conservation under the KZN Protected Areas Expansion 20-year Strategy and no protected areas or forests within the North Block.



Legend

- Proposed North Block Mining Right Area
- Proposed South Block Mining Right Area

Provincial Vegetation Types (SANBI 2011)

- Alluvial Wetlands : Temperate Alluvial Vegetation
- Dry Coast Hinterland Grassland
- Eastern Scarp Forests : Northern Coastal Scarp Forest
- Eastern Valley Bushveld
- Moist Coast Hinterland Grassland
- Northern Zululand Sourveld

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Scale: 1:70 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-24
LOCATION AND EXTENT OF PROVINCIAL VEGETATION TYPES- NORTH BLOCK

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Map Ref No: ESIA 7-21	Date: 04/07/2023

720.10023.00001 ESIA 7-21 Provincial Vegetation_Northern Block

Municipal Conservation and Spatial Planning Datasets

The Mthonjaneni LM has conservation planning datasets that inform priorities for protection at the local scale, which are discussed below.

Environmental Management Areas and Terrestrial Minset

According to the Minset, large portions of the North Block have been flagged as areas of high biodiversity value/protected areas or indigenous forested areas. Mining in these areas would be in direct conflict with meeting the "minimum set" of conservation targets that need to be met at the local scale by the municipality and therefore these areas should be avoided.

Mthonjaneni LM's Conceptual Plan

Portions of the North Block have been flagged as important environmental areas (refer to Figure 7-21).

BASELINE VEGETATION AND HABITAT ASSESSMENT

A baseline description of the vegetation communities encountered in the North Block are presented in this section. The vegetation communities were separated based on differences in vegetation condition and structure and were assessed through a combination of rapid field verification and desktop mapping. The following terrestrial vegetation communities were identified within the North Block:

- Ngongoni Veld/Northern Zululand Sourveld Open Savannah;
- Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland;
- Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket;
- Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah; and
- Secondary Open Savannah/Thicket/Closed Woodland (includes existing/historical forestry and cultivated areas, dirt roads, grass tracks, buildings, recently cleared areas).

Ngongoni Veld/Northern Zululand Sourveld Open Savannah

Vegetation cover mapped as part of this community include areas of open savannah that are either categorised as Moist/Dry Coast Hinterland Grassland or Northern Zululand Sourveld at the provincial level. These areas have not been disturbed by human activity and are considered to have moderate to high levels of floristic diversity. Vegetation within this community is considered to be either moderately modified or near-natural and is likely in fair to good ecological condition. It should be noted that a number of red-listed and protected plant species are highly likely to occur in this vegetation community and would require further sampling at a later stage, if the Project planning progresses further.

Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket

Vegetation within this community likely comprises a mixture of degraded Ngongoni Veld/Natal Zululand Sourveld closed woodland or thicket areas which based on examination of aerial imagery are thought to be heavily invaded by invasive alien plant species such as *Chromolaena odorata*, *Lantana camara* and include areas which were historically open savannah under reference conditions which have now been adversely affected by bush encroachment associated with pioneer species such as *Vachellia natalitia*, V. *sieberiana*, *Dichrostachys cinerea* and *Lippia javanica*. These cumulative minor impacts have likely resulted in this vegetation community being moderately to severely modified and primarily in poor ecological condition at a desktop level. Nevertheless, this community has the potential to support red listed plant species and protected plant species and therefore may still retain some remnant biodiversity. These areas could be considered in fair ecological condition with the potential to be rehabilitated and improve their condition further. Given this vegetation community has the potential to support threatened or protected plant species, this would need to be verified through fieldwork in the appropriate seasonal window, if the Project planning progresses further.

Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah

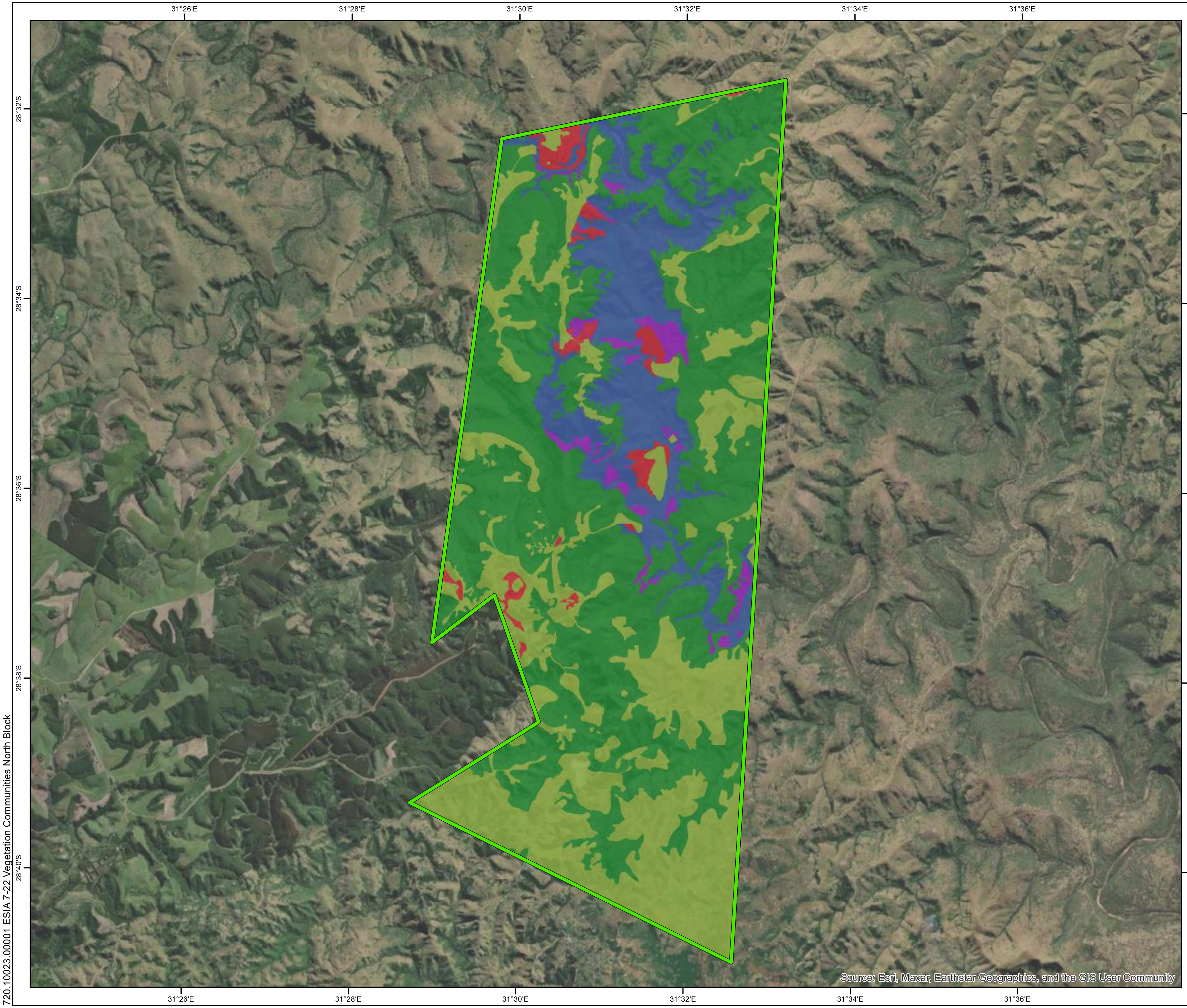
Degraded areas of open savannah categorised as Moist / Dry Coast Hinterland Grassland or Northern Zululand Sourveld at the provincial level, which are situated closer to road networks and associated with less precipitous topography form part of this vegetation community. Likely existing impacts associated with this community include overgrazing by livestock, edge effects/habitat fragmentation, alien plant invasion and bush encroachment. This community has therefore been categorised as moderately to severely modified at a desktop level and is thought to be in fair to poor ecological condition, depending on the level of alien plant invasion and the grazing and burning regime prevalent. Areas in fair condition potentially retain some level of forb diversity that would need to be verified through seasonally appropriate sampling if the Project planning progresses further.

Scarp Forest /Northern Zululand Sourveld Thicket / Ngongoni Veld Closed Woodland

Vegetation cover mapped as part of this community include areas of closed-canopy forest categorised as Eastern Scarp Forest: Northern Coastal Scarp Forest at the provincial level grading into dry thicket vegetation categorised as Ngongoni Veld or Northern Zululand Sourveld that has remained largely undisturbed by direct impacts due to the steep terrain in which it occurs. This vegetation community is hypothesised to retain moderate to high levels of floristic diversity and ranges from natural to moderately modified and is potentially in fair to good ecological condition. It should be noted that red-listed and protected plant species are highly likely to occur in this vegetation community and in-field verification and sampling of this vegetation community will be required, if the Project planning progresses further.

Secondary Open Savannah/Thicket/Closed Woodland

This vegetation has likely suffered disturbance in the past (direct disturbance or disturbance sufficient to facilitate alien plant invasion that has notably reduced the plant biodiversity) and as a result can be considered severely to critically modified and in poor ecological condition at a desk-top level. It is likely to contain a similar suite of weedy pioneer and alien invasive species as the Secondary Open Savannah/Thicket/Closed Woodland that occurs throughout the southern blocks; however, this would require further in-field verification and sampling if the Project planning progresses further.



Legend

▭ Proposed North Block Mining Right Area

Vegetation Communities (Eco-Pulse, 2022)

🟩 6.Ngongoni Veld/Northern Zululand Sourveld Open Savannah

🟦 7.Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland

🟪 8.Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket

🟥 9.Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah

🟩 10.Secondary Open Savannah/Thicket/Closed Woodland

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Scale: 1:70 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-25
SPATIAL DISTRIBUTION OF IDENTIFIED VEGETATION COMMUNITIES - NORTH BLOCK

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Prepared By: BG
Map Ref No: ESIA 7-22
Date: 04/07/2023

720.10023.00001 ESIA 7-22 Vegetation Communities North Block

7.4.9.3 Biota of Conservation Concern within the Project Area

VEGETATION SURVEY FINDINGS – THREATENED FLORA

Two floral SCC were identified within the Project area. These floral SCC were the Sensitive Species 191 (Vulnerable) and Butterfly Iris - *Moraea subsp. graminicola* subsp*. graminicola* (Near Threatened, South African Endemic) which occur in the Open Savannah and Grassland areas. The sensitivity of the Project area in terms of the Plant Species Theme as identified by the DFFE Screening Report is considered to be Very High, given that two red-listed plant species have been identified.

It is important to note that other areas within the Project area also support these species and further field surveys within open/ savannah grassland, on rock outcrops near the edge of intact thicket, and within intact thicket would need to be undertaken in the appropriate seasonal window for these red listed species, prior to finalisation of preliminary layouts, plans and the development of the Project.

Table 7-50 Floral SCC Confirmed to Occur Within the South Block

Scientific Name	Conservation status	Criterion	Guidelines[6]	Comment and Conservation Requirements
Sensitive Species 191	Vulnerable	A	• If the species has a restricted range, Extent of Occurrence (EOO) < 2 000 km^2, no further loss of habitat is recommended. • If the range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered under certain circumstances. These circumstances include the implementation of an offset whereby another viable known subpopulation is formally conserved in terms of NEMPA, and provided that the subpopulation to be destroyed should not occur (i) within a threatened ecosystem, or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan, or (iii) on a site associated with additional ecological sensitivities.	• Range size is larger than 2 000 km^2, however, the species occurs (i) within a threatened ecosystem on-site and (ii) within an area required for conservation in terms of the KZN SCA and (iii) within an area that has additional ecological sensitives i.e., other threatened plant species. No further loss in habitat is recommended. • A minimum 200 m buffer (refer to Figure 7-26) which is standard minimum best practice for red listed species, is likely insufficient for the continued persistence of populations of species on site as this runs the risk of populations becoming fragmented from other intact areas of vegetation, reducing their resilience to disturbance and ability to recover from anthropogenic impacts, resulting in their eventual decline and local extirpation from the Project area. • The protection of all habitat that may play host to this species is required. i.e., all natural/near natural/moderately modified open savannah/grassland or thicket/closed woodland vegetation on site, namely, Ngongoni Veld/Eastern Valley Bushveld Open Savannah and Ngongoni Veld/Northern Zululand Sourveld Open Savannah and Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland Community and Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket.
Moraea graminicola subsp.	Near Threatened South African Endemic	A	• If the species has a restricted range, EOO < 2 000 km^2, no further loss of habitat is recommended. • If range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable known subpopulation is formally conserved in terms of NEMPA, and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem, or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan, or (iii) on a site associated with additional ecological sensitivities.	• The EOO is 9 500 km^2 therefore range size is larger than 2 000 km^2. However, the species is only known from 10 – 20 remaining locations and as above occurs (i) within a threatened ecosystem on-site and (ii) within an area required for conservation in terms of the KZN SCA and (iii) within an area that has additional ecological sensitives i.e., other threatened plant species. • On this basis no further loss in habitat is essential. A minimum 200 m buffer (refer to Figure 7-26) which is standard minimum best practice for red listed species, is likely insufficient for the continued persistence of populations of species on site as this runs the risk of populations becoming fragmented from other intact areas of vegetation, reducing their resilience to disturbance and ability to recover from anthropogenic impacts, resulting in their eventual decline and local extirpation from the study area. Therefore, protection of all habitat that may play host to this species is required. i.e., all natural/near natural/moderately modified open savannah/ vegetation on site, namely, Ngongoni Veld/Eastern Valley Bushveld Open Savannah and Ngongoni Veld/Northern Zululand Sourveld Open Savannah.
		B	• The species is approaching thresholds for listing as threatened but there are still a number of subpopulations in existence and therefore there is a need to minimise loss of habitat. • Conservation of subpopulations is essential if they occur (i) within a threatened ecosystem, or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan, or (iii) on a site associated with additional ecological sensitivities.	

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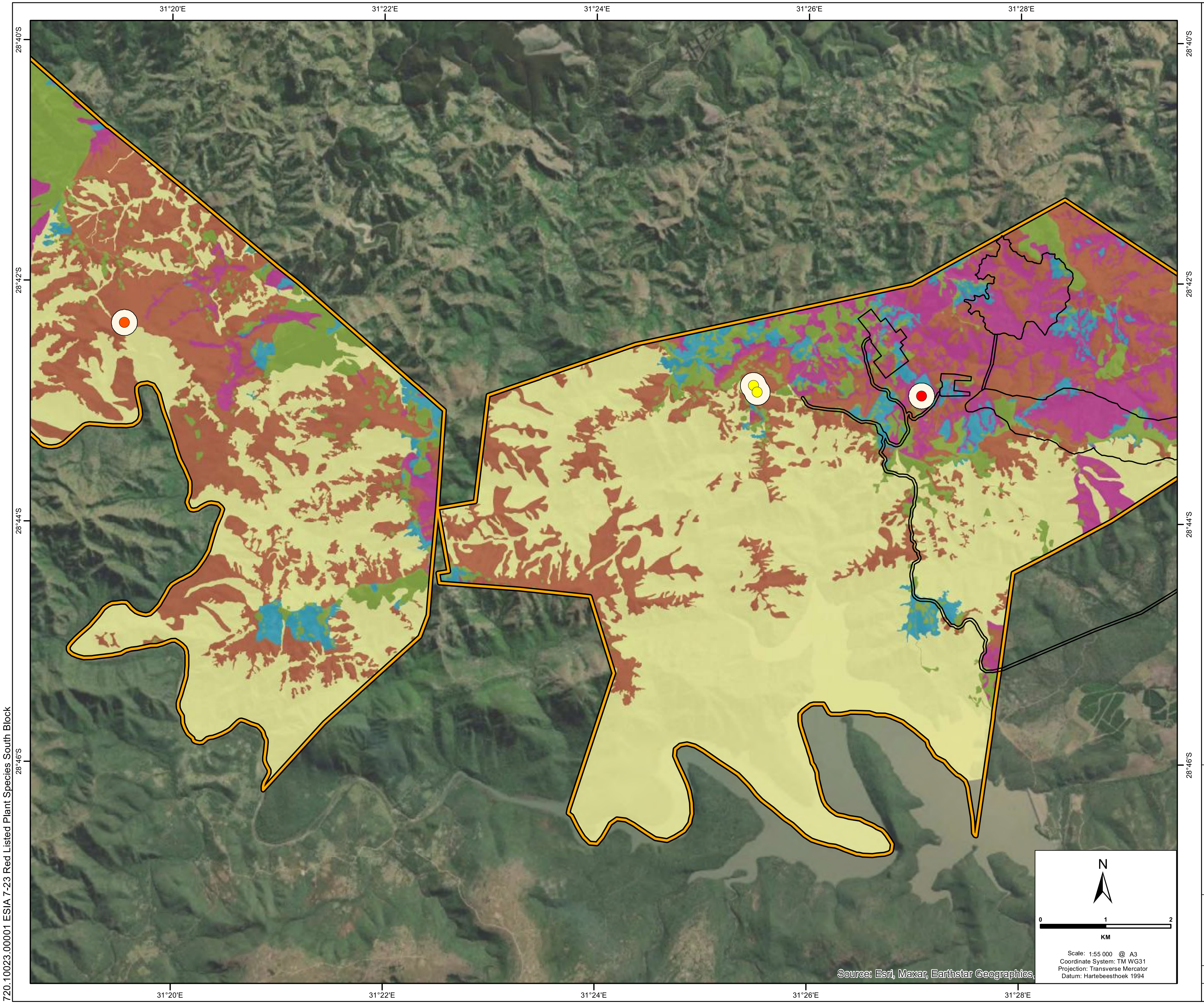
[6] South African National Biodiversity Institute (SANBI). 2020. *Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa*. South African National Biodiversity Institute, Pretoria. Version 1.2020.



Legend

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FIGURE 7-26
THE DISTRIBUTION OF RED-LISTED PLANT SPECIES CONFIRMED TO BE ON SITE SANBI (200) SPECIES GUIDELINES

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7.4.9.4 Desktop Threatened Biota Potential Occurrence (POC) Assessment

A desktop Potential Occurrence (POC) assessment of biota (flora and fauna) of conservation concern was undertaken to inform the need for any further species-specific assessments. Detailed (individual) summaries of the desktop likelihood of occurrence assessment is included in Appendix G. A summary of the species identified as part of the desktop POC assessment are provided in Table 7-51.

Table 7-51 Summary of the Species Identified as Part of the Desktop POC Assessment

Flora	Field verification conducted in April 2021 confirmed the presence of 2 floral SCC in the grassland/open savannah vegetation on site. An additional 24 floral SCC either have a high or moderate possibility of occurring on site.	
	Acalypha entumenica – Endangered Endemic (Medium: Possible)	*Aloe saundersiae* – Endangered (Medium: Possible)
	Begonia homonyma – Endangered Endemic (High: Probable)	*Brachystelma chlorozonum* – Near Threatened Endemic (High: Probable)
	Brachystelma gerrardii – Endangered (High: Probable)	Cassipourea gummiflua var. verticillata - Vulnerable (High: Probable)
	Clivia gardenii - Vulnerable Endemic (High: Probable)	*Clivia miniata* var. *miniata* – Vulnerable (High: Probable)
	Plectranthus esculentus - Data Deficient (Insufficient Information) (Medium: Possible)	*Prunus africana* – Vulnerable (High: Probable)
	Salpinctium natalense – Rare Endemic (Medium: Possible)	*Selago zuluensis* – Endangered (High: Probable)
	Crinum moorei – Vulnerable Endemic (High: Probable)	*Cryptocarya myrtifolia* – Vulnerable Endemic
	Dierama dubium – Vulnerable Endemic (High: Probable)	*Dioscorea sylvatica* – Vulnerable (High: Probable)
	Disperis woodii – Vulnerable (High: Probable)	*Emplectanthus cordatus* – Vulnerable Endemic (High: Probable)
	Euphorbia gerstneriana – Vulnerable (High: Probable)	*Faurea macnaughtonii* – Rare (Medium: Possible)
	Gerbera aurantiaca – Endangered Endemic (High: Probable)	*Habenaria culveri* – Rare (Medium: Possible)
	Helichrysum pannosum – Endangered Endemic (High: Probable)	*Mystacidium aliceae* - Vulnerable Endemic (High: Probable)
Fauna (mammals)	Conservation important mammal species are unlikely to occur within the degraded secondary vegetation and transformed habitats in the study area given the lack of suitable habitat, although nine mammal species may potentially utilise the more intact thicket/closed woodland, open savannah, and grassland patches on site. Either as residents or transient visitors that use intact vegetation as an important ecological corridor.	
	Blue duiker - *Philantomba monticola bicolor* (Vulnerable)	Maquassie Musk Shrew - *Crocidura maquassiensis* (Vulnerable), Serval - *Leptailurus serval* (Near Threatened)
	Water Rat - *Dasymys imcomtus* (Near Threatened)	African Striped Weasel - *Poecilogale albinucha* (Near Threatened)

	Cape Clawless Otter - *Aonyx capensis* (Near Threatened)	Leopard - *Panthera pardus* (Vulnerable)
	Swamp Musk Shrew - *Crocidura mariquensis* (Near Threatened)	Samango Monkey - *Cercopithecus albogularis labiatus* (Endangered)
Fauna (birds)	Tawny Eagle - *Aquila rapax* (Endangered)	African marsh-harrier - *Circus ranivorus* (Endangered)
	European Roller - *Coracias garrulus* (Near Threatened)	Lanner Falcon - *Falco biarmicus* (Vulnerable)
	Southern Bald Ibis - *Geronticus calvis* (Vulnerable)	Martial Eagle -*Polemaetus bellicosus* (Endangered)
	Secretary bird - *Sagittarius serpentarius* (Vulnerable)	Crowned Eagle - *Stephanoaetus coronatus* (Vulnerable)
Fauna (reptiles)	There is a strong possibility that reptile species occur within the more intact open savannah/grassland and thicket habitat on site where anthropogenic impacts are limited. One reptile species was assessed as being potentially present on site based on the available habitat and its reported distribution range namely, the Southern African Python - *Python natalensis* (Least Concern – Protected).	
Fauna (amphibians)	Three frog SCC may occur within specific freshwater habitats on site, they include the Bilbo's Rain Frog - *Breviceps bagginsi* (Vulnerable); Natal Cascade Frog - *Hadromorphryne natalensis* (Not red listed but threatened by introduced trout and habitat destruction) and Shovel-Nosed Frog - *Hemisus guttatus* (Vulnerable).	
Fauna (invertebrates)	Very few formal surveys of invertebrates have been carried out in the study area. A review of available online/desktop databases highlighted 17 species that could potentially occur in vegetation communities that are in good ecological condition on site.	

7.4.9.5 Grassland Ecosystems – Undervalued and Overlooked

The desktop ecological context and baseline assessment of the Project area indicate that large portions comprise savannah or grassland vegetation communities. Grassland ecosystems are among the most biodiverse vegetation types on Earth and are home to a rich variety of herbaceous plant species. However, despite their ecological importance, ancient grassland ecosystems have been undervalued and overlooked until recently. They have been lost to agricultural practices, tree plantations, mining, and urbanization. Remaining grassland ecosystems are threatened by various factors, such as invasive species, poor livestock management, altered fire regimes, and pollution. It is therefore important to take stock of the inherent value of these ecosystems when assessing their ecological importance and sensitivity to anthropogenic impacts i.e., when assessing Site Ecological Importance and when assessing the significance of impacts to these ecosystems. The key values of intact grassland ecosystems are outlined below. These key values were taken into consideration when assessing the Site Ecological Importance(SEI) and anticipated impacts associated with the proposed Jindal MIOP.

Grassland Forb Diversity

Natural grassland ecosystems are characterised by a high level of forb diversity, which contribute the bulk of the total plant species richness in these ecosystems with grass species contributing 20% or less of the species richness. Grassland forbs have been largely understudied or overlooked due to their low value as forage for livestock in grazed natural grasslands and very little is known about the possible functional roles of grassland forb species and the potential ecological consequences of any depletion of populations of forb species. This has led to a lack of concern over the anthropogenic impacts that have caused forb biodiversity loss in these important ecosystems.

Given that grassland ecosystems are considered one of the most threatened ecosystems there is an urgent need to first and foremost conserve and secondly attempt to restore old growth grasslands – not only to preserve their biodiversity but also to concurrently retain their invaluable contributions with regards to provisioning and regulatory ecosystem services.

Functional Value of Grassland Ecosystems

Grasslands cover about one-third of the Earth's land and provide crucial ecosystem services such as food production, biodiversity maintenance, pollination, water regulation, and recreational services. However, grasslands are declining worldwide, with 60% in southern Africa already irreversibly transformed. Grasslands are undervalued compared to other production systems such as forests and croplands. Grasslands are considered to play an important role in the following:

- Water production landscapes as they contribute to maintaining the quality and quantity of water entering rivers, streams, and ground water aquifers.
- Capture of water and optimisation of infiltration rates due to the herbaceous vegetation which occurs in the grassland environment.
- Limiting surface run-off and reducing soil loss via erosion.
- Flood attenuation services during high rainfall events by decreasing the rate of surface runoff and velocity of flows.
- Enhancing and regulating stream flow by retaining water within their soil profile and gradually releasing this water into downstream streams and rivers through diffuse percolation and sub-surface flow (this which often ensures that base flows within these water resources are maintained during the dry season).

Within South Africa the value of grassland ecosystems with regards to regulating water supply is particularly pertinent, given the semi-arid climate and the fact that South Africa is already a water-scarce country.

7.4.9.6 Site Ecological Importance Assessment

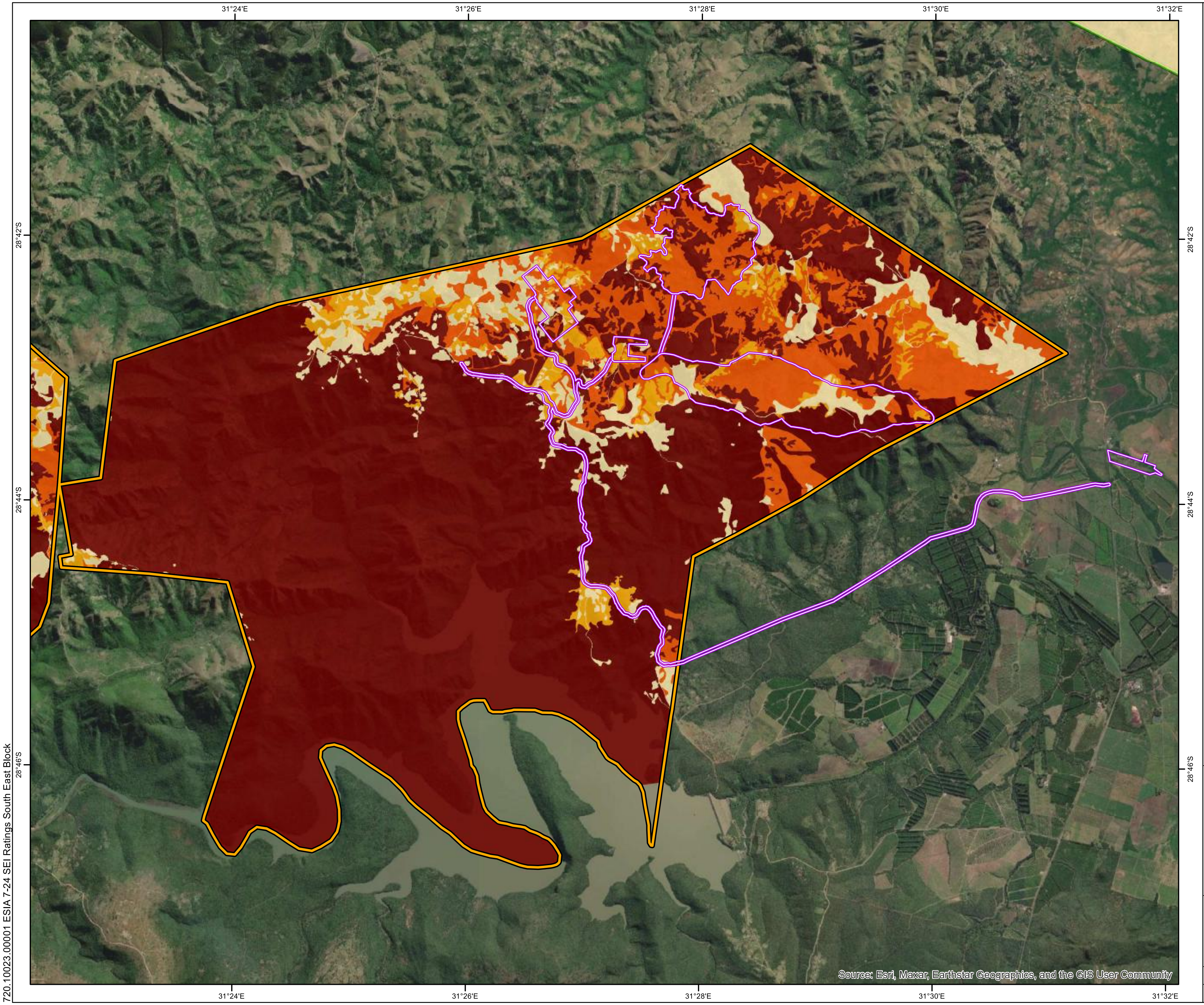
The results of the SEI assessment are outlined in Table 7-52 for the vegetation communities mapped for the South Block (also see Figure 7-27 and Figure 7-28. The SEI ratings assigned at a desktop level to vegetation communities located within the North Block are presented in Table 7-53 and mapped in Figure 7-29.

It is important to note that the SEI assessment, conducted as part of the specialist study, is subject to revision due to various limitations. These limitations include the fact that the site survey and sampling were not conducted at the optimal time and/or during the optimal season. Moreover, the rapid field assessments conducted were limited in terms of the extent of area surveyed within the North Block. Therefore, additional fieldwork is required to address these limitations and revise the SEI assessment accordingly.

Based on the SEI Assessment for the 10 broad vegetation communities identified within the Project area. The Project area covers approximately 193.8 ha. The sensitivity in terms of the Terrestrial Biodiversity Theme for the Project area is Very High Sensitivity.

Table 7-52 Terrestrial Habitat Ecological Importance Ratings for Vegetation Communities Mapped Across the Southern Blocks

	Ngongoni Veld/ Eastern Valley Bushveld Open Savannah	Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah	Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	Secondary Open Savannah/Thicket/Closed Woodland
Conservation Importance	High A number of threatened plant species listed under IUCN criteria other than A are highly likely to occur within this vegetation community, with Moist Coast Hinterland Grassland on site in good condition providing suitable habitat for these threatened species Moreover, this vegetation community contains a large area of natural habitat of VU ecosystem type.	High *Prunus africana* which is considered VU under criteria A and C, may occur within the thicket vegetation on site and it is estimated that less than 10 000 mature individuals of the species occur in the wild. Other species confirmed or likely to occur within this vegetation community include *Dioscorea sylvatica* (VU) and Sensitive Species 191 (VU) both listed under criterion A only.	Low <50% of receptor contains natural habitat with limited potential to support SCC	Medium > 50 % of receptor contains natural habitat with potential to support SCC	Very Low Minimal to no natural habitat remaining highly unlikely that populations of SCC occur
Functional Integrity	High Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.	Very High Very large (>100 ha) intact area for any conservation status of ecosystem type.	Medium Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien and invasive flora) and a few signs of minor past disturbance; moderate rehabilitation potential.	Medium Larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance; moderate rehabilitation potential.	Low Low rehab potential, but migrations still possible
Biodiversity Importance	High	Very High	Low	Medium	Very Low
Receptor Resilience	Very Low This savannah retains a level of diversity not encountered in secondary systems as it has never been planted for cultivation or timber. Given the fact that savannah/ grassland systems have been shown to lose their resilience as a result of habitat fragmentation and the fact that once transformed in any way, they are unlikely to fully recover the system should be regarded as having Very Low Resilience i.e., it should be viewed as habitat unable to recover from major impacts such as reduction in extent.	Low This vegetation community may play host to a number of rare endemic and/or threatened species with limited/scattered occurrence which if lost may not be replaced and has a higher level of diversity which may be lost if affected by anthropogenic impacts with >15 years likely required to restore less than 50% species composition.	High Habitat that can recover relatively quickly (~ 5-10 years) to restore > 70 % of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed	Medium Despite being invaded by IAPs this vegetation community may play host to remnant plant species of conservation concern, which if lost may not be replaced. However, may recover the majority of its current species complement after 10 years or more.	Very High Habitat that can recover rapidly (~ less than 5 years) to restore > 70 % of the original species composition and functionality of the receptor.
Site Ecological Importance Rating	Very High	Very High	Low	Medium	Very Low



Legend

- ▭ Proposed South Block Mining Right Area
- ▭ Proposed North Block Mining Right Area
- ▭ Proposed Mine Layout

SEI Ratings (Eco-Pulse, 2022)

- 🟥 Very High
- 🟧 Medium
- 🟨 Low
- ▭ Very Low

N

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KM

Scale: 1:50 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-27
SEI RATINGS FOR THE VEGETATION COMMUNITIES - SOUTH CENTRAL AND EASTERN BLOCK

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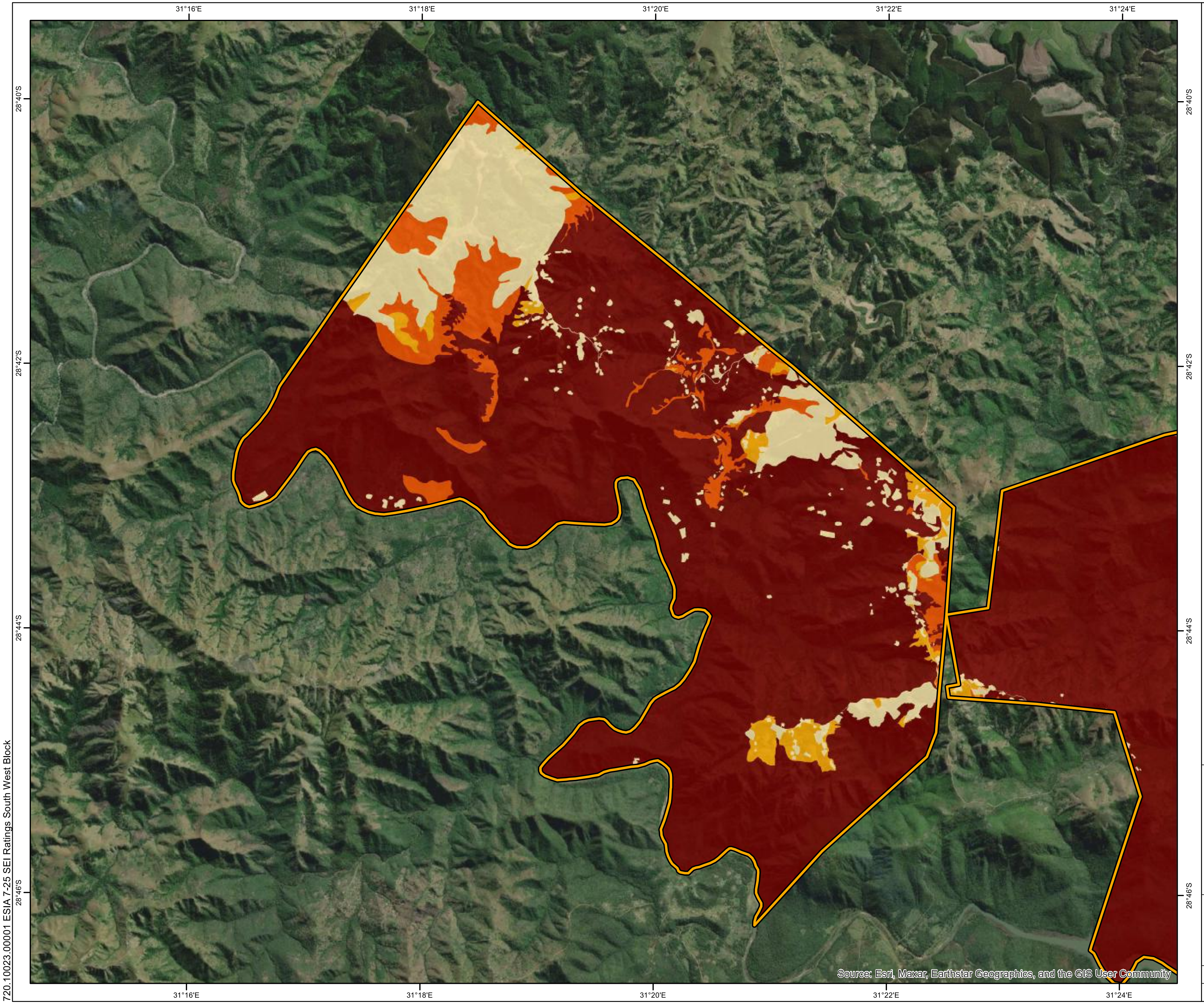
720.10023.00001 ESIA 7-24 SEI Ratings South East Block



Legend

- ▭ Proposed South Block Mining Right Area

SEI Ratings (Eco-Pulse, 2022)

- 🟥 Very High
- 🟧 Medium
- 🟨 Low
- ▭ Very Low

Scale: 1:50 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-28
SEI RATINGS FOR THE VEGETATION COMMUNITIES - SOUTH WESTERN BLOCK

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Table 7-53 Terrestrial habitat Ecological Importance Ratings for Vegetation Communities Mapped Across the North Block

	Ngongoni Veld/Northern Zululand Sourveld Open Savannah	Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland	Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket	Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah	Secondary Open Savannah/ Thicket/Closed Woodland
Conservation Importance	High A number of threatened plant species listed under IUCN criteria other than A are highly likely to occur within this vegetation community, with Moist Coast Hinterland Grassland on site in good condition providing suitable habitat for these threatened species Moreover, this vegetation community contains a large area of natural habitat of VU ecosystem type.	High *Prunus africana* which is considered Vulnerable under IUCN criteria A and C, may occur within the thicket vegetation on site and it is estimated that less than 10 000 mature individuals of the species occur in the wild. In addition, *Begonia homonyma* (Endangered) and *Clivia Gardenii* (Vulnerable) may occur with steep Scarp Forest that forms part of this vegetation community which are also listed under IUCN criteria other than A, For this reason a 'High' rating is assigned to this vegetation community which is species driven. Other species confirmed or likely to occur within this vegetation community include *Dioscorea sylvatica* (Vulnerable) and Sensitive Species 191 (Vulnerable) and *Clivia miniata* var. *miniata* (Vulnerable).	Low <50% of receptor contains natural habitat with limited potential to support SCC .	Medium > 50 % of receptor contains natural habitat with potential to support SCC .	Very Low Minimal to no natural habitat remaining highly unlikely that populations of SCC occur
Functional Integrity	High Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.	Very High Very large (>100 ha) intact area for any conservation status of ecosystem type.	Medium Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien and invasive flora) and a few signs of minor past disturbance; moderate rehabilitation potential.	Medium Larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien and invasive flora) and a few signs of minor past disturbance; moderate rehabilitation potential.	Low Low rehab potential, but migrations still possible
Biodiversity Importance	High	Very High	Low	Medium	Very Low
Receptor Resilience	Very High This savannah retains a level of diversity not encountered in secondary systems as it has never been planted for cultivation or timber. Given the fact that savannah/grassland systems have been shown to lose their resilience as a result of habitat fragmentation and the fact that once transformed in any way, they are unlikely to fully recover the system should be regarded as having Very Low Resilience i.e., it should be viewed as habitat unable to recover from major impacts such as reduction in extent.	Low This vegetation community may play host to a number of rare endemic and/or threatened species with limited/scattered occurrence which if lost may not be replaced and has a higher level of diversity which may be lost if affected by anthropogenic impacts with >15 years likely required to restore less than 50% species composition.	High Habitat that can recover relatively quickly (~ 5-10 years) to restore > 70 % of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed	Medium Despite being invaded by IAPs this vegetation community may play host to remnant plant species of conservation concern, which if lost may not be replaced. However, may recover the majority of its current species complement after 10 years or more.	Very High Habitat that can recover rapidly (~ less than 5 years) to restore > 70 % of the original species composition and functionality of the receptor.

	Ngongoni Veld/Northern Zululand Sourveld Open Savannah	Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland	Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket	Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah	Secondary Open Savannah/ Thicket/Closed Woodland
Site Ecological Importance Rating	Very High	Very High	Low	Medium	Very Low

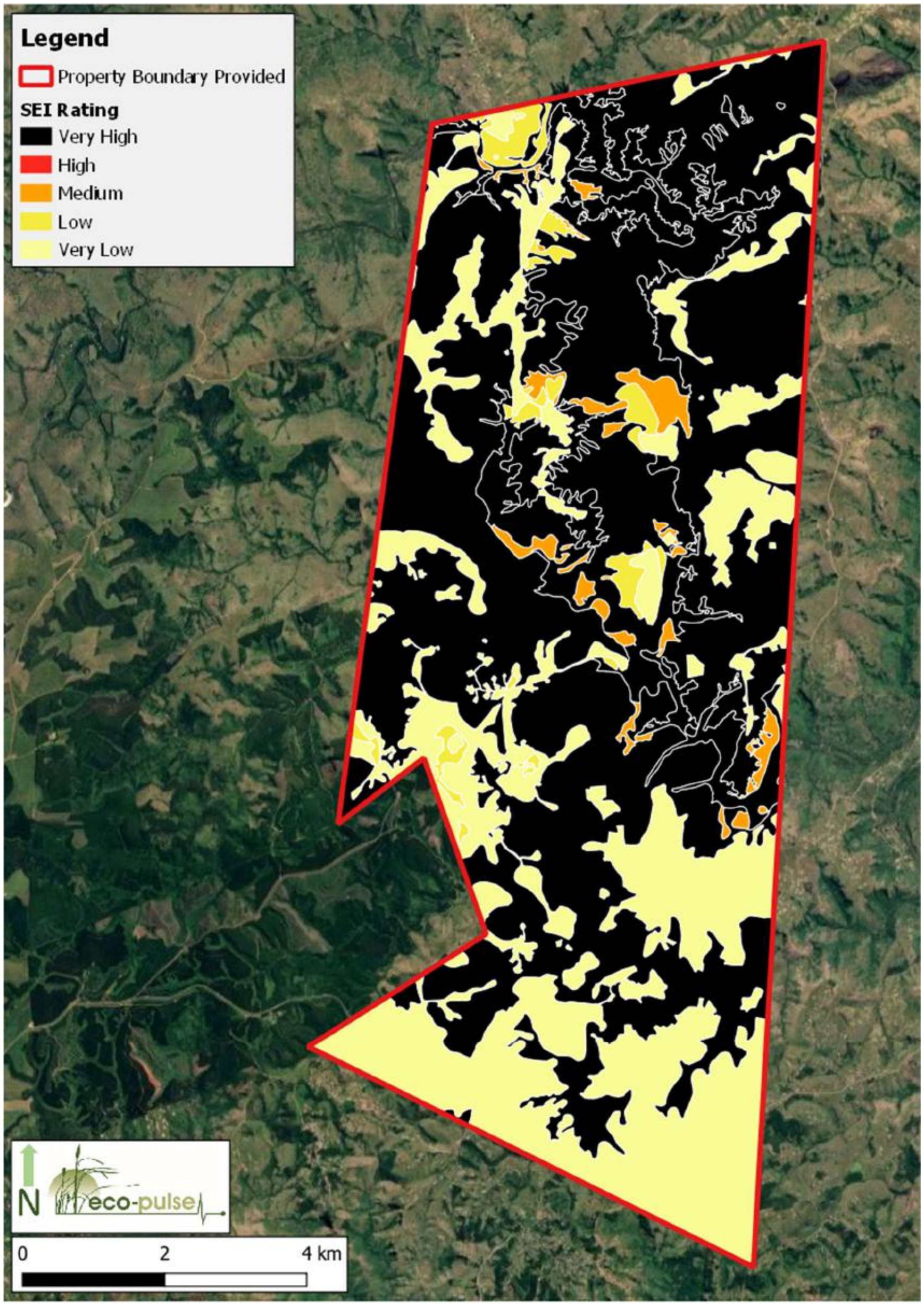


Figure 7-29: SEI Ratings for Vegetation Communities Mapped for the North Block

7.4.10 Geohydrology

The information presented in the sections below was sourced from the Geohydrological Assessment Report for the Jindal Iron Ore Mine (SLR, 2023) included in Appendix E. No new data for the Jindal MIOP area was collected as part Geohydrological Study due to a lack of access to the site. Gaps were therefore filled with the data collected by Golder during their baseline study in 2015 (where available). Drilling in the TSF area was undertaken in 2022 and was supervised by SLR.

7.4.10.1Borehole Siting Drilling and Test Pumping Results

The groundwater levels have been calculated from the initial drilling programme undertaken by Golder (2014) and an additional hydrocensus undertaken by SLR in June 2022. A total of 28 boreholes with groundwater levels were considered, however, only five were able to be remeasured in 2022 for the proposed mine area (GJ01, GJ02, GJ03, GJ14 and GJ15) and five new boreholes were drilled for the TSF. The location of the hydrocensus boreholes for the pit and the TSF are shown in Figure 7-31.

The details of the boreholes used for the hydrocensus and for input into the groundwater study are included in Table 7-54 and Table 7-55.

Table 7-54: Details of Boreholes Sited by Golder in 2014 (Golder, 2015)

Borehole	East	South	Description
MWGA01	353007.67	6822266.03	North of Pit 1 / Up gradient of WRD
MWGA02	353118.79	6823280.14	Down gradient of WRD
MWGA03	353387.27	6821965.23	East of Pit 1
MWGA04	352881.80	6821797.00	Southwest of Pit 1
MWGA05	351395.58	6821726.32	South of Pit 2
MWGA06	350262.29	6822278.45	West of Pit 2 / Upgradient of Pit 1 and Pit 2
MWGA07	351467.79	6822472.12	Down gradient of Pit 2
GJ01	352600	6821934	Community Borehole - In Pit Area
GJ02	350123	6822277	Community Borehole - In Pit Area
GJ03	348358	6821714	Community Borehole - In Pit Area
GJ14	350371	6822260	Community Borehole - In Pit Area
GJ15	350622	6822232	Community Borehole - In Pit Area

Table 7-55 TSF Monitoring Boreholes Drilled in 2022

Borehole	East	South	Description
TSF5-01	358549.45	6818911.48	North of TSF(down gradient) between TSF and Mhlatuze River
TSF5-02	360005.43	6818748.19	East of TSF (down gradient) between TSF and Mhlatuze River
TSF5-03	360726.62	6816815.96	Southeast of TSF on a tributary of the Mhlatuze
TSF5-04	356315.91	6817134.16	North-west area of the TSF
TSF5-05	356315.91	6817134.16	Redrill of TSF5-04

7.4.10.2Groundwater Levels

The current groundwater level averaged from available borehole data, most of which are located within the proposed pit footprint, is 56 mbgl with the mean hydraulic head in the pit area at 450 mamsl. Groundwater levels range from artesian to 178.5 mbgl using the hydrocensus, diamond drilling and hydrogeological borehole data. Several of the borehole water levels for the diamond drilled boreholes (STH-71, STH 57, STH 69 and STH 76) are deeper than expected and it is therefore assumed that these water levels are not reflective of steady state conditions (Figure 7-30).

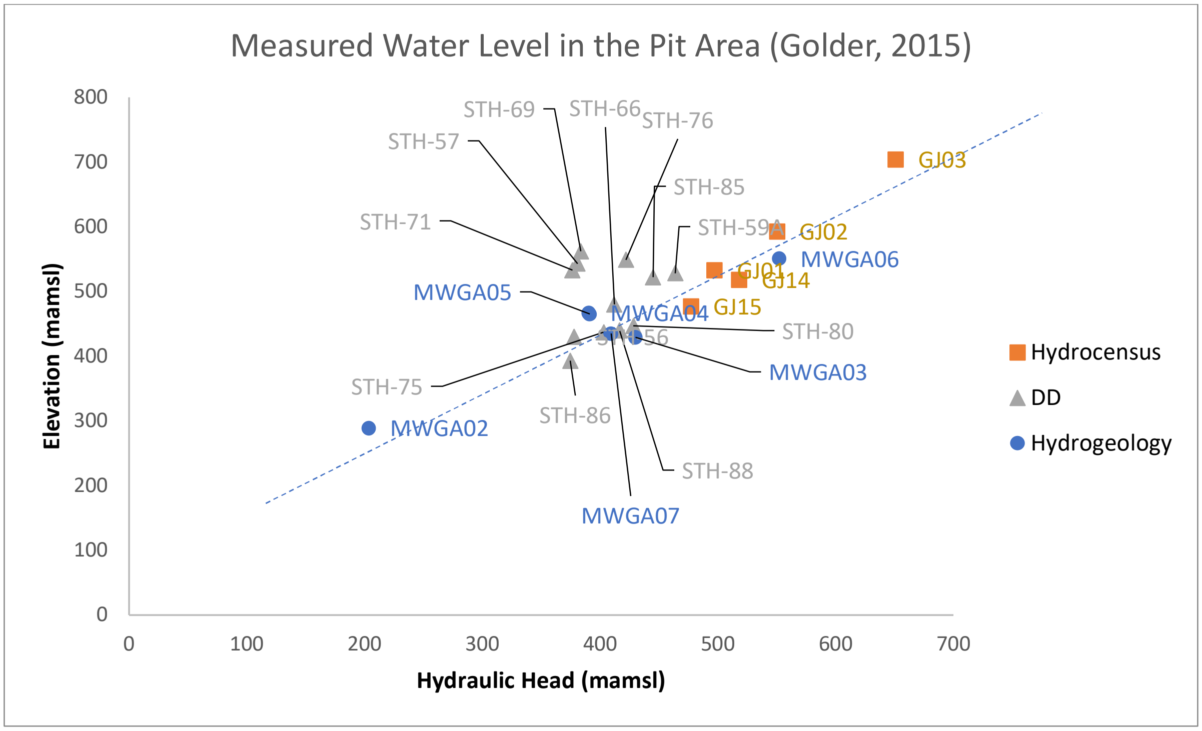
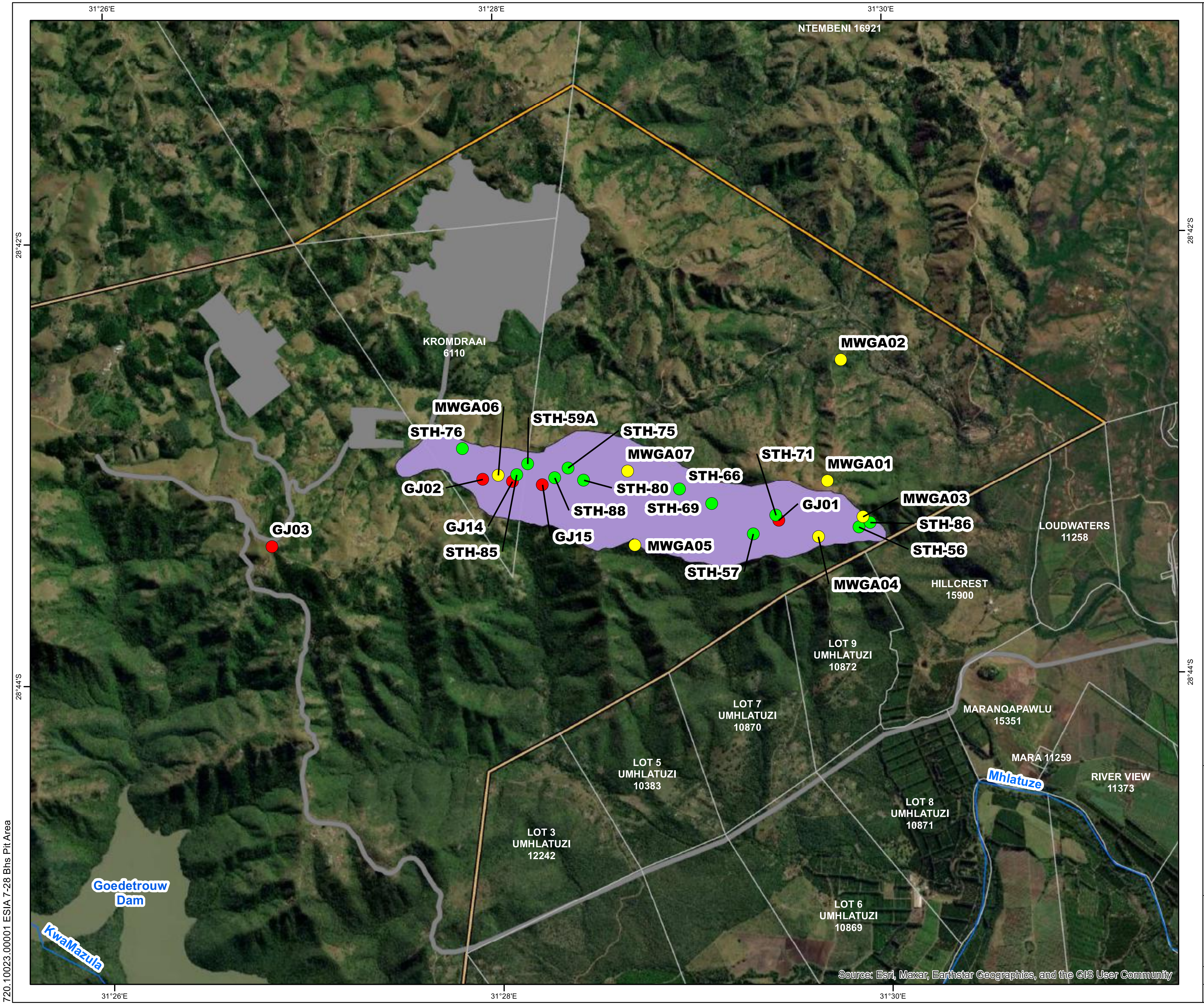


Figure 7-30: Water levels obtained from the Golder (2015) study in the pit area



Scale: 1:30 000 @ A3
Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984

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FIGURE 7-31
BOREHOLES LOCATED IN THE PIT AREA

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Map Ref No: ESIA 7-28	Date: 17/06/2023

720.10023.00001 ESIA 7-28 Bhs Pit Area

PIT AREA AND TSF DRILLING RESULTS

Previous drilling by Golder in 2014 in the pit area indicated that all water strikes were intersected deeper than 94 metres below ground level (mbgl), with the deepest strike recorded at 234 mbgl at MWGA07, and an average water strike depth of 168 mbgl (Table 7-56). The strikes intersect granite, meta dolerite, schist and meta sediments with the sediments having a higher yield potential than granite. Individual water strike yields vary from seepage of <0.1 to 5.0 L/s resembling a fractured, anisotropic aquifer.

Table 7-56 Monitoring Boreholes Drilled in 2014 (Golder, 2015)

Borehole	Latitude (East)	Longitude (South)	Description	Depth (m)	Yield (L/s)	Weathered zone (m)	Water strike(s) (m)
MWGA01	353008	6822266	N of Pit 1 / Up gradient of WRD	300	0	34	Dry
MWGA02	3532150	6822337	Down gradient of WRD	127.4	0.5	126	94, 127
MWGA03	353387	6821965	E of Pit 1	217	3.6	22	182, 190, 216
MWGA04	352882	6821797	SW of Pit 1	340	0.6	23	241
MWGA05	351396	6821726	S of Pit 2	190	0.3	13	131, 188
MWGA06	350262	6822278	W of Pit 2 / Up gradient of Pit 1 and Pit 2	202	3.5	83	163, 200
MWGA07	350262	6822478	Down gradient of Pit 2	234	6.6	13	176, 198, 234

Five boreholes were drilled in proximity of the TSF (Table 7-57). All holes intersected shale of the Pietermaritzburg formation. The drilling depths varied between 51 m and 116 m with the weathered zone varying between 2 m and 36 m. Blow yields were recorded in two holes, both had a yield of 0.4 l/s.

Table 7-57 TSF Borehole Drilling Description

Borehole	**Latitude (East)**	**Longitude (South)**	**Description**	**Depth (m)**	**Yield (L/s)**	**Weathered zone (m)**	**Water strike(s) (m)**
TSF5-01	358549.45	6818911.48	North of TSF (down gradient) between TSF and Mhlatuze River	70	Not reported	2	43,56,69
TSF5-02	360005.43	6818748.19	East of TSF (down gradient) between TSF and Mhlatuze River	76	Not reported	36	11
TSF5-03	360726.62	6816815.96	Southeast of TSF on a tributary of the Mhlatuze	116	0.40	12	42,85
TSF5-04	356315.91	6817134.16	Northwest are of the TSF	51	Not reported.	8	26, 36, 40

Borehole	Latitude (East)	Longitude (South)	Description	Depth (m)	Yield (L/s)	Weathered zone (m)	Water strike(s) (m)
					Noted to be high yielding.		
TSF5-05	356315.91	6817134.16	Redrill of TSF5-04	85	0.42	3	17,39

7.4.10.3 Unsaturated Zone

In the general mining operations and pit areas, the terrain is mountainous and water levels are typically 40 – 50 mbgl. Characteristics of the unsaturated zone are not established. In the proximity of the TSF which is in a low-lying area near to the Mhlatuze river groundwater is typically very shallow (< 5 mbgl) and consequently the unsaturated zone is thin in this area.

7.4.10.4 Saturated Zone

In the mine area, the saturated zone is recharged through precipitation percolating through soil and exposed weathered rock. In the TSF area the aquifer comprises of weathered and fresh shale to between approximately 60 and 80 m. Dwyka underlays the shales. The shales formations in this area are expected to be low permeability aquifer zones. The shallow groundwater in the proximity of the proposed TSF discharges to the Mhlatuze River and flow is thus in a northerly direction in relation to the footprint of the TSF.

7.4.10.5 Groundwater Quality

The analyses performed on samples collected by Golder in 2015 were not available for this study and as previously mentioned no new samples were able to be collected as part of this study. No water chemistry data is therefore available for the pit area. Samples collected at the TSF boreholes drilled in 2022 are outlined below and compared against SANS 241:2015 water quality guidelines for drinking water quality. This refence was selected as the rural water users in the area utilise groundwater for domestic supply.

Current water quality in the TSF boreholes have several exceedances relative to the SANS 241:2015 drinking water quality guidelines. The exceedances are typical of water quality in crop farming areas.

- **TSF-GH-501**: Elevated Sodium, Chloride, Conductivity, TDS and ammonium.
- **TSF-GH-502:** Elevated Sodium, Chloride, Conductivity and TDS.
- **TSF-GH-503:** Elevated Sodium, Chloride, Conductivity and TDS.
- **TSF-GH-504:** Elevated Sodium, Chloride, Nitrite, Conductivity and TDS well above the guidelines, nitrate is also elevated in this borehole.
- **TSF-GH-503:** Elevated Sodium, Chloride, aluminium, and manganese.

The results were analysed for physical parameters, macro elements as well as a full scan of trace metals. Where relevant, the results are compared against the South African Water Quality Guidelines (SAWQG), Volume 1: Domestic Use (DWAF, 1996).

The analytical results of the physical parameters for the boreholes drilled at the TSF (Table 7-59) show that all the sites tested are well within drinking water guidelines in terms of pH and salinity. Physical parameters taken in the field by Golder (2014) for the existing sites (GJ01-GJ16, STH/82) had very low salinities (10 to 40.1 mS/m) and neutral pH (average 7.4), with exception of GJ04 and GJ12 which had pH values below 7. The sites MWGA02, MWGA04, and MWGA07 also had low salinity (24.1 to 58.8 mS/m) and neutral pH (7.5).

Table 7-58: Physical Parameters of Samples Analysed

Site	pH	pH Temperature (°C)	Total Conductivity at 25 °C) (mS/m)	TDS (mg/l)
DWAF (1998) Domestic Use SAWQG	4 to 9	-	< 70	> 450
GJ01	7.31	25	22.2	162
GJ02	7.56	25	13.2	102
GJ03	7.85	25	13.9	110
GJ04	6.71	25	11	92
GJ07	7.62	25	14.8	150
GJ12	6.89	25	10	106
GJ13	7.54	25	28.1	204
GJ16	6.95	25	21	156
STH/82	8.24	25	40.1	314
MWGA02	7.39	25	24.1	220
MWGA04	7.78	25	57.8	402
MWGA07	7.41	25	58.8	414

Table 7-59: TSF Water Quality Data

Sample number.	Matrix.	Units (unless stated elsewhere)	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	K	Mn	Mo
		SANS 241:2015	0.3	0.01	2.4	0.7			0.003		0.05	2	2		0.4	
TSF-GH-501	Water	mg/l [ppm]	0.14	<0.05	<0.5	0.14	<0.05	56.83	<0.05	<0.05	<0.05	0.08	0.06	5.63	0.23	<0.1
TSF-GH-502	Water	mg/l [ppm]	0.27	<0.05	<0.5	0.13	<0.05	17.06	<0.05	<0.05	<0.05	0.07	0.13	12.6	0.19	<0.1
TSF-GH-503	Water	mg/l [ppm]	0.06	<0.05	<0.5	0.19	<0.05	59.34	<0.05	<0.05	<0.05	<0.05	0.13	3.03	0.16	<0.1
TSF-GH-504	Water	mg/l [ppm]	0.06	<0.05	<0.5	<0.05	<0.05	38.36	<0.05	<0.05	<0.05	0.07	<0.05	2.9	0.06	<0.1
TSF-GH-505	Water	mg/l [ppm]	0.42	<0.05	<0.5	0.1	<0.05	73.05	<0.05	<0.05	<0.05	0.07	0.41	3.59	0.67	<0.1
Sample number.	Matrix.	Units (unless stated elsewhere)	Na	Ni	Pb	Sb	Se	Tl	V	Zn	Mg	Hg	Cl	SO4	NO3 as N	NO2 as N
		SANS 241:2015	200	0.07	0.01		0.04			5		0.006	300	500	11	0.9
TSF-GH-501	Water	mg/l [ppm]	283.2	<0.05	<0.05	<0.05	<0.1	<0.1	<0.05	0.07	41.32	<0.005	475.6	128.6	0.7	<0.13
TSF-GH-502	Water	mg/l [ppm]	594.4	<0.05	<0.05	<0.05	<0.1	<0.1	<0.05	0.05	22.35	<0.005	451.5	116	1.44	<0.13
TSF-GH-503	Water	mg/l [ppm]	653.2	<0.05	<0.05	<0.05	<0.1	<0.1	<0.05	0.1	43.18	<0.005	555.8	67.68	0.55	<0.13
TSF-GH-504	Water	mg/l [ppm]	345.4	<0.05	<0.05	<0.05	<0.1	<0.1	<0.05	0.11	43.93	<0.005	307.1	60.24	6.46	3.7
TSF-GH-505	Water	mg/l [ppm]	226.6	<0.05	<0.05	<0.05	<0.1	<0.1	<0.05	0.11	44.17	<0.005	303.5	98.78	0.7	<0.13
Sample number.	Matrix.	Units (unless stated elsewhere)	F	PO4 as P	pH	Conductivity (µs/cm)	TDS	NH4	CO3	HCO3						
		SANS 241:2015	1.5		≥5 to ≤9.7	1700	1200	1.5								
TSF-GH-501	Water	mg/l [ppm]	0.48	0.26	7.52	2465	1405	1.63	0	114.6						
TSF-GH-502	Water	mg/l [ppm]	1.44	<0.2	8.46	2697	1876	0.13	30.96	547.8						
TSF-GH-503	Water	mg/l [ppm]	0.58	0.25	7.62	2803	2086	0.42	0	1027						
TSF-GH-504	Water	mg/l [ppm]	0.63	<0.2	7.6	1781	1260	0.04	0	589.6						
TSF-GH-505	Water	mg/l [ppm]	0.33	<0.2	7	1602	1042	0.52	0	446.3						

7.4.10.6Aquifer Testing

Aquifer testing was carried out by Golder (2015). Four boreholes were tested to determine aquifer parameters in the pit area. No further aquifer testing was completed in the pit area and no aquifer testing was completed for the TSF.

Hydraulic testing can provide appropriate estimates of hydraulic conductivities (K, often referred to as permeability and expressed as m^2/day) or transmissivity (T, the product of hydraulic conductivity and aquifer thickness, expressed as m^2/day). Transmissivity is more directly useful in groundwater resource studies and results are expressed as T and shown in Table 7-60.

The T values vary between 7.3 and 53 m^2/d which is typical of fractured aquifers that are anisotropic in nature. The yields pumped versus water level drawdown proves the airlift yields obtained during drilling correlate. The quantity of hydraulic testing hinders interpretation for each lithological unit therefore, further test pumping would be required prior to mining.

Table 7-60: Summary of Hydraulic Aquifer Parameters (Golder, 2015)

Borehole	Test type	Test duration	T (m^2/day)	Formation	Comment
MWGA01	No test – dry			Granite gneiss	-
MWGA02	Slug (recovering head)	0h55min	16.4	Granite gneiss	-
MWGA03	Slug (falling head)	2h00min	37	Granite gneiss /Meta dolerite	T might be invalid due to artesian pressure
MWGA04	CDT (0.1 L/s)	3h15min	7.3	Quartz vein	-
MWGA05	No test – blocked		-	Granite gneiss	-
MWGA06	No test – sealed artesian		-	Quartz Amphibole Magnetite Schist	-
MWGA07	CDT (3.6 L/s)	1h10min	53	Quartz Amphibole Magnetite Schist	-

7.4.10.7Aquifer Characterisation

The aquifer characterisation is determined based on the groundwater vulnerability, aquifer classification and aquifer protection classification.

GROUNDWATER VULNERABILITY

The Aquifer Vulnerability Map of South Africa indicates the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer (Figure 7-32). Based on the vulnerability map, the proposed project area is classified as having a low vulnerability.

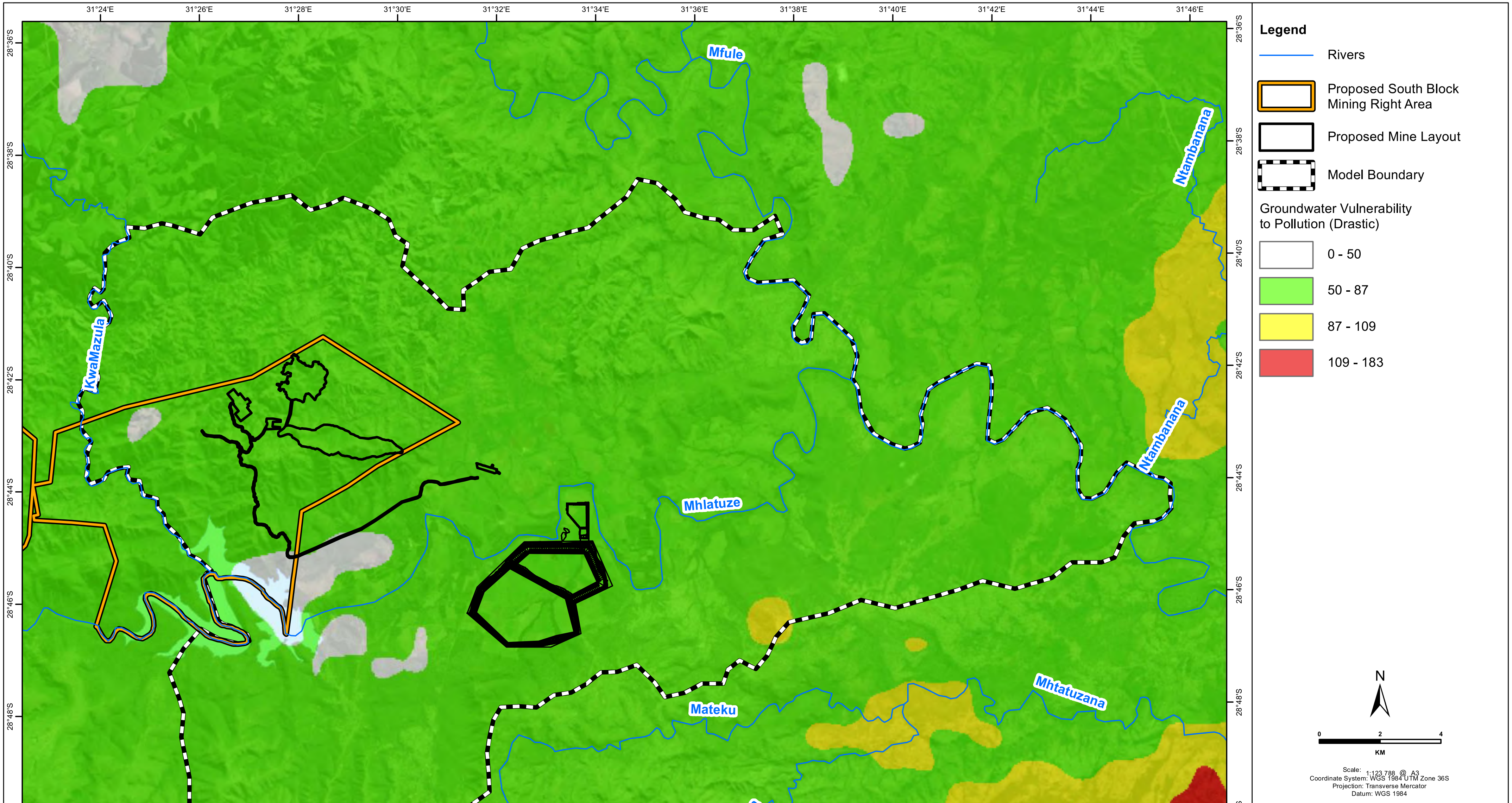
AQUIFER CLASSIFICATION

According to the Aquifer Classification Map of South Africa (DWAF, 1999), the aquifers of the study area are characterized as minor aquifers (low yielding). Given the general aquifer profile (Lithology aquifer type), there are three major aquifer systems in the Pongola-Mtavuna WMA:

- Intergranular and fractured aquifers with borehole yields between 0.5 and 2.0 l/s and water quality ranges < 70 mS/m and 70 - 300 mS/m.
- Fractured aquifers with boreholes yielding between 0.5 and 2.0 l/s and water quality ranges < 70 mS/m.
- Intergranular/alluvial (T-Qm coastal and inland deposits) with borehole yields between 0.5 and 2.0 L/s, but multi-layered aquifer systems may occur in the coastal belts (fresh, underlain by saline) (Figure 7-33).

AQUIFER PROTECTION CLASSIFICATION

Based on the vulnerability and aquifer classification, the aquifers contamination susceptibility is regarded as being of low susceptibility.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Scale: 1:123,788 @ A3
Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984

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FIGURE 7-32
AQUIFER VULNERABILITY MAP OF THE STUDY AREA

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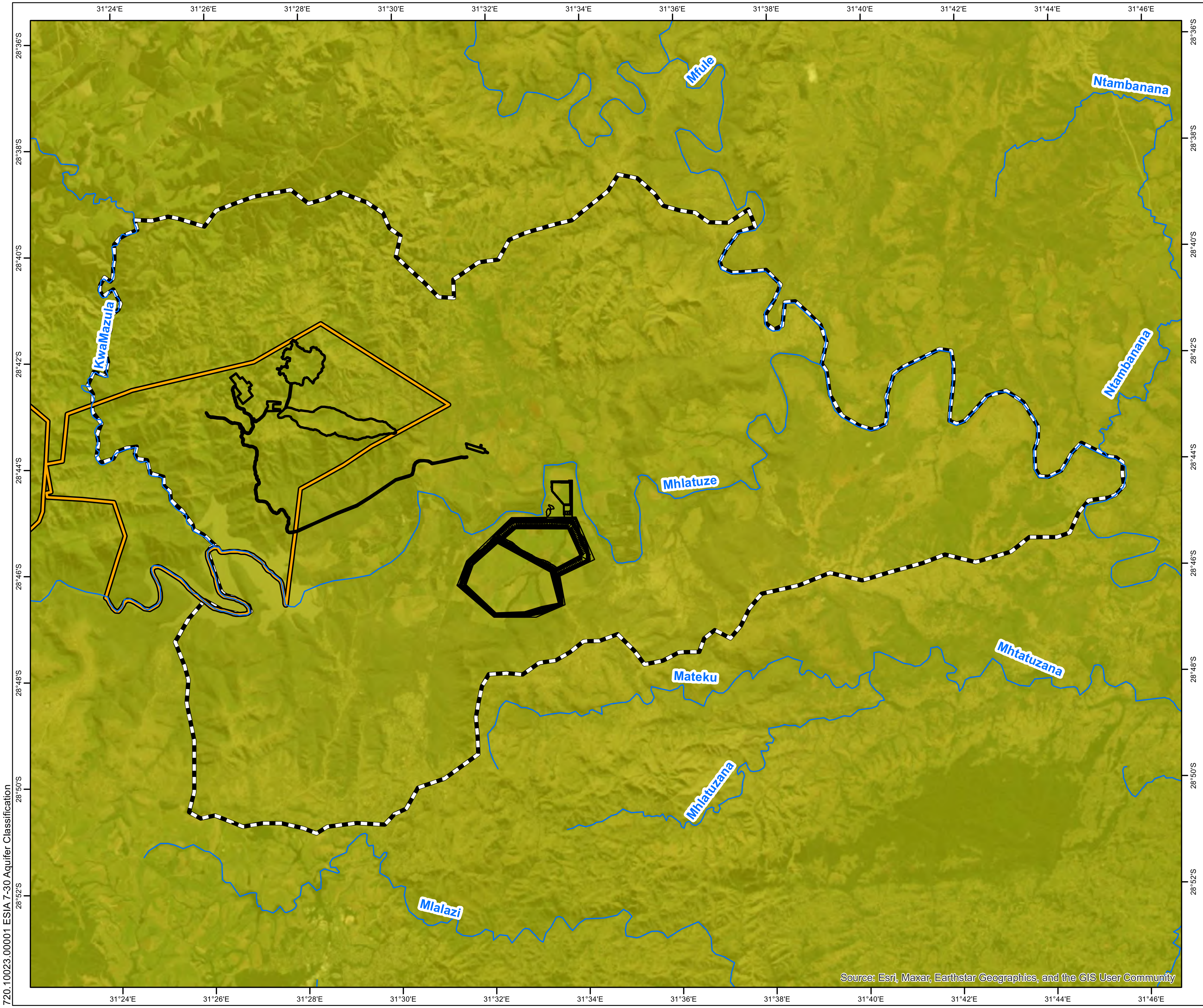
Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 7-29	Date: 04/07/2023

720.10023.00001 ESIA 7-29 Aquifer Vulnerability



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

▭	Proposed South Block Mining Right Area
▭	Proposed Mine Layout
▭	Model Boundary
—	Rivers

Aquifer Classification

🟨	Minor

N

0 2 4
KM

Scale: 1:125 000 @ A3
Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984

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FIGURE 7-33
AQUIFER CLASSIFICATION MAP OF THE STUDY AREA

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720.10023.00001 ESIA 7-30 Aquifer Classification

7.4.10.8Groundwater Elevation and Gradient

In the proximity of the proposed TSF, the measured hydraulic heads in proximity of the tailing's facility vary between 104 mamsl and 162 mamsl. The Ntshamanzi river currently drains the footprint of the proposed TSF from southwest to northeast. The drainage flows into the Mhlatuze River. The hydraulic gradients beneath the TSF are estimated to be 0.03 – 0.04 and a corresponding seepage velocity of 0.01 m/d assuming a porosity of 3 %.

The WRD and pit area, are in the hills north of the Mhlatuze River. There are no measured water levels in proximity of the WRD. However, based on interpolations from the pit area, a steep gradient beneath the WRD is anticipated (0.1). Topography beneath the WRD area undulates with elevations exceeding 600 m on the hill tops and elevations of 370 m in the valleys.

Groundwater is expected to discharge along the drainages developed in the valley areas. Seepage generated within the WRD would flow to the topographical low points and discharge along drainages including the Kwasengeni and the Memela Rivers.

Measured water levels are highly variable within the pit area owing to the topography. Artesian conditions arising from hill side seeps occur in the northwestern valley areas of the pit (MWGA03 and MWGA06). The mean water level within the pit area is 450 mamsl. The lowest elevation of the pit is 405 mamsl (eastern extent of the pit). Post-mining, should decant occur, seepage from the pit is anticipated to be in this area and runoff from areas around the open pit can possibly flow into a tributary of the Nkwalinye River which ultimately flows into the Mhlatuze River.

The current approximated groundwater levels and the direction of groundwater flow can be seen in Figure 7-34.

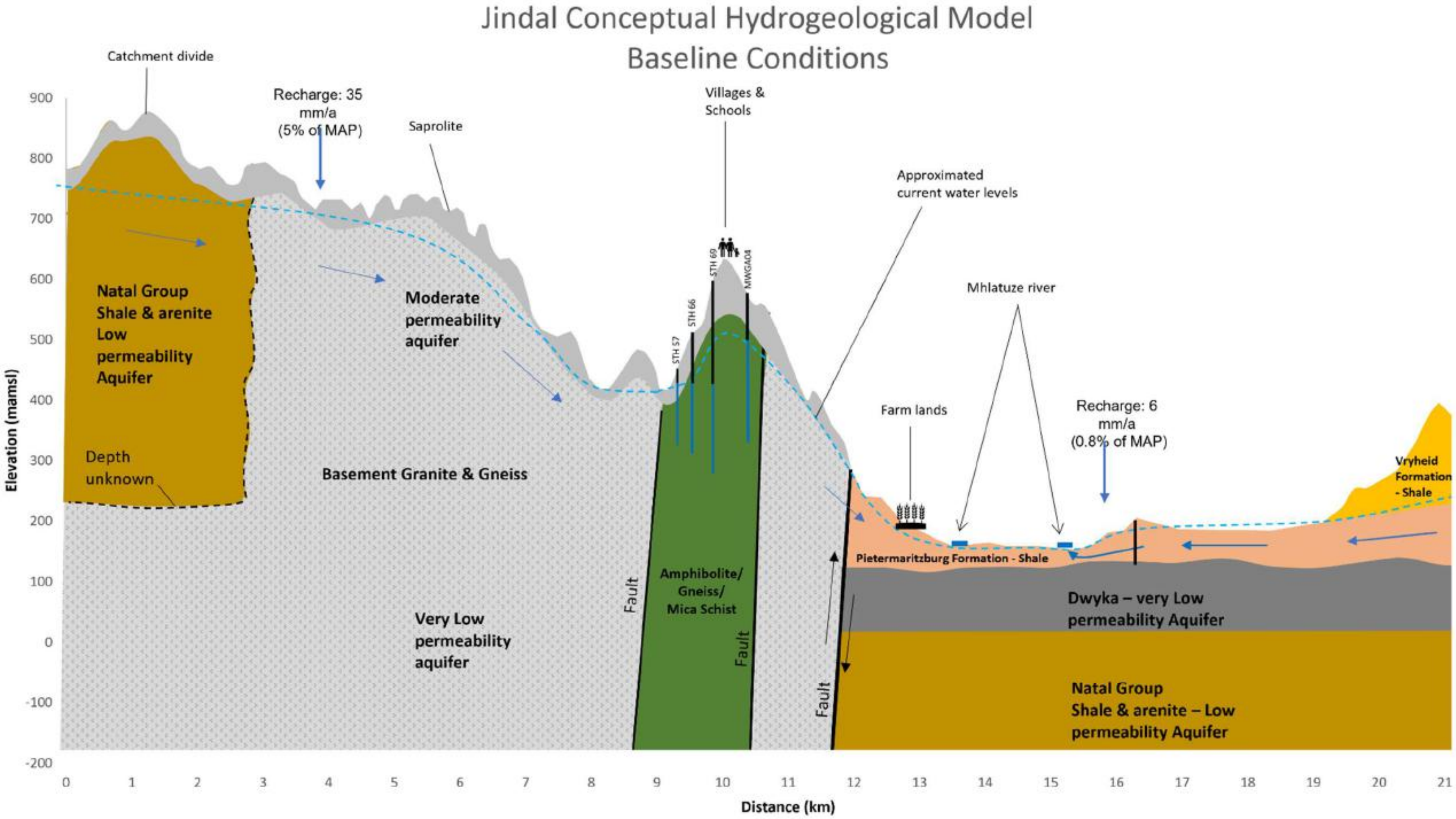


Figure 7-34 Conceptual Groundwater Model

7.5 SOCIO-ECONOMIC ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PROJECT AREA

The Jindal MIOP would be undertaken in a phased approach beginning with areas where the iron ore resource has been defined. The first phase of the Jindal MIOP (Phase 1) includes the development of the mine and (infrastructure) within the south-eastern section of the South Block. Although the MRA and EIA considers the entire extent of the North and South Blocks, specific focus is on Phase 1 of the Jindal MIOP. As such this socio-economic baseline is applicable to the South Block only. The information presented in this section was sourced from the Socio-Economic Impact Assessment Report (Urban-Econ Development Economists, 2023), which has been included as Appendix S.

7.5.1 Socio-Economic

7.5.1.1 National and Regional Economic Profile

NATIONAL CONTEXT

Originally based around the primary sector (owing to an abundance of mineral wealth and favourable agricultural conditions), South Africa's economy has undergone structural shifts over the last three decades, driven primarily by the tertiary sector. The economic structure is now considered to be diversified, with strong contributions from the secondary, and tertiary sectors. An overview of the economic structure of the economy in 2019 is shown in Figure 7-35.

Agriculture and mining are the primary sectors which account for 8.7% of the economic activity, where mining contributes the higher percentage of the two (Figure 7-35). The secondary sector is comprised of electricity, gas, and water, and construction activity which contributes 30.6% of the country's economy, with the manufacturing sector contributing the most. The tertiary sector accounts for 60.7% of the economic activity in the country and comprises of trade, transportation, finance and business services, general government, and community, social, and personal services. The finance and trade sectors are considered the main contributors to growth within the tertiary sector.

The composition and structure of the economy indicates that South Africa is moving towards a knowledge-based economy, with a greater focus being placed on technology, e-commerce, and financial and business services. Nevertheless, while there is a shift towards a tertiary economy, the productive economic sectors, viz. the primary and secondary sectors, are considered important drivers of GDP and are critical to generating economic activity, creating employment opportunities, and securing much-needed export revenue.

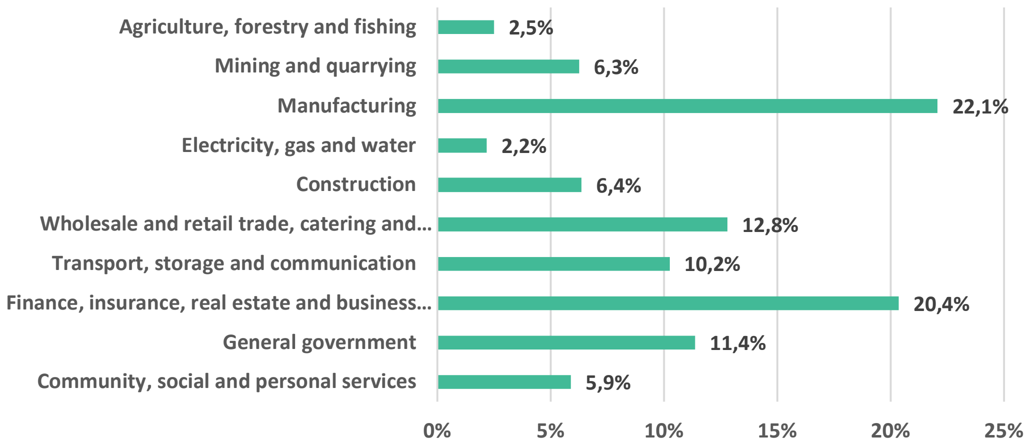


Figure 7-35 Structure of the South African Economy (2019) (Quantec, 2021b)

REGIONAL ECONOMIC PROFILE

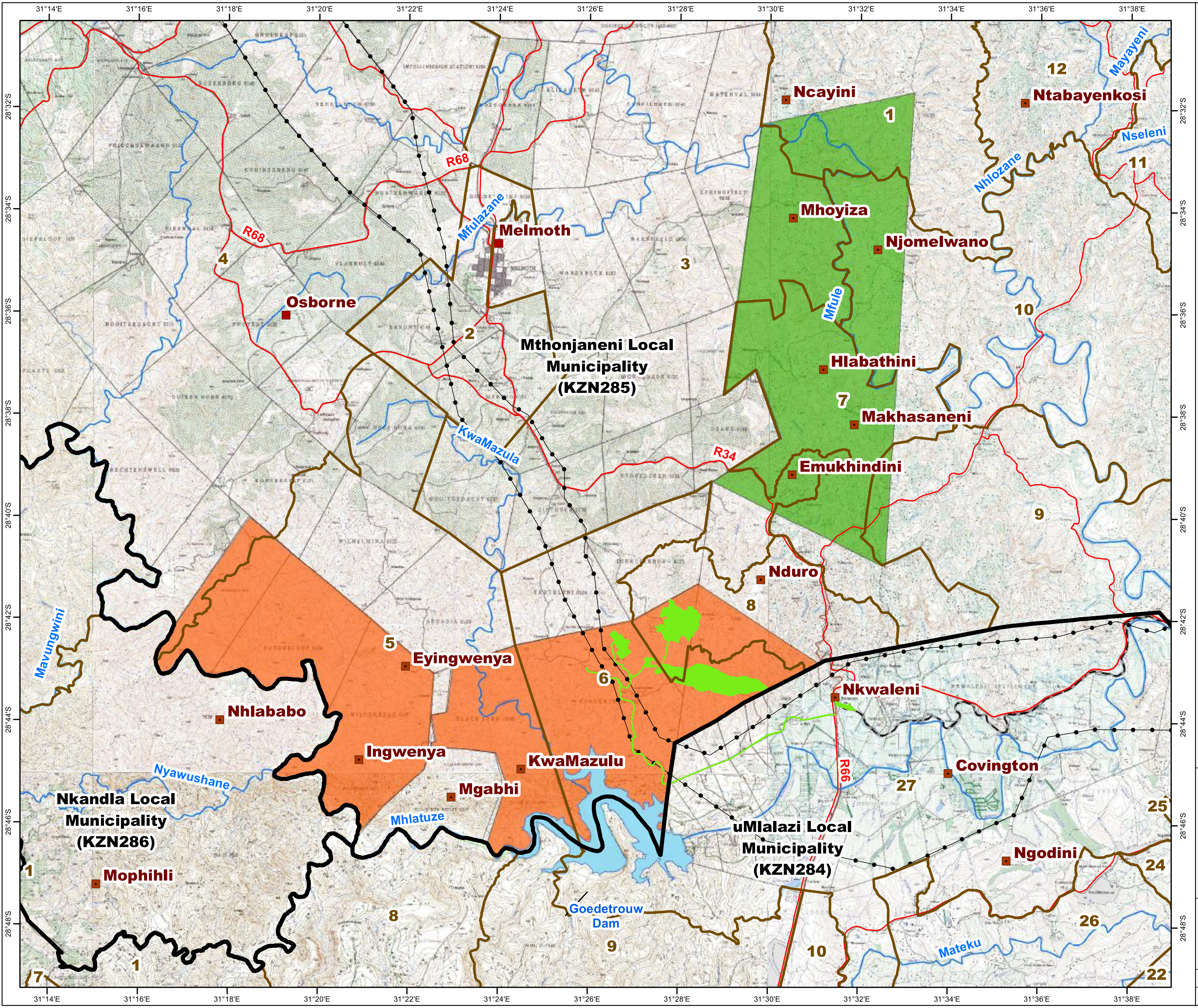
The regional economic structure of both Mthonjaneni LM and uMlalazi LM (Figure 7-36) is dominated by the primary and secondary sectors, where the agriculture and manufacturing sectors play a critical role in the economic growth of both LMs. Both primary and secondary sector account for 59.3% economic activity in Mthonjaneni LM and 47.4% of economic activity in uMlalazi LM. However, the uMlalazi LM shows signs of a shift towards a tertiary based economy, with this sector accounting for 52.5% of economic activity, driven by a comparatively more advanced finance and business services sector.

A snapshot of the structure of the municipal economies in 2019 is shown in Figure 7-37. In 2019, the main contributor to both local municipality economies was the agriculture, forestry, and mining sector (with the Mthonjaneni LM being more reliant on these sectors than uMlalazi LM). The contribution of general government, as part of the tertiary sector contributes to notable economic growth in both local municipalities (third largest sector for Mthonjaneni LM and fourth largest in uMlalazi LM). Trade also plays a notable role in both economies, while uMlalazi LM has a more advanced finance and business services sector (the third largest economic contributor).

The Gross Value Added (GVA) is used as a measure of GDP[7]. Considering the economy as whole, both Mthonjaneni LM and uMlalazi LM followed a similar growth trajectory between 2009 and 2019. After a period of positive and improving growth, from 2011, both economies begun a slow downward trend, with growth in uMlalazi LM falling flat in 2015 (0.5%) and dipping into recession in 2016 (-0.7%). Mthonjaneni LM showed some, although very low, positive growth in 2016 (0.8%). Both economies experienced a notable rebound in 2017, recording growth of 5.3% (uMlalazi LM) and 7.1% (Mthonjaneni LM), before plummeting back into recession in 2018 and 2019.

---

[7] The relationship between GDP and GVA is defined as: GDP = GVA + Taxes – Subsidies. Given that the total aggregates of taxes and subsidies are available only at the scale of the whole economy, GVA is used to measure GRDP. GVA is the difference between output and intermediate consumption for any given sector/ industry.



Scale:1:130 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-36
ADMINISTRATIVE AREAS

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Map Ref No: ESIA 7-33	Date: 17/06/2023

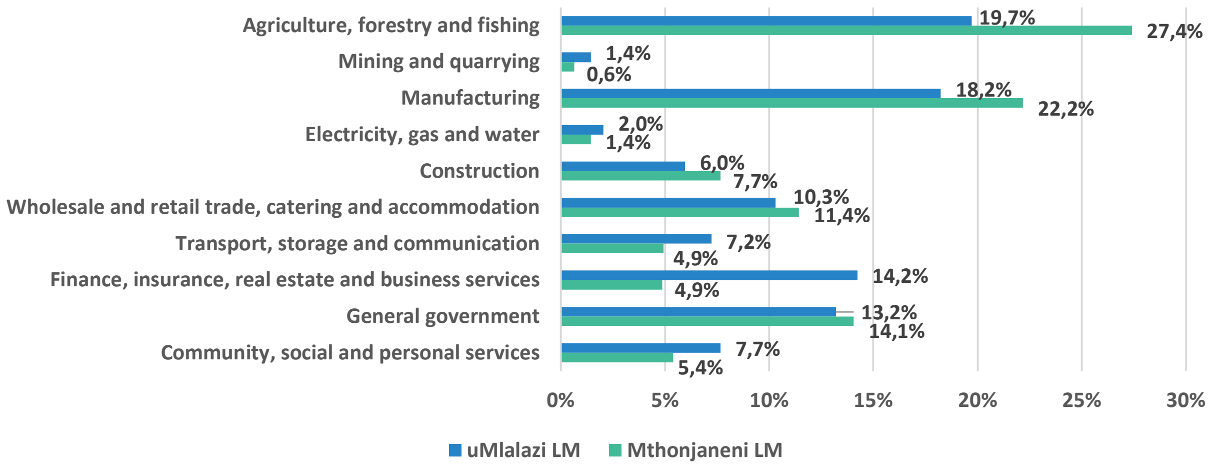

Figure 7-37 The 2019 Economic Profile for the Mthonjaneni LM and uMlalazi LM

The reliance on the primary and secondary sectors and the impacts of these sectors on overall changes in GVA is evident in Figure 7-38.

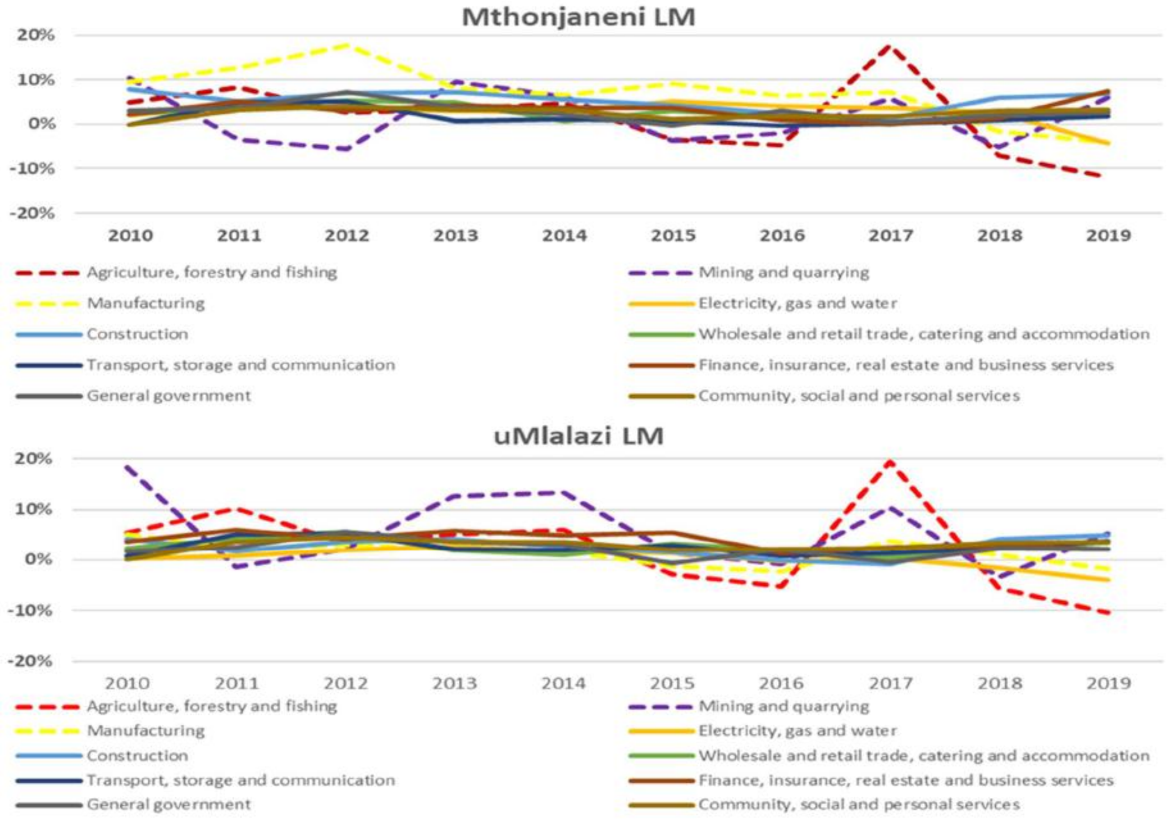

Figure 7-38 Year-on-Year Change in Sector GVA in Mthonjaneni LM and uMlalazi LM (2009-2019)

DEMOGRAPHIC AND SOCIO-ECONOMIC PROFILE[8]

The following section provides an overview of the demographic and socio-economic profile of the Mthonjaneni LM and uMlalazi LM.

Population, Households, and Age Distribution Profile

Population profile

A consistent trend of population contraction is evident for both the Mthonjaneni LM and uMlalazi LM, which is likely driven by the out-migration of individuals in search of employment opportunities in the nearby urban centres of Empangeni and Richards Bay (in the City of uMhlatuze LM). A brief overview of the population projections for uMlalazi LM and Mthonjaneni LM is shown in Table 7-61. According to the Center for International Earth Science Information Network (CIESIN), the population of the Mthonjaneni LM was projected to be 43 119 and the population of the uMlalazi LM to be 195 692 in 2020. Over the next 30 years, both areas are expected to experience a net population contraction of 0.76% and 0.46% per year, respectively. However, the City of uMhlatuze is expected to grow at a rate of 1.61% per year over the next three decades, which is higher than the national average growth rate of 1.2% per year experienced by the South African population from 2001 to 2011.

Table 7-61 Population Projections for uMlalazi LM and Mthonjaneni LM

Area	Year				Compound Annual Growth Rate (CAGR)
	2020	**2030**	**2040**	**2050**	
Mthonjaneni LM	43 119	43 710	39 666	34 304	-0.76%
uMlalazi LM	195 692	202 657	189 275	170 514	-0.46%
City of uMhlathuze LM	360 270	450 345	515 346	581 295	1.61%

Household profile

Mthonjaneni LM has experienced an average annual contraction of 1.19% over the last decade, with a projected 9 956 households in the local area in 2021. The uMlalazi LM has seen average annual growth in households of approximately 0.37%, with a projected 47 995 households in the local area in 2021. The divergent trend in household growth in the face of contracting population in both municipal areas suggests that people are leaving Mthonjaneni LM in search of economic opportunities and better services. Another possible reason behind the trend could lie in improving education levels and a growing cohort of young professionals who have moved out of the family home but chosen to continue residing in the area.

Table 7-62 2021 Household Profile*

Area	Year		10-year CAGR	2021 projection
	2001	**2011**		
Mthonjaneni LM	12 658	11 226	-1.19%	9 956
uMlalazi LM	44 611	46 272	0.37%	47 995

---

[8] The demographic profiles are based on the Census 2011 and were augmented with data obtained from the Community Survey 2016 (where possible), as a derived dataset. For population projections, the data has been augmented with information obtained from the CIESIN, which contains some of the mostly widely accepted projections of global population.

* Extrapolated based on historical trends

Age distribution

Population distribution according to age provides an indication of the size of the labour pool. Economically active persons (EAPo) are defined as the proportion of the population that has the potential to perform labour and are 15 – 64 years of age. This definition excludes the youth (below 15 years of age) and elderly (above 65 years of age). The relative distribution of the EAPo, youth and elderly provide insight into the relative dependency of any particular area. The population distribution in terms of age and gender is illustrated in Figure 7-39.

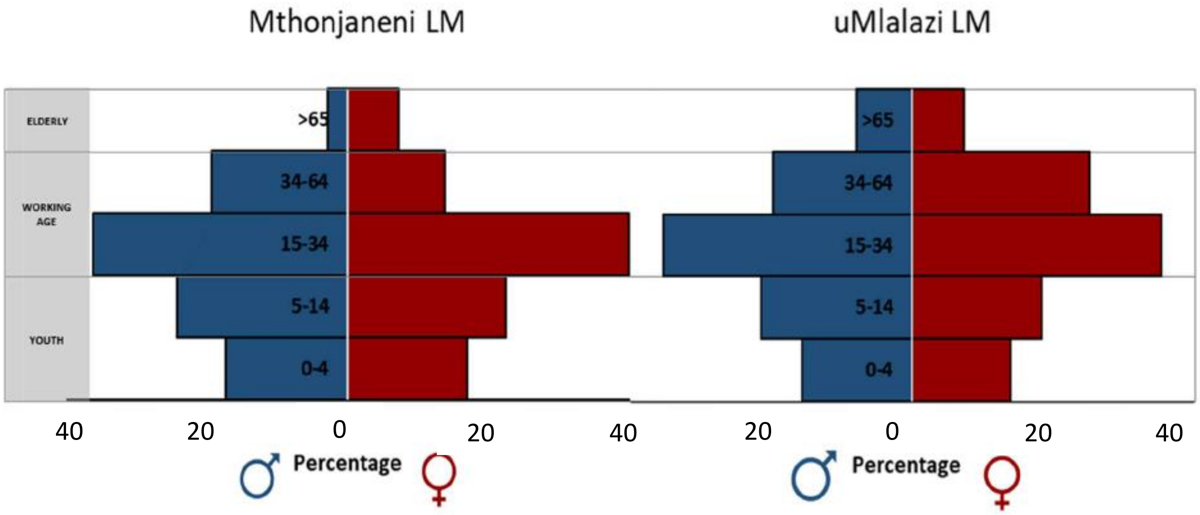

Figure 7-39 Population Pyramid for Mthonjaneni LM and uMlalazi LM - 2021*

The age dependency ratio is a measure of the degree to which the EAPo is relied upon to provide for and support the youth and elderly segments of the population. The higher the ratio, the greater the level of dependency and burden placed on the EAPo. An overview of the population distribution per segment and the resulting dependency ratio is included in Table 7-63. More than half of the population falls into the working age/ EAPo segment (58% in Mthonjaneni LM and 55% in uMlalazi LM), however, this is still a relatively low proportion and creates a significant dependency burden in both LMs. The StatsSA mid-year population estimates for 2020 indicated that the country's age dependency ratio is around 50, which suggests that there is a considerably greater dependency burden in Mthonjaneni LM and uMlalazi LM than elsewhere in the country and points to potentially greater levels of poverty as potential income earners must support a large proportion of the population.

Table 7-63 Population Distribution – 2021*

Population segment	Mthonjaneni LM	uMlalazi LM
Youth	35%	40%
EAPo	58%	55%
Elderly	8%	5%
Age dependency ratio	73	83

---

* Extrapolated based on historical trends

Education Profile

Between 2001 and 2011, there was a decline in the proportion of the adult population over the age of 20 with no access to formal education, and a corresponding increase in the population with at least a National Senior Certificate (Grade 12) in both uMlalazi LM and Mthonjaneni LM. The highest level of education in the population over the age of 20, between 2001 and 2011 is indicated in Table 7-64.

Table 7-64 Highest Level of Education of the Population Over the Age of 20 (2001 - 2011∗)

Highest Level of Education	Mthonjaneni LM		uMlalazi LM	
	2001	**2011**	**2001**	**2011**
No Schooling	37.5%	23.3%	39.1%	22.6%
Grade 12 / National Senior Certificate	13.2%	22.2%	11.5%	23.3%
Higher	3.9%	4.4%	3.7%	5.5%

The trend of better access to education is promising for potential economic growth since higher education levels, in theory, equate to better employment prospects. This is also evident in the modest growth in the population over the age of 20 reporting to have received some form of tertiary education, which in South Africa, typically means that they have passed through the formal primary and secondary education systems and attained a National Senior Certificate. From 2001 to 2021, there has been a continual steady decline in the population over the age of 20 without access to formal education, representing an average annual decline of 5.1% in Mthonjaneni LM and 4.9% in uMlalazi LM. The proportion of the population that has received a National Senior Certificate or higher education at tertiary level has also improved in both LMs. However, there are still large portions of the population that have not completed secondary school, particularly in Mthonjaneni LM, and a relatively low percentage of the population that has moved into tertiary education following attainment of the National Senior Certificate.

Household Income Profile

Household income and expenditure, and economic growth have a direct relationship. Higher levels of income translate into increased demand for goods and services, which, in turn, drive expenditure higher. This, in turn, drives production, economic growth and the size of the economy. A summary of household income levels in Mthonjaneni LM and uMlalazi LM in 2021 is provided in Table 7-65. The proportion of households with no formal income decreased in both uMlalazi LM and Mthonjaneni LM between 2001 and 2011, with average annual declines of 5.6% and 9.0%, respectively. The proportion of low-income households also decreased in both areas over this period. However, despite growth in other income categories, the high proportion of households in the low-income category, with annual incomes of R 38 400 or less, indicates that both local municipalities are classified as low-income areas. Almost half of the households in both local municipalities have an annual income of less than R 19 200 which indicates that there are high levels of poverty and deprivation.

∗ Extrapolated based on historical trends

Table 7-65 Household Income Profile - 2021*

Income category	Annual income	Mthonjaneni LM		uMlalazi LM	
		% households	CAGR 2001-2011	% households	CAGR 2001-2011
No income	R 0	2.34%	-9.0%	3.67%	-5.6%
Low income	R 1 – R 38 400	61.28%	-2.1%	54.40%	-0.6%
Low/middle income	R 38 401 – R 153 600	18.74%	9.5%	20.14%	8.7%
Middle/high income	R 153 601 – R 614 400	16.54%	15.1%	19.14%	18.35
High income	R 614 401+	1.09%	10.1%	2.65%	11.5%

Employment Profile[9]

Unemployment levels are an important indicator of socio-economic well-being, as formal employment indicates access to income and the ability to provide for basic needs. According to the Quarterly Labour Force Survey (QLFS) the official unemployment rate in South Africa was 32.6% in the first quarter of 2021 (the highest since 2008), where the expanded definition of unemployment also considers that discouraged work-seekers are also unemployed. The official unemployment rate amongst the youth (those individuals aged between 15 – 34 years old) was 46.3%, and the unemployment rate amongst university graduates was 9.3%. Employment levels in Mthonjaneni and uMlalazi increased, by an average of 1.2% and 1% per year between the period 2001 - 2011. There was also a significant decrease in the number of unemployed persons, by 7.5% and 6.3% per year, respectively. However, it is important to note that data collection process between these two time periods changed, with the inclusion of discouraged work-seekers in the 2011 census. Using the expanded definition of unemployment, the inclusion of the discouraged work seekers results in a more modest decline in the unemployment rate in both areas, by 2.1% per year in Mthonjaneni LM and only 0.4% in uMlalazi LM. The employment profile for Mthonjaneni LM and uMlalazi LM is included in Table 7-66.

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[*] Extrapolated based on historical trends

[9] When considering the unemployment profiles of uMlalazi LM and Mthonjaneni LM, it is important to understand that up-to-date employment data is not available at a sub-national scale. The information in this section therefore only provides a snapshot of the national unemployment profile.

Table 7-66 Employment Profile for Mthonjaneni LM and uMlalazi LM - 2011

Indicator	Mthonjaneni LM	uMlalazi LM
Employed	69.9%	59.9%
Unemployed	15.3%	11.4%
Discouraged work-seeker	18.8%	24.8%
Labour force participation rate	41.0%	33.3%
Labour absorption rate	28.6%	19.9%

Access to Basic Services

The provision of basic services such as water and sanitation, electricity, and refuse and waste removal is a critical function of municipalities as these services are considered fundamental. A description of basic service provision for the Mthonjaneni LM and uMlalazi LM, at a municipal household level, is included in this section.

Access to water

The biggest source of water supply in both municipal areas is from a regional/ local water scheme operated by the municipality/ other water services provider, which is above the basic level of service (LoS) provision. However, less than half of the households in each municipality receive this LoS, implying that more than half of the households in each municipality receive below the basic Los.The poor levels of access to safe and clean potable water, for drinking, cooking, and cleaning, has the potential to create a health burden. The proportion of households accessing water via rivers/ streams, and stagnant sources is cause for concern.

Access to sanitation

Access to basic levels of sanitation is poor in both municipal areas. More than half of the households in uMlalazi LM (52.9%) and almost one-third of households in Mthonjaneni LM (29.8%) have poor levels of access to basic sanitation, relying on pit latrines without ventilation, bucket latrines or no access to a toilet at all. Only 20% of households in uMlalazi LM and almost one-third (31%) in Mthonjaneni LM receive above a basic level of sanitation service provision. The high dependence on pit latrines, both with and without ventilation, in both municipalities is a concern due to the potential health risks associated with poor sanitation. However, due to the area's topography and settlement patterns, achieving universal waterborne sewerage coverage is unlikely.

Access to electricity

Energy is required for cooking, heating and lighting purposes, with lighting being arguably the most important use of electricity in a household. The various different sources of energy, such as burning of wood, coal, and/ or animal dung, can have a significant impact on the health of household members, especially those from vulnerable groups, such as young children, pregnant women, and the elderly. Paraffin is the primary source of lighting for households in both Mthonjaneni LM and Umlazi LM, with over 80% relying on it. Less than 20% of households in Mthonjaneni LM and only 11% in uMlalazi LM have access to electricity for lighting. Other sources of energy for lighting are negligible, with fewer than 1% of households making use of them. The use of paraffin has potential health consequences such as respiratory related impacts resulting from poor ventilation, burn and fire hazards. According to the Human Sciences Research Council (HSRC), a poorly regulated supply chain, the failure to pre-package paraffin, and the absence of safety related information poses a significant poisoning risk to children.

Access to refuse removal

The provision of refuse removal services by the local municipal authorities reaches just over one third of households (34.5%) in Mthonjaneni LM and only 22.4% of households in uMlalazi LM. Most households are receiving sub-basic service levels in relation to refuse removal and rely on their own refuse dumps. Poor service delivery with refuse removal can have serious environmental and health impacts.

STATS SA 2022 UPDATE

According to Stats SA census figures for 2022[10] the population of Mthonjaneni is estimated at 47 818 community members distributed in the wards of the municipality. The dominant race group is black African, constituting 47 089, followed by 320 whites, 214 coloureds, 114 Indians or Asians, and others. The total population is characterized by a larger proportion of females in all age groups, except for teen ages, where the proportion of males is higher than females. Overall, there are more females than males within the municipality.

As a rural municipality, Mthonjaneni has a backlog of social services and facilities, particularly in the rural areas. Priority services to alleviate the plight of rural residents include: water and sanitation, housing, roads, schools and clinics. Economically, the municipality faces a number of challenges when it comes to assisting the residents to access economic opportunities in order for them to participate in the local economy. The primary economic activities include, farming sugar cane, timber and cattle. The expansion of the local economy according to the IDP will be informed by acceleration of tourism related activities.

The economic perspective of the locality is gleaned from the recent Stats SA whereby the following findings are mentioned:

a. A large number of people in Mthonjaneni area are either unemployed or discouraged work seekers;
b. The majority of those who are employed are low-income earners;
c. A high percentage of the households depend on government social grants as a means of poverty alleviation;
d. There is a large labour force employed by farms around Mthonjaneni and very low salaries are earned; and
e. A relatively large proportion of the economically active people in the municipality earn between R4 801 and R19 600 per annum.

PROFILE OF DIRECTLY AFFECTED COMMUNITIES

An overview of the demographic and socio-economic profile of the communities that are likely to be directly affected by the Project is included in this section. The communities in this area are those that would be directly affected by the Project as they are located within the boundary of the South Block, and are within the southeastern portion of the block, where the majority of mine operations would be concentrated in the first phase. The Area of Influence (AoI) contains Wards 6 and 8 in Mthonjaneni LM, with Ward 5 also located within the boundary of the South Block (Figure 7-36).

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[10] https://www.statssa.gov.za/?page_id=993&id=mthonjaneni-municipality

Table 7-67 Wards and Sub-Places Within the AoI

Ward	Sub-place within the Affected Area	Ward	Sub-place within the Affected Area
Mthonjaneni Ward 5	KwaMazulu SP[11] Magbhi SP Mthonjaneni NU (non-urban)[12]	Mthonjaneni Ward 8	• Edubeni SP • Mbangu SP • Nduro SP
Mthonjaneni Ward 6	Bedlane SP Isibaya Esikhulu SP Mehlamasha SP Mthonjaneni NU Zigagayi SP		

A consolidated demographic and socio-economic profile for the above-mentioned sub-places (SP) (which includes non-urban areas) based on the StatsSA Census 2001 and 2011, is provided below. A summary of the demographic profile of the sub-places in the AoI is included in Table 7-68 and discussed in more detail in the following sections.

Table 7-68 Summary of the Demographic Profile of Sub-Places Within the AoI

Category	Value	Unit
Population	8 195	Persons
Population group profile	93.9%	Black African
	4.9%	Coloured
	0.3%	Indian/ Asian
	0.5%	White
	0.5%	Other
Households	2 118	Households
Average household size	3.9	Persons per household
Area	837	Square kilometres (km2)
Household density	2.5	Households per square kilometre (km)
Land use pattern	70.8%	Tribal/ traditional authority
	29.2%	Farming
Age profile	45%	Younger than 15
	39%	Working Age/ EAPo
	16%	Elderly
Age dependency ratio	156%	Per 100 persons
Education profile	18.5%	No schooling
	19.1%	Some primary
	4.3%	Complete primary

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[11] StatsSA collects demographic and economic data at the place level. A sub-place is therefore considered to be the "second (lowest) level of place names and could "be a suburb, section of a township, smallholding, village, sub-village, ward or informal settlement.

[12] In the StatsSA census geography, areas are defined by geography type, which is a classification according to settlement characteristics. Under this definition, a non-urban (NU) area is "any area not classified as urban"

Category	Value	Unit
	34.0%	Some secondary
	23.0%	Grade 12/ Std 10
	1.1%	Higher
Employment profile	24.8%	Employed
	86.1%	Unemployed
	89.1%	Discouraged work-seeker
Household income profile	7%	No income
	80%	Low income
	10%	Low/ Middle income
	2%	Middle/ high income
	1%	High income

SETTLEMENT AND LAND USE PROFILE

Data on settlement and land use patterns was not captured in the 2001 population Census but was captured in the 2011 population Census. A trend analysis is therefore not possible, however, change in these patterns is unlikely, as the land is completely rural/ non-urban, with Tribal/ Traditional Authority land being the dominant land type (70.8%) and farmland accounting for the remaining land (29.2%).

POPULATION, HOUSEHOLDS AND AGE DISTRIBUTION PROFILE

The AoI shows a similar trend to the broader municipal trend where both population numbers and households experienced a notable contraction between 2001 and 2011 (Table 7-69).

A sustained contraction in population and household numbers appears to have altered the settlement densities and if the trend is extrapolated to 2021, the population density (i.e., persons per square km) has more than halved, from 23.8 to 9.8, while housing densities (i.e., households per square km) have fallen even further. As a result of household numbers contracting at a faster rate than the population, the average household occupancy increased between 2001 and 2011, from 3.2 to 3.5 persons per household. Extrapolation of the trend suggests that there are now around 3.9 people living in each of the 2 118 households in the AoI.

Table 7-69 Change in Population and Households, 2001-2011

Category	2001	2011	10 year CAGR	2021*
Population total	19 933	12 781	-4.3%	8 195
Households total	6 302	3 653	-5.3%	2 118
Average household size	3.2	3.5	1.0%	3.9
Area (square km)	836.6	836.6	0.0%	836.6
Household density (persons/ household)	7.5	4.4	-5.3%	2.5
Population density (persons per square km)	23.8	15.3	-4.3%	9.8

*extrapolated based on historical trends

In the AoI 93.9% of the population identifies as Black African, the next largest population group is Coloured (4.9%) followed by White (0.5%), and Indian/ Asian individuals (0.3%). 0.5% of the population did not specify their population group. The population is relatively evenly split in terms of gender, with 51% of the population being female and 49% of the population male. However, within the working age cohort, there are notably more females than males, with 50.9% of the female population falling within this age group, and only 26.5% of the male population in the same age group. The age and gender distribution profile is depicted in Figure 7-40.

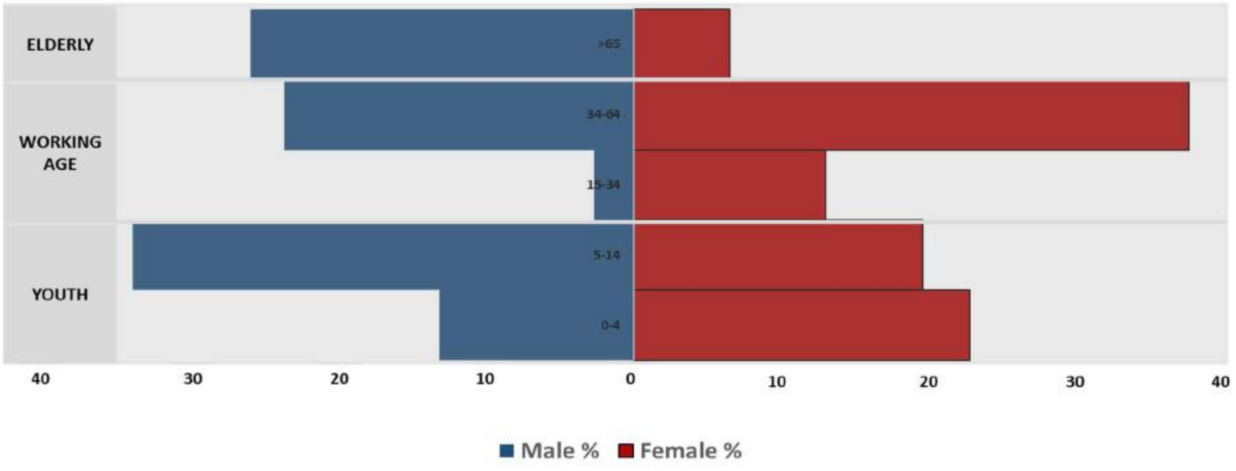

Figure 7-40 Population Pyramid for the AOI (StatsSA, 2001) (StatsSA, 2011), Urban-Econ, 2021

The population distribution profile above is concerning as only 39% of the population falls into the working age cohort, which is smaller than the under 15 years of age cohort that is typically not economically active. When combined with the 16% of the population that falls into the elderly age cohort, the age dependency ratio is quite high at 156. This means that every person of working age is supporting another 1.5 people, a situation which places a significant burden on those that are employed. In the next five to ten years the age dependency ratio looks likely to undergo some positive shifts as the 34.7% of the male population and 19.7% of the female population in the 5-14 years age grouping becomes part of the economically active sector.

HOUSING PROFILE

Access to decent housing is an important indicator of well-being. An analysis of the housing profile in the AoI in terms of the type of dwelling that the resident population resides in indicates that most of the population lives in a formal brick/ concrete block house, flat/ apartment, townhouse, or house/ flat/ room in a backyard (granny flat), with approximately 64% of the population living in these structures. The rest of the population lives in traditional housing, such as hut or structure made of traditional materials (17.5%), with only an insignificant part of the population residing in informal dwellings. Table 7-70 provides an overview of the housing profile in the in terms of dwelling type.

Table 7-70 Housing Profile in the AOI, 2021*

Dwelling type	%
House or brick/ concrete block structure on a separate stand or yard or on a farm	56.7%
Flat or apartment in a block of flats	0.6%

Dwelling type	%
Town/cluster/semi-detached house (simplex; duplex; triplex)	2.9%
House/ flat/ room in backyard	3.8%
Traditional dwelling/ hut/ structure made of traditional materials	17.5%
Informal dwelling (shack; in backyard)	0.2%
Informal dwelling (shack; not in backyard; e.g., in an informal/ squatter settlement or on a farm)	0.0%
Room/ flatlet on a property or larger dwelling/ servants quarters/ granny flat	0.0%
Caravan/ tent	0.0%
Other	18.3%

*extrapolated based on historical trends

Tenure status is an important indicator of economic prospects and relative wealth (Table 7-71). Individual property ownership is a key enabler of access to finance through commercial banking institutions. Almost half of residents in the AoI indicate that they own the house that they live in, with just short of 40% having paid their property off in full, and another 8.2% working towards repaying their home loan. Just over one third of residents are renting the house that they live in, while 14.4% are living rent-free.

Table 7-71 Tenure Status, 2021*

Tenure status	%
Owned and fully paid off	39.9%
Owned but not yet paid off	8.2%
Rented	37.5%
Occupied rent-free	14.4%
Not applicable/ Not specified	0.1%

*extrapolated based on historical trends

EDUCATION PROFILE

Between 2001 and 2011 there was a notable decline in the proportion of the adult population over the age of 20 with no access to formal education, and an increase in the population with at least a National Senior Certificate (Grade 12). The highest level of education in the population over the age of 20, between 2001 and 2011 is indicated in Table 7-72.

Table 7-72 Highest Level of Education, 2001-2011

Highest Level of Education	2001	2011
No Schooling	42.2%	29.6%
Complete primary	5.5%	5.1%
Grade 12 / National Senior Certificate	8.6%	15.0%
Higher	1.9%	1.5%

While the decrease in the proportion of the population with no formal education is a positive sign of improving employment prospects, unfortunately, there is a poor conversion from secondary education to tertiary education, with a decrease in the proportion of the population over the age of 20 that has received a higher education qualification. Digging deeper into the education profile and extrapolating the trend, suggests that there should be a continual decline in the proportion of the population without access to formal education, from 42.2% in 2001, to 29.6% in 2011 and to 18.5% in 2021, representing an average annual decrease of 7.1%. Similarly, a generally improving trend in the proportion of the population that has received a National Senior Certificate is also evident (Table 7-73).

Table 7-73 Summary of Education Profile in the AoI

Highest level of education	2021	CAGR 2001-2011
No schooling	18.5%	-7.1%
Some primary	19.1%	-4.4%
Complete primary	4.3%	-4.5%
Some secondary	34.0%	0.1%
Grade 12/ Std 10	23.0%	1.6%
Higher	1.1%	-6.0%
Unspecified	0.1%	

The poor progression from the secondary to tertiary education system is likely to create a blockage to economic growth as residents in the AoI would not be adequately equipped with the advanced skillsets required for the fourth industrial revolution, with career progression opportunities likely to be limited to elementary occupations.

HOUSEHOLD INCOME PROFILE

The household income profile of the AoI reveals that the area is classified as a low-income area. When one considers the very high age dependency ratio (156%), and the low levels of access to higher education, economic growth prospects appear limited. A summary of household income levels in the AoI in 2021, extrapolated from the Census 2011 and Census 2011 datasets, is presented in Table 7-74.

Table 7-74 Household Income Profile in the AOI, 2021*

Income category	Annual income	% households	CAGR 2001-2011
No income	R0	6.5%	-17.2%
Low income	R1 – R38 400	80.2%	-7.1%
Low/middle income	R38 401 – R153 600	10.4%	5.5%
Middle/high income	R153 601 – R614 400	2.3%	8.1%
High income	R614 401+	0.6%	13.1%

*extrapolated based on historical trends

Positively, a significant reduction in the proportion of households with no formal income is evident between 2001 and 2011, with a similar but less pronounced decline in the number of low-income households. However, 80.2% of households earn less than R38 400 a year within which 68.3% of the households have an annual income of less than R19 200. These numbers suggest high levels of poverty considering that the average household houses four people and every person of working age is supporting 1.56 people that are not able to work.

EMPLOYMENT PROFILE

As with the unemployment profiles for Mthonjaneni LM and uMlalazi LM, the data extrapolation for the AoI suggests that the unemployment rate is lower than the South African average rate of unemployment (32.6% under the restricted definition). While there are likely to be few employment opportunities in the AoI, almost 50% of the working age population is either employed or actively looking for employment (labour force participation rate) with current numbers indicating that 37% of those have found employment (Table 7-75).

Table 7-75 Employment Profile in the AOI, 2011

Indicator	%
Employed	75.2%
Unemployed	13.9%
Discouraged work-seeker	10.9%
Labour force participation rate	49.9%
Labour absorption rate	37.3%

7.5.1.2 Demographic and Socio-Economic Profile (North Block)

While an in-depth review of the demographic and socio-economic profile of the communities in the North Block has not been undertaken, it is reasonable to consider that they share similar characteristics to those in the south-eastern block. The wards that fall within parts of the North Block are:

- Mthonjaneni Ward 1;
- Mthonjaneni Ward 3;
- Mthonjaneni Ward 7; and
- Mthonjaneni Ward 10.

According to the Census 2011, the above wards contain 30 264 people living in 6 235 households, which suggests a household density of approximately 4.9 persons per household[13]. The four wards cover around 560 km^2 which suggests an average population density of 53.9 people per km^2 and 11.1 households per km^2.

7.5.2 Traffic

Traffic from mining developments has the potential to affect the capacity of existing road networks as well as result in noise, air quality and public road safety issues. This section provides an overview of the current road network, conditions and road use. Understanding the layout, use and conditions of transport systems relevant to the proposed project area provides a basis for understanding change as a result of project contributions. The information presented in this section was sourced from the Traffic Impact Assessment Report (Siyazi Thula Transportation Planning, 2023), which has been included as Appendix R.

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[13] It is worth noting that the above wards do not fit neatly inside the boundaries of the North Block and therefore the households and people affected in the North Block would likely be lower than the figures provided above. It is also likely that the same trend of population contraction experienced in the Mthonjaneni LM in general would be applicable to these wards, which would in turn also result in fewer households and people.

7.5.2.1 Existing Land Use and Traffic Network

Access to and from the proposed mining development would be gained directly from the existing Road D395 which traverses the site. Broader access to the site is currently gained via a series of local gravel roads including Road L742, Road L2765, Road PROW15, and Road P258. All of the roads lead to the main Road P47-4 (R66) which connects Melmoth and Eshowe (Figure 7-41). The R66 road runs almost directly in-between the North and South Blocks in a north-south direction.

Pedestrian activity was observed at all of the relevant intersections, predominantly at Point D, during the manual traffic counts.

In order to gain a better understanding of the existing traffic patterns and movements adjacent to the proposed Jindal MIOP, 12-hour manual traffic counts were conducted at the existing intersections that would potentially be affected by the proposed mining development (see Table 7-76). It is standard traffic engineering practice to conduct at least 12-hour manual traffic counts, as close as possible to a month-end Friday when traffic movement is expected to be at its highest. 12-hour manual traffic counts were conducted in April 2018 at the following intersections under investigation:

- Point C: Intersection of Roads P47-4 (R66), P393 (R34) and Local Road;
- Point D: Intersection of Roads P47-4 (R66), PROW314 and Shop Access;
- Point E: Intersection of Road P47-4 (R66) and Nkwalini Railway Siding Access Road; and
- Point F: Intersection of Roads P47-4 (R66) and Road PROW15.

Table 7-76 Existing Traffic Volumes at Key Intersections (SIYAZI, 2023)

Intersection	Number of vehicles AM Peak	Number of vehicles PM Peak
C	467	582
D	303	379
E	261	321
F	246	319

Road P47-4 (R66) showed very limited activity at all relevant intersections during the surveys. It is anticipated that this road is relatively infrequently utilised. There was activity observed at the intersection of Road P47-4 and Road PROW314 due to a clinic and shops located in the vicinity and the public transport loading and off-loading at the lay-by facility. The various relevant intersections along the main Road P47-4 are included in Figure 7-41. The traffic count at the Road P47-4 and relevant intersections showed morning peak hour load averages of about 370 vehicles per hour. The afternoon peak hour load average was found to be 480 vehicles per hour.

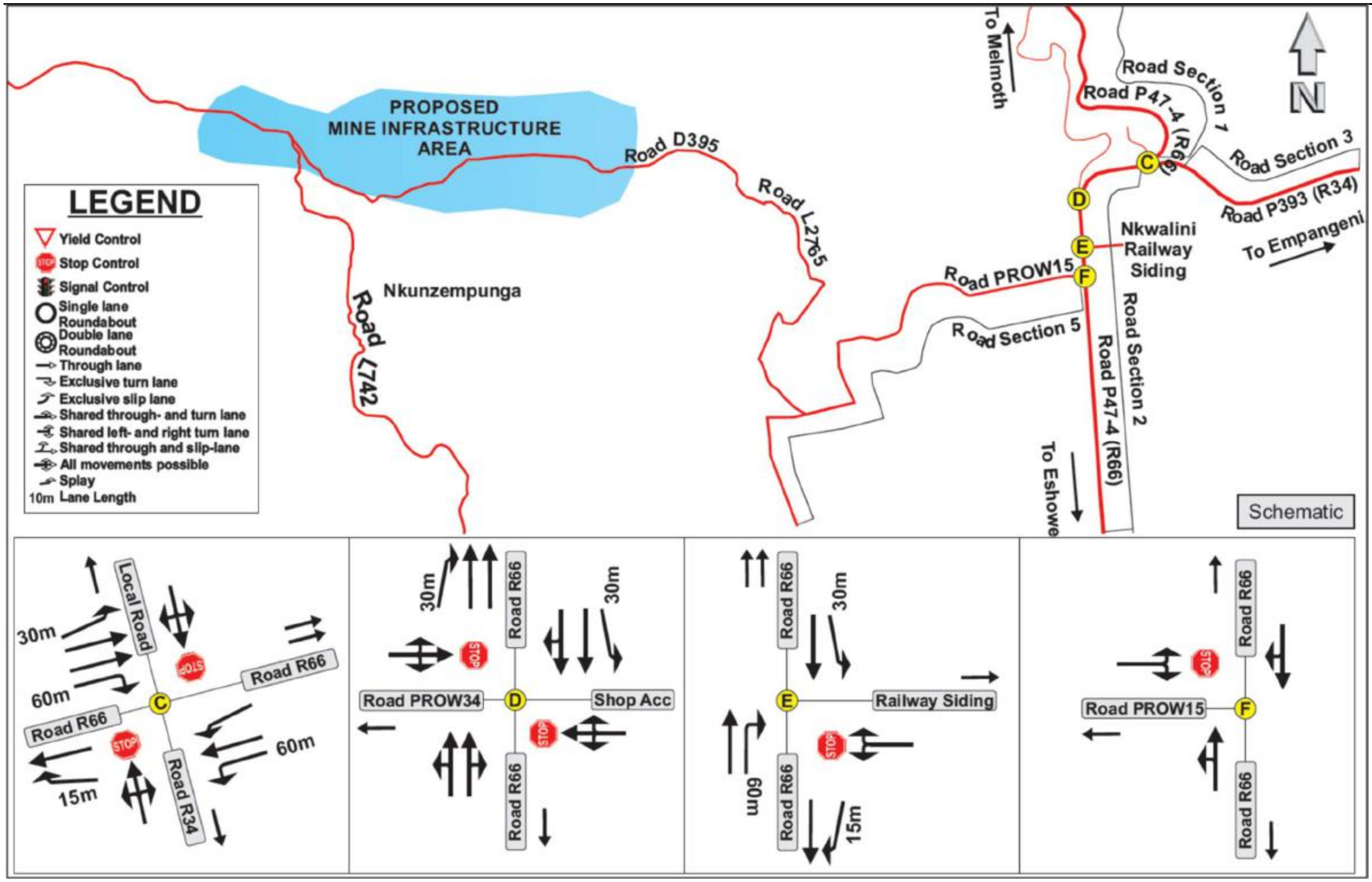


Figure 7-41 Schematic Layout of the Existing Road Network (Siyazi, 2023)

The intersections investigated as part of the Traffic Impact Assessment are currently operating at acceptable levels of service. Reserve capacity is available at the relevant intersections on the existing road network. Vehicle trips generated by the proposed mining development will, however, determine if road network improvements will be required from an intersection performance and road safety perspective.

From a traffic engineering perspective, most of the existing road network and intersections under investigations is considered to have a low sensitivity. However, the intersection of Road R66, Shop Access and Road PROW314 (Point D) is considered to have a medium sensitivity, due to the retail activities at this intersection which create vehicular traffic and pedestrian movements (Potential vehicle/pedestrian conflict).

7.5.3 Visual

The visual character of an area is determined by considering landscape character, scenic quality, sensitivity of the visual resource, sense of place and visual receptors. Mine-related infrastructure and activities have the potential to alter the visual aspects in a project area and surrounding area.

Information in the sections below were sourced from the Visual Impact Assessment (Young, December 2022), included in Appendix L.

7.5.3.1 Landscape Character

The study area comprises mostly hilly terrain which is dominated by Ngongoni Veld (Section 7.4.9.1). This vegetation unit features dense, tall grassland with wooded areas found in the valleys at lower altitudes. The Mhlatuze River valley and the tributaries that feed it are associated with Eastern Valley Bushveld vegetation in a mosaic of thickets. Much of this vegetation is compromised through commercial agriculture (citrus and sugar cane), forestry, and rural development. However, remnants of the original vegetation are scattered throughout the study area.

The area is divided into six landscape character types of varying levels of quality and scenic value. These include:

- Goedertrouw Dam and Environs - The Goedertrouw Dam is the focal element of this landscape. Although tourism was once associated with the dam the infrastructure has not been maintained. Nevertheless, this landscape type, with its wooded valleys and hills along with the Goedertrouw Dam represents a landscape type that is intact. It is considered the most scenic area within the study area.
- Rivers and valley systems - The study area is typical of the KZN region with deep valley systems and grassed hills with several river systems crossing the area, specifically upstream of the Goedertrouw Dam. Downstream of the dam, the valleys are associated with commercial citrus and sugarcane farming.
- Grassland and Associated Open Bush - This landscape type is the most widespread within the study area, and the proposed mine and associated infrastructure occur within this landscape character type. Typically, the hills contain villages and homesteads with some introduced tree species. The valleys contain some woodland and exotic species which have begun to take hold. Some of the original grasslands remain intact, but it is slowly being compromised with the growth of the villages and homesteads and overgrazing in some areas.
- Rural Villages and Homesteads - With densities increasing, there is evidence of degradation and erosion of features resulting in areas of a mixed character, particularly in the south and southeast of the study area.
- Industrial Agriculture and Forestry - This is a typical landscape type within the sub-region and large sections of the area have been converted to industrial agriculture and forestry. Forestry and sugarcane

fields dominate the area south of Melmoth and downstream of the Mhlatuze River is dominated by citrus and sugar cane.

- Urban Areas and Power Utilities - The only urban development within the study area is Melmoth. Two ESKOM transmission lines run through the study area and pass immediately west of the proposed Jindal MIOP.

7.5.3.2 Visual Resource Value, Scenic Quality, and Landscape Sensitivity

The value of the visual resource and its associated scenic quality is determined through the value of "individual contributors to landscape character, especially key characteristics, which may include individual elements of the landscape, particular landscape features, notable aesthetic, perceptual or experiential qualities, and combinations of these contributors". These primary features give the area its typical characteristics and a sense of place. The various local landscape character types and their consequent sensitivities are summarised in Table 7-77.

Table 7-77 Value of the Visual Resource

High	Moderate	Low
Goedertrouw Dam and surrounding woodland valleys and hills; other River and Valley systems	Natural grassland on hills and open bush on low lying hills; villages and homesteads on hills; Agricultural lands and forestry.	Urban development and power infrastructure
This landscape type is considered to have a high value because it is a: A distinct landscape that exhibits an extremely positive character with valued features that combine to give the experience of unity, richness, and harmony. It is a landscape that may be of particular importance to conserve, and which has a strong sense of place. Sensitivity: It is sensitive to change in general and will be detrimentally affected if the change is inappropriately dealt with.	This landscape type is considered to have a moderate value because it is a: A common landscape that exhibits some positive character, but which has evidence of alteration/ degradation/ erosion of features resulting in areas of more mixed character. Sensitivity: It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with	This landscape type is considered to have a low value because it is a: Minimal landscape, negative with few, if any, valued features. Sensitivity: It is not sensitive to change in general and scope for positive enhancement frequently occurs

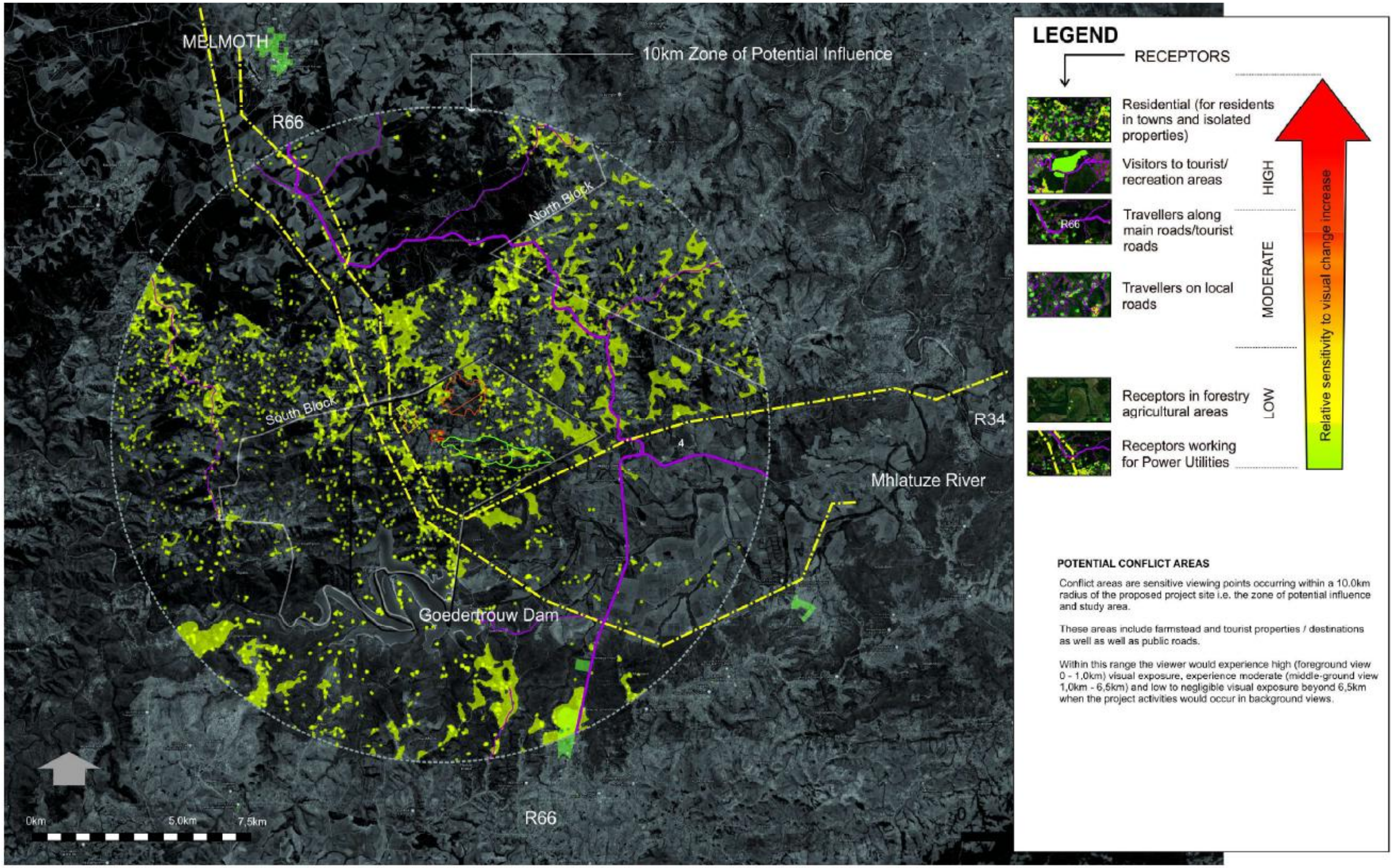
7.5.3.3 Sense of Place

A sense of place is how a person can recognize or recall a place as being distinct from other places - as having a vivid, unique, or character of its own. The combination of the cultural and agricultural/forestry activities, the distinctiveness of the rugged incised topography, and the relative intactness of the original landscape give the study area a relatively strong sense of place.

7.5.3.4 Visual Receptors

Sensitive viewing locations occur throughout the study area and across the proposed mining area. The primary areas of concern are the following and depicted in Figure 7-42:

- Residential properties associated with rural development on the hills in and around the Project site north and east of the ridgeline;
- Residential/homestead, farming and tourist facilities south of the ridgeline and associated with the Goedertrouw Dam and environs, including Shakaland; and
- Travellers along the R66 main road.



POTENTIAL CONFLICT AREAS

Conflict areas are sensitive viewing points occurring within a 10.0km radius of the proposed project site i.e. the zone of potential influence and study area.

These areas include farmstead and tourist properties / destinations as well as well as public roads.

Within this range the viewer would experience high (foreground view 0 - 1,0km) visual exposure, experience moderate (middle-ground view 1,0km - 6,5km) and low to negligible visual exposure beyond 6,5km when the project activities would occur in background views.

GYLA
Graham A Young
Landscape Architect
082 482 1491

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FIGURE 7-42
SENSITIVE VISUAL RECEPTORS

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Map Ref No: ESIA 7-39	Date: 17/06/2023

7.5.4 Cultural and Heritage Resources

Heritage and cultural resources are important to the history of South Africa and are protected by national legislation. This section describes the existing status of the heritage and cultural environment that may be affected by the Jindal MIOP. Heritage (and cultural) resources include all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

The information presented in the sections below was sourced from the Heritage Impact Assessment Report (Ethembeni Cultural Heritage, 2023), which has been included as Appendix Q. Unfortunately, due to community tension within the Project area, access to the area to conduct a site visit was not allowed. Interviews were, however, held with some of the community members during which it was confirmed that there was no oral history pertaining to their people having ever mined for or smelted iron ore within the proposed project area. They were aware of the oral history of the Shezi clan and the Ncube people having done so in the past in the Nkandla district.

CULTURAL/ HERITAGE RESOURCES

It is the opinion of the Heritage Specialist that the areas identified for mining activities in the Project area have a very low potential for archaeological residues. Late Iron Age settlements tend to cluster on hill tops and the higher lying ground of the valley interfluves, and such site residues are extremely ephemeral in nature. These are the same areas that historically and latterly have been settled by the current communities in the proposed South Block MRA area. Any Late Iron Age settlement residues will then have been masked or displaced by the historical and more recent settlements, rendering them to be of low scientific significance. However, given the nature of the topography and some unsettled interfluve areas within the proposed Project area and its anticipated infrastructure developments, in situ archaeological remains may be present.

During the interviews it was also confirmed that grave burials were conducted under traditional rites and that graves are mostly located at family homesteads. The interviewees indicated that they were aware of a single extended family's graves (~ 27 graves) that are older than 60 years, located within the footprint of the proposed WRD. They further conceded that some of the abandoned and oldest *imizi* (homesteads) may include graves predating 1960 but that this would have to be confirmed by the respective homestead residents.

Further surveys will be required to identify all potential cultural or heritage resources that fall within the proposed Jindal MIOP footprint area.

7.5.5 Palaeontological Resources

The SAHRIS palaeosensitivity map for the site for the proposed Jindal MIOP indicates that the site is insignificant in terms of potential fossils. However, the site is on the unnamed granitic gneiss and the Mhlatuze Formation of the Nondweni Group which are ancient volcanic rocks within which single-celled algae or bacteria have been found in other to the north. The Nondweni Greenstone belt represents an ancient ocean floor.

There are two strata in the Barberton Greenstone Belt that have strong evidence of the earliest microbial life forms, namely the deposits of the 3.416 Ga Buck Reef Chert (in the Onverwacht Anticline and Kromberg Syncline, central part) and the sandstones of the 3.22 Ga Moodies Group. These strata contain preserved microbial mats and microfossils, consistent lateral exposure for several tens of kilometres and with a fairly thick stratum. Based on its universal and outstanding geological and palaeobiological value the Barberton-Makhonjwa Mountains were inscribed in the UNESCO World Heritage Site register in 2018.

Research on the earliest evidence of early life from the Barberton Greenstone Belt has allowed many researchers to reconstruct its habitat, metabolism, biogeochemical cycling and mode of preservation. The rocks preserve the oldest traces of microbial mats or microbial structures, which include lenticular, spheroidal, and filamentous microstructures that are generally regarded as the prokaryotes.

7.6 LAND USE WITHIN AND SURROUNDING THE PROJECT AREA

Mining-related activities have the potential to affect land uses both within the MRA area and in the surrounding areas. This can be caused by physical land transformation and through direct or secondary impacts. The key related potential environmental impacts are loss of soil, loss of biodiversity, air pollution, noise pollution, reduced surface and groundwater quality/ quantity, socio-economic changes and visual impacts.

7.6.1 South Block

7.6.1.1 Surface Rights

The surface rights for the proposed MRA were held by the Ingonyama Trust Board (ITB). However, in a recent ruling (May/ June 2023) made by the High Court of South Africa KZN Division in Pietermaritzburg it was established that landowner rights would fall to the occupiers of the land (“the true and beneficial owners under Zulu customary law).

7.6.1.2 Mineral/ Prospecting Rights

Jindal currently holds a prospecting right (PR 10652) over various portions of the farms Kromdraai 6110, Ntembeni 16921, Black Eyes 13385, Wilderness 6107, Goedgeloof 6106 and Vergelegen 6104. The prospecting right was issued by the then Department of Mineral Resources (DMR) in 2011 to Sungu Sungu (Pty) Ltd (later renamed to Jindal Iron Ore (Pty) Ltd for the concession).

7.6.1.3 Land Claims

Consultation with the Office of the Regional Land Claims Commissioner: KZN was undertaken regarding the lodging of land claims within the Project area. The Department’s response dated 15 July 2021 indicated that no land claims were lodged for properties within the MRA area, other than Vergelegen 6104. However, the notice of this claim was subsequently amended to exclude this property. Supporting information is included in Appendix C8.

7.6.1.4 Traditional Authorities

The area surrounding the proposed MIOP is classified as fully rural/ non-urban, with 70.8% of the land under tribal/ traditional authority administration. Numerous communities inhabit the area with most households comprising of formal brick dwellings, and traditional housing.

There are three Traditional Authority areas within the Mthonjaneni LM:

- Biyela KwaYanguye Traditional Authority is located to the north-east of the municipality and incorporating the KwaYanguye area and surrounding settlements.
- Zulu-Entembeni Traditional Authority is located to the south-east of the municipality and incorporates Makasaneni and Ndundulu and surrounding settlements.

- Biyela-Obuka Traditional Authority is located towards the East of the municipality and incorporates areas like Sqhomaneni, Upper Nseleni and other surrounding rural settlements.

7.6.1.5 Land Use Within and Surrounding the Project Area

The main land use of the South Block, including the proposed development footprint, is subsistence farming. The subsistence farming consists of livestock grazing and crop cultivation. However, the crop fields are small and scattered alongside the homesteads. There are numerous small fields between 5 and 10 ha with more subsistence farming taking place outside the South Block, approximately 1.5 km to the north. No large commercial agricultural fields are present within the South Block.

There are no areas with rainfed annual crops or planted pasture within the South Block but an area of rainfed crops that are located between horticultural fields, are located about 0.5 to 1 km south-east of the most eastern part of the southern boundary. The most prominent production area located southeast of the south-eastern boundary of the South Block, is the Nkwalini valley (Figure 7-43). In this area, a variety of horticultural crops are produced under irrigation that include citrus, macadamias, bananas and passion fruit. Other areas consist of irrigated sugar cane. Irrigation systems used in the area include micro and drip irrigation as well as centre pivot irrigation used for sugar cane.

The southern border of the South Block consists of the Goedertrouw Dam and the Mhlatuze River. The Goedertrouw Dam historically was an important tourism area but the infrastructure has now fallen into disrepair. Currently, Shakaland and the Phobane Guest House and nature area are located near the dam. These areas potentially have some tourism from within the region.

The only urban development within the Project area is Melmoth (central west of the study area), which is approximately 15 km to the north west of the proposed Jindal MIOP. Two ESKOM transmission lines run directly through the study area and pass immediately west of the proposed mine, primary crusher and plant sites. The R66 road runs almost directly in-between the North and South Blocks in a north-south direction.

7.6.2 North Block

7.6.2.1 Surface Rights

The surface rights for the proposed MRA were held by the Ingonyama Trust Board (ITB). However, in a recent ruling (May/ June 2023) made by the High Court of South Africa KZN Division in Pietermaritzburg it was established that landowner rights would fall to the occupiers of the land ("the true and beneficial owners under Zulu customary law).

7.6.2.2 Mineral/ Prospecting Rights

Jindal currently holds a prospecting right (PR 10644) over various portions of the farm Ntembeni 16921. The prospecting right was issued by the DMR in 2011 to Sungu Sungu (Pty) Ltd (later renamed to Jindal Iron Ore (Pty) Ltd for the concession.

7.6.2.3 Land Claims

Consultation with the Office of the Regional Land Claims Commissioner: KZN was undertaken regarding the lodging of land claims within the Project area. The Department's response indicated that no land claims were lodged for properties within the Mining Right application area. Supporting information is included in Appendix C8.

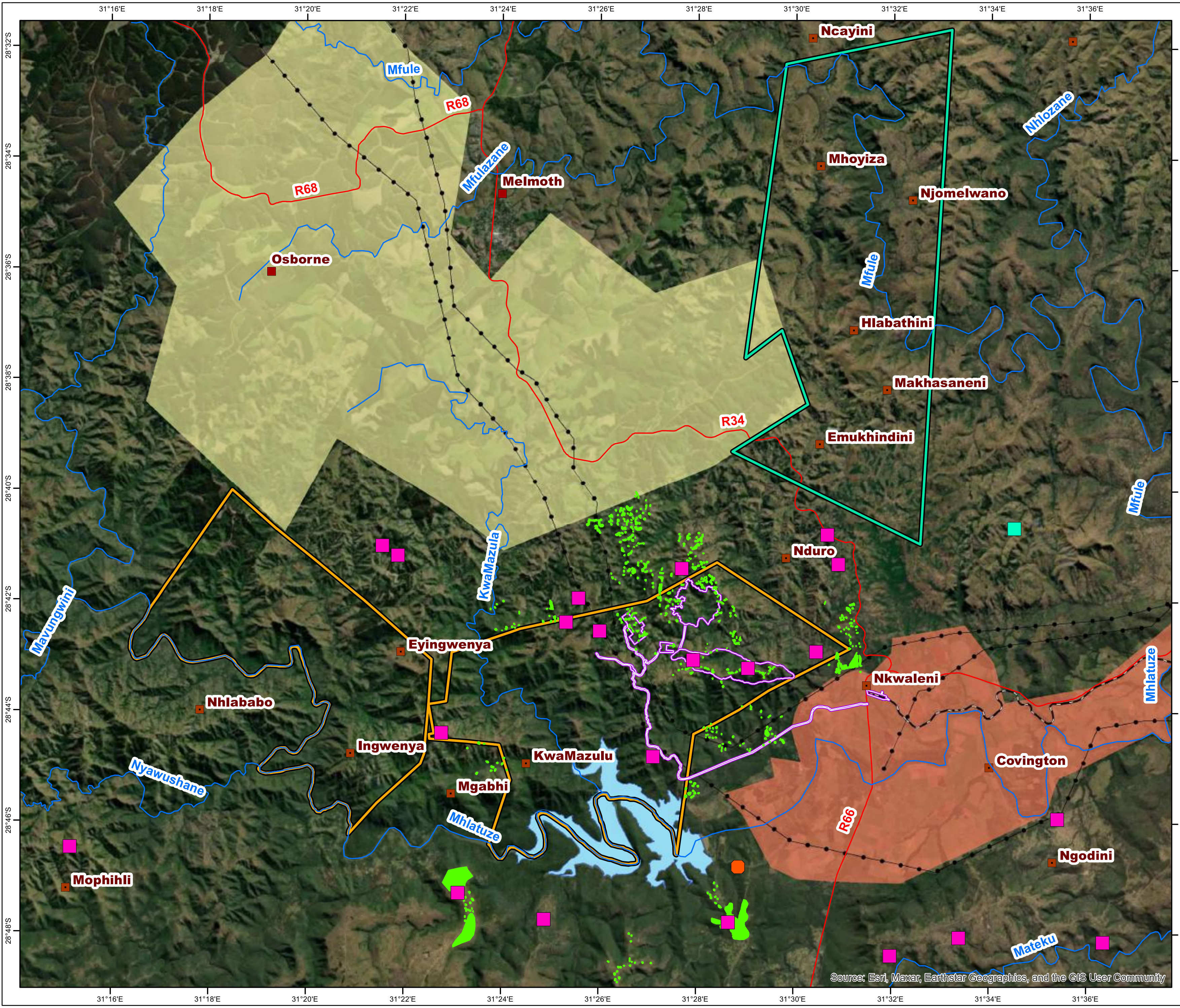
7.6.2.4 Traditional Authorities

There are three Traditional Authority areas within the Mthonjaneni LM:

- Biyela KwaYanguye Traditional Authority is located to the north-east of the municipality and incorporating the KwaYanguye area and surrounding settlements.
- Zulu-Entembeni Traditional Authority is located to the south-east of the municipality and incorporates Makasaneni and Ndundulu and surrounding settlements.
- Biyela-Obuka Traditional Authority is located towards the East of the municipality and incorporates areas like Sqhomaneni, Upper Nseleni and other surrounding rural settlements.

7.6.2.5 Land Use Within and Surrounding the Project Area

In the North Block subsistence farming fields are mostly scattered along the eastern, southern and western boundaries. The subsistence farming areas within the North Block, are all classified as small scale or emerging farms where the output is primarily for home consumption.



Legend

■ Towns / Villages

Roads

Railway Lines

Power Lines

Rivers

Goedetrouw Dam

Proposed North Block Mining Right Area

Proposed South Block Mining Right Area

Proposed Mine Layout

Homesteads

Commercial Cane and Timber

Commercial Fruit Crops

■ Schools

■ Tileem Poultry Farm

● Shakaland Theme Park

N

0 2 4
KM

Scale: 1:120 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-43
SURROUNDING LAND USE

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720.10023.00001 ESIA 7-40 Land Use

7.7 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE

The environmental features and infrastructure in the project area are described in Section 7.4. A summary of the key noticeable features associated with the proposed Project is provided in Table 7-78.

Table 7-78 Key Noticeable Environmental Features Associated with the Jindal MIOP – South Block

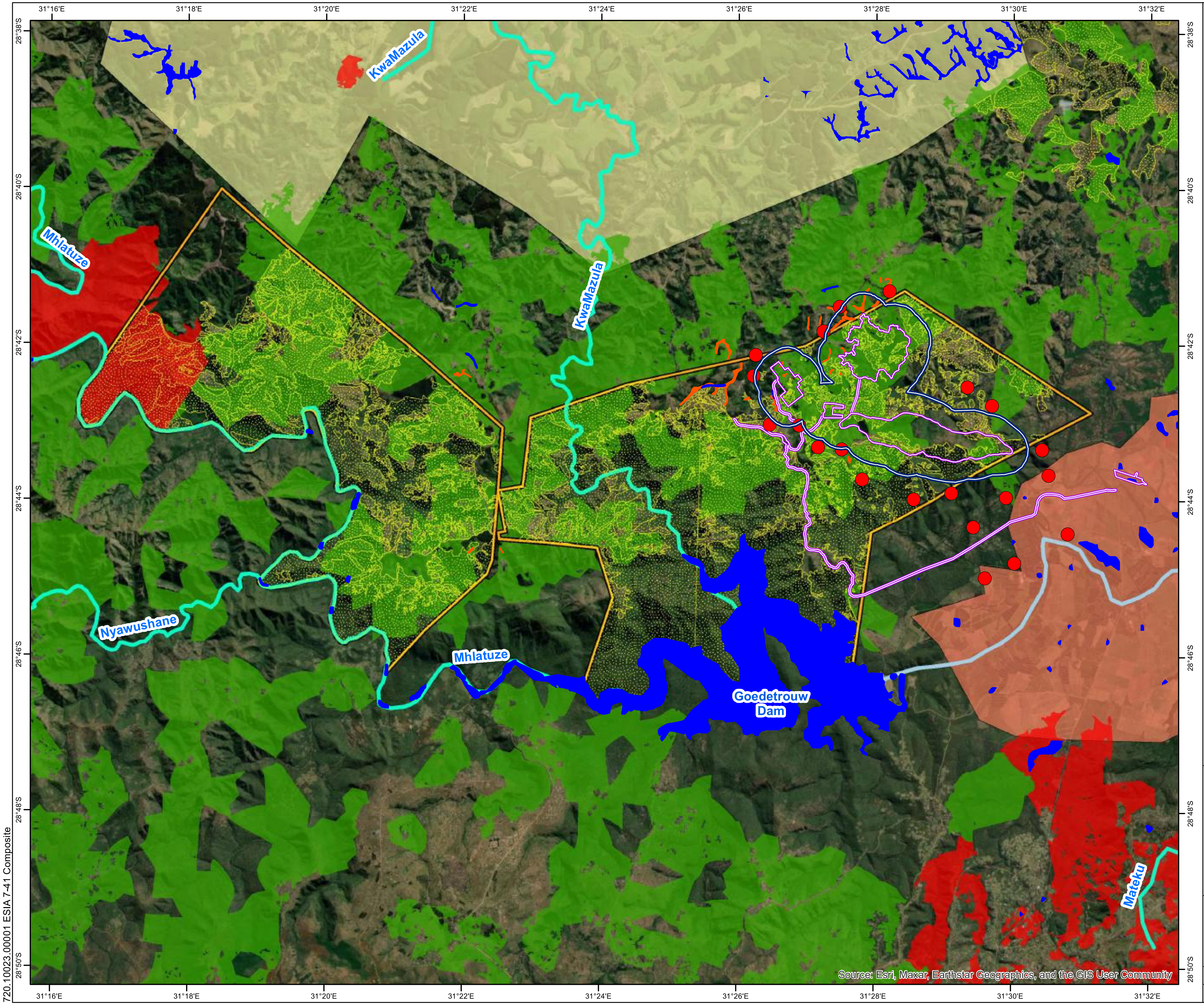
Aspect	Description of specific feature
Topography	The study area is typical of the KZN region with deep valley systems and rolling grassed hills. The Goedertrouw Dam with its wooded valleys and hills along with the dammed up Mhlatuze River is a focal point of the area.
Soils	Eight soil associations are found within the South Block. The Glenrosa group is the most prevalent in the South Block, followed by the Hutton group and then the Mispah group. The South Block area has five different land capability classes. The proposed infrastructure of the Jindal Melmoth Iron Ore project will affect land of all five of the land capability classes. The most prevalent land capability class is Class 5 (Low) where a combination of shallower soil profiles and steep slope limit the crop production potential of the land. The entire South Block area is dominated by land with Low agricultural sensitivity (a total area of 7542 ha), followed by land with Medium agricultural sensitivity (3716 ha) and with High agricultural sensitivity delineated for a total area of 456 ha. The areas with High sensitivity include areas where deep soils from the Hutton soil association is present on terrain with suitable slope for cultivation.
Terrestrial Ecology	Areas of; CBA: Irreplaceable, CBA: Optimal, and overlapping ESA's are present within the North and South Blocks of the study area. More than half of the south-western block is flagged as either CBA: optimal or CBA: Irreplaceable while approximately half of the south-eastern and central southern blocks have been flagged as CBA: Optimal (Figure 7-44). This suggests that the proposed mining development may have significant negative impacts on provincial conservation planning targets potentially compromising Ezemvelo KZN Wildlife's ability to meet these targets. Ten broad vegetation communities were described on-site, four of which are considered to be in fair to natural condition and have a Very High SEI rating. The remaining six vegetation communities on site range in SEI from Medium to Very Low. In addition to being in good to fair ecological condition the four largely intact vegetation communities are highly likely to support a number of floral SCC that are either red-listed, rare, or endemic. Following the initial site inspection, two floral SCC were confirmed to occur within open savannah/grassland vegetation on-site, namely Sensitive Species 191 (Vulnerable) and *Moraea graminicola* subsp. graminicola (Near Threatened, South African Endemic). In addition to the two threatened plant species occurring on site, which are protected under the NEM:BA, there are several plant species that are protected under the Natal Conservation Ordinance and National Forest Act. Several faunal SCC have been flagged as potentially occurring within the study area.
Aquatic Ecology and Wetlands	Most watercourses in this area consist of rivers and streams. The rivers and streams ranged from a poor Condition to natural condition. Most were Low to Moderate EIS, with the exception being the assessed reach of the Mhlatuze River, which was assessed as being of High EIS. A total of 23 wetland units were mapped within the

Aspect	Description of specific feature
	South Block. This consisted of 11 unchanneled valley bottom wetlands and 12 seeps which ranged from a poor condition to a fair condition.
Surface water	Jindal's North and South blocks Mining Right Area (MRA) are both located within the upland region of the Mhlathuze Catchment. The Jindal MIOP's MRA, including both the North and South block, is influenced by three quaternary catchments (QC) W12B, W12C and W12D which fall within the Usutu-Mhlatuze WMA. QC W12B is drained by the perennial Mhlatuze, KwaMazula, Nyawushane and Mavungwini Rivers. QC W12C is drained by the Mfule River, Nhlozane and Mfulazane River and QC W12D is drained by the Mfule and Mhlatuze Rivers. The natural drainage systems flow in an eastern direction towards the Indian Ocean.
Groundwater	The current the groundwater level averaged 56 mbgl with the mean hydraulic head in the pit area at 450 mamsl. The waste assessment undertaken showed minimal potential for acid rock drainage (Section 25.3).
Social	An analysis conducted found identified four community structures located within the 500m infrastructure buffer (three schools and one clinic), namely: • Dlozeyane Primary School. • Gqokubukhosi Secondary School. • Nogajuka Primary School. • Nogajuka Clinic. An initial high level survey of the area identified approximately 1 500 households within the south-eastern part of the South Block.

The environmental sensitivities associated with the proposed Jindal MIOP MRA are illustrated in Figure 7-44.

7.8 ENVIRONMENT AND CURRENT LAND USE MAP

A map illustrating the key features of the current environment and land use is included in Figure 7-44.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- ▭ Proposed South Block Mining Right Area
- ▭ Proposed Mine Layout
- ▭ 500m Buffer
- 🟦 NFEPA Wetlands
- 🟧 Wetlands (Eco-Pulse, 2021)
- 🟥 Commercial Fruit Crops
- 🟨 Commercial Cane and Timber

KZN Systematic Conservation Assessment (EKZN, 2016)

- 🟥 Critical Biodiversity Area : Irreplaceable
- 🟩 Critical Biodiversity Area : Optimal

SEI Ratings (Eco-Pulse, 2022)

- ▨ Very High

NFEPA Rivers

- — CLASS B: Largely Natural
- — CLASS C: Moderately Modified
- ● Identified Sensitive Receptors After Relocation

N

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KM

Scale: 1:85 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-44
COMPOSITE MAP OF KEY ENVIRONMENTAL FEATURES

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720.10023.00001 ESIA 7-41 Composite

7.9 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The method to be used for the assessment of impacts is set out in Table 7-79. This assessment methodology enables the assessment of environmental impacts including: cumulative impacts, the intensity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

Table 7-79 Impact Assessment Methodology

PART A: DEFINITIONS AND CRITERIA		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of intensity, spatial extent, and duration**
Criteria for ranking of the INTENSITY of environmental impacts	**VH**	Severe change, disturbance, or degradation. Associated with severe consequences. May result in severe illness, injury, or death. Targets, limits, and thresholds of concern continually exceeded. Habitats or ecosystems of high importance for maintaining the persistence of species or habitats that meet critical habitat thresholds. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance, or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits, and thresholds of concern regularly exceeded. Habitats or ecosystems which are important for meeting national/provincial conservation targets. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance, or discomfort. Associated with real but not substantial consequences. Targets, limits, and thresholds of concern may occasionally be exceeded. Habitats or ecosystems with important functional value in maintaining biotic integrity. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance, or nuisance. Associated with minor consequences or deterioration. Targets, limits, and thresholds of concern rarely exceeded. Habitats and ecosystems which are degraded and modified. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance, or nuisance. Associated with very minor consequences or deterioration. Targets, limits, and thresholds of concern never exceeded. Species or habitats with negligible importance. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.

	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	**Very Short term**	Very short, always less than a year or may be intermittent. Quickly reversible.
	Short term	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	Medium term	Medium-term, 5 to 10 years.
	Long term	Long term, between 10 and 20 years. Likely to cease at the end of the operational life of the activity or because of natural processes or by human intervention.
	Very long term/ permanent	Very long, permanent, +20 years. Irreversible. Beyond closure or where recovery is not possible either by natural processes or by human intervention.
Criteria for ranking the EXTENT of impacts	**Site**	A part of the site/property. Impact is limited to the immediate footprint of the activity and within a confined area.
	Whole site	Whole site. Impact is confined to within the project area and its nearby surroundings.
	Beyond site	Beyond the site boundary, affecting immediate neighbours.
	Local	Local area, extending far beyond site boundary.
	Regional/ national	Regional/National. Impact may extend beyond district or regional boundaries with national implications.

PART B: DETERMINING CONSEQUENCE – APPLIES TO POSITIVE OR ADVERSE IMPACTS						
		EXTENT				
		A part of the site/property	Whole site	Beyond the site, affecting neighbours	Local area, extending far beyond site	Regional/ National
		VL	**L**	**M**	**H**	**VH**
INTENSITY = VL						
DURATION	**Very long term /permanent**	**Low**	**Low**	**Medium**	**Medium**	**Medium**
	Long term	**Very Low**	**Low**	**Low**	**Medium**	**Medium**
	Medium term	**Very Low**	**Low**	**Low**	**Low**	**Medium**
	Short term	**Very low**	**Very Low**	**Low**	**Low**	**Low**
	Very short term	**Very low**	**Very Low**	**Very Low**	**Very Low**	**Low**
INTENSITY = L						
DURATION	**Very long term /permanent**	**Low**	**Medium**	**Medium**	**High**	**High**
	Long term	**Low**	**Medium**	**Medium**	**Medium**	**High**
	Medium term	**Low**	**Low**	**Medium**	**Medium**	**Medium**
	Short term	**Very low**	**Low**	**Low**	**Medium**	**Medium**
	Very short term	**Very low**	**Very low**	**Low**	**Low**	**Low**
INTENSITY = M						
DURATION	**Very long term /permanent**	**Medium**	**Medium**	**High**	**High**	**Very High**
	Long term	**Low**	**Medium**	**Medium**	**High**	**High**
	Medium term	**Low**	**Medium**	**Medium**	**Medium**	**High**

	Short term	Low	Low	Medium	Medium	Medium
	Very short term	Very low	Low	Low	Low	Medium
INTENSITY = H						
DURATION	Very long term /permanent	Medium	High	High	Very High	Very High
	Long term	Medium	Medium	High	High	Very High
	Medium term	Low	Medium	Medium	High	High
	Short term	Low	Medium	Medium	Medium	High
	Very short term	Very low	Low	Low	Medium	Medium
INTENSITY = VH						
DURATION	Very long term /permanent	Medium	High	Very High	Very High	Very High
	Long term	Medium	High	High	Very High	Very High
	Medium term	Medium	Medium	High	High	Very High
	Short term	Low	Medium	Medium	High	High
	Very short term	Low	Low	Medium	Medium	Medium

PART C: DETERMINING SIGNIFICANCE - APPLIES TO POSITIVE OR ADVERSE IMPACTS							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	VH	Very Low	Low	Medium	High	Very High
	Probable	H	Very Low	Low	Medium	High	Very High
	Possible/ frequent	M	Very Low	Very Low	Low	Medium	High
	Conceivable	L	Insignificant	Very Low	Low	Medium	High
	Unlikely/ improbable	VL	Insignificant	Insignificant	Very Low	Low	Medium
			VL	L	M	H	VH
			CONSEQUENCE				

PART D: INTERPRETATION OF SIGNIFICANCE		
Significance		Decision guideline
Very High	Very High +	Represents a key factor in decision-making. Adverse impact would be considered a potential fatal flaw unless mitigated to lower significance.
High	High +	These beneficial or adverse impacts are considered to be very important considerations and must have an influence on the decision. In the case of adverse impacts, substantial mitigation will be required.
Medium	Medium +	These beneficial or adverse impacts may be important but are not likely to be key decision-making factors. In the case of adverse impacts, mitigation will be required.
Low	Low +	These beneficial or adverse impacts are unlikely to have a real influence on the decision. In the case of adverse impacts, limited mitigation is likely to be required.
Very Low	Very Low +	These beneficial or adverse impacts will not have an influence on the decision. In the case of adverse impacts, mitigation is not required.
Insignificant		Inconsequential, not requiring any consideration.

7.9.1 Additional Assessment Criteria

Additional criteria that are taken into consideration in the impact assessment process to further describe the impact and support the interpretation of significance in the impact assessment process include:

- the degree to which impacts may cause irreplaceable loss of resources;
- the degree to which impacts can be avoided;
- the degree to which impacts can be reversed;
- the degree to which the impacts can be mitigated; and
- the extent to which cumulative impacts may arise from interaction or combination from other planned activities or projects is tabulated below.

ADDITIONAL ASSESSMENT CRITERIA		
Criteria for DEGREE TO WHICH AN IMPACT CAN BE REVERSED	**IRREVERSIBLE**	Where the impact cannot be reversed and is permanent.
	PARTIALLY REVERSIBLE	Where the impact can be partially reversed and is temporary.
	FULLY REVERSIBLE	Where the impact can be completely reversed.
Criteria for DEGREE OF IRREPLACEABLE RESOURCE LOSS	**NONE**	Will not cause irreplaceable loss.
	LOW	Where the activity results in a marginal effect on an irreplaceable resource.
	MEDIUM	Where an impact results in a moderate loss, fragmentation or damage to an irreplaceable receptor or resource.
	HIGH	Where the activity results in an extensive or high proportion of loss, fragmentation or damage to an irreplaceable receptor or resource.
Criteria for DEGREE TO WHICH IMPACT CAN BE AVOIDED	**NONE**	Impact cannot be avoided and consideration should be given to compensation and offsets.
	LOW	Impact cannot be avoided but can be mitigated to acceptable levels through rehabilitation and restoration.
	MEDIUM	Impact cannot be avoided, but the significance can be reduced through mitigation measures.
	HIGH	Impact can be avoided through the implementation of preventative mitigation measures.
Criteria for the DEGREE TO WHICH IMPACT CAN BE MITIGATED	**NONE**	No mitigation is possible or mitigation even if applied would not change the impact.
	LOW	Some mitigation is possible but will have marginal effect in reducing the impact significance rating.
	MEDIUM	Mitigation is feasible and will may reduce the impact significance rating.
	HIGH	Mitigation can be easily applied or is considered standard operating practice for the activity and will reduce the impact significance rating.
Criteria for POTENTIAL FOR CUMULATIVE IMPACTS	**UNLIKELY**	Low likelihood of cumulative impacts arising.
	POSSIBLE	Cumulative impacts with other activities or projects may arise.
	LIKELY	Cumulative impacts with other activities or projects either through interaction or in combination can be expected.

7.10 POSITIVE AND NEGATIVE IMPACTS OF THE PROPOSED ACTIVITY AND ALTERNATIVES

The advantages and disadvantages of the alternatives that were considered are included in Section 7.1 and Figure 7-1.

The Jindal MIOP is proposed to be an open pit mine as the iron ore resource is situated close to the surface and underground mining would not be viable for extracting the ore in this case. The position of the open pit cannot be changed for the reason that the resource is located in this area, which defines where the mining needs to be undertaken. The ability to amend the pit size and shape is thus also limited.

7.10.1 Open Pit

The Jindal MIOP is proposed to be an open pit mine as the iron ore resource is situated close to the surface and underground mining would not be viable for extracting the ore. The position of the open pit cannot be changed due to the location of the resource , which defines where the mining needs to be undertaken. Similarly the pit size and shape is limited by the nature and characteristics of the ore resource.

The location of the South-East pit encroaches upon Vegetation Community 1 (Open Savannah) and Vegetation Community 2 (Thicket/Closed Woodland), which are both assigned a very high sensitivity rating and form part of the recommended no-go area (Figure 7-45). Encroachment on areas rated as being of very high sensitivity according to the latest best practice guidelines should be avoided as far as possible and development is generally not recommended in these areas. In addition to the terrestrial biodiversity concerns, there are potential direct and indirect impacts to watercourses in the study area.

In addition, the South-East pit crosses a sub-catchment divide. Mountain and Mountain Headwater Streams to the north of the divide drain into SE-Upper Foothill River-466, which then drain into the Mhlatuze River approximately 11 km downstream of the Goedertrouw Dam wall. Mountain and Mountain Headwater Streams to the south of the divide drain directly into the Mhlatuze River approximately 5 km downstream of the Goedertrouw Dam wall. The feasibility of the size and location of the pit being adjusted to prevent it crossing to the southern side of the catchment divide was considered. However, in order to mine the iron ore at the Jindal MIOP, a 32 mtpa mine has been proposed to ensure economic viability. The pit size and shape therefore has limited scope for change.

7.10.2 Waste Rock Dump

Two potential localities were assessed for the WRD. The preferred option is the most viable in terms of the footprint, the alternative location did not allow for a large enough WRD for the 32 mtpa operation. The location of the preferred option is also closer to the pit minimising; visual impacts, transportation of the waste rock from the active mining area, together with the associated impacts of noise and dust generation. With further design of the WRD by Geotheta (2023) the footprint was also able to be significantly reduced from approximately 600 Ha to around 200 Ha thereby reducing impacts due to the footprint area by approximately a third.

The footprint area is partially classified as a ‘no-go’ area due to the very high sensitivity (EIS) terrestrial biodiversity as outlined in Table 7-52 and Figure 7-27 and potential offsets would therefore need to be considered. In terms of watercourse habitat loss this is also a likely impact from the establishment and operation of the WRD. Affected environmental aspects for the Jindal MIOP are shown in Figure 7-45.

7.10.3 Processing Plant and Crusher

In the current proposed locations, the processing plant and the primary crusher footprint coincide with open savannah/grassland areas (Vegetation Community 1) rated as being of Very High SEI (Figure 7-45) which is part of the recommended terrestrial no-go Area. Without re-siting, the above-mentioned vegetation community stands to be directly or indirectly impacted by the proposed infrastructure. The proposed processing plant location also coincides with the headwater areas of two Mountain Headwater Streams, a single wetland, and a single Mountain Stream (Figure 7-45). Additionally, the proposed location of the incoming power yard coincides with a single wetland while the primary crusher advances into the preliminarily recommended watercourse buffer zone area for a Mountain Headwater Stream and a Mountain Stream. There is limited scope for alternate sites due to the topography of the area which required that terraces be built for the processing plant and substation and suitable space for this size of infrastructure is limited. The processing plant and substation would preferably be placed as close to the mining operations as possible in order to minimise distances that ROM needs to be moved and the associated impacts that come with that including safety, dust and noise.

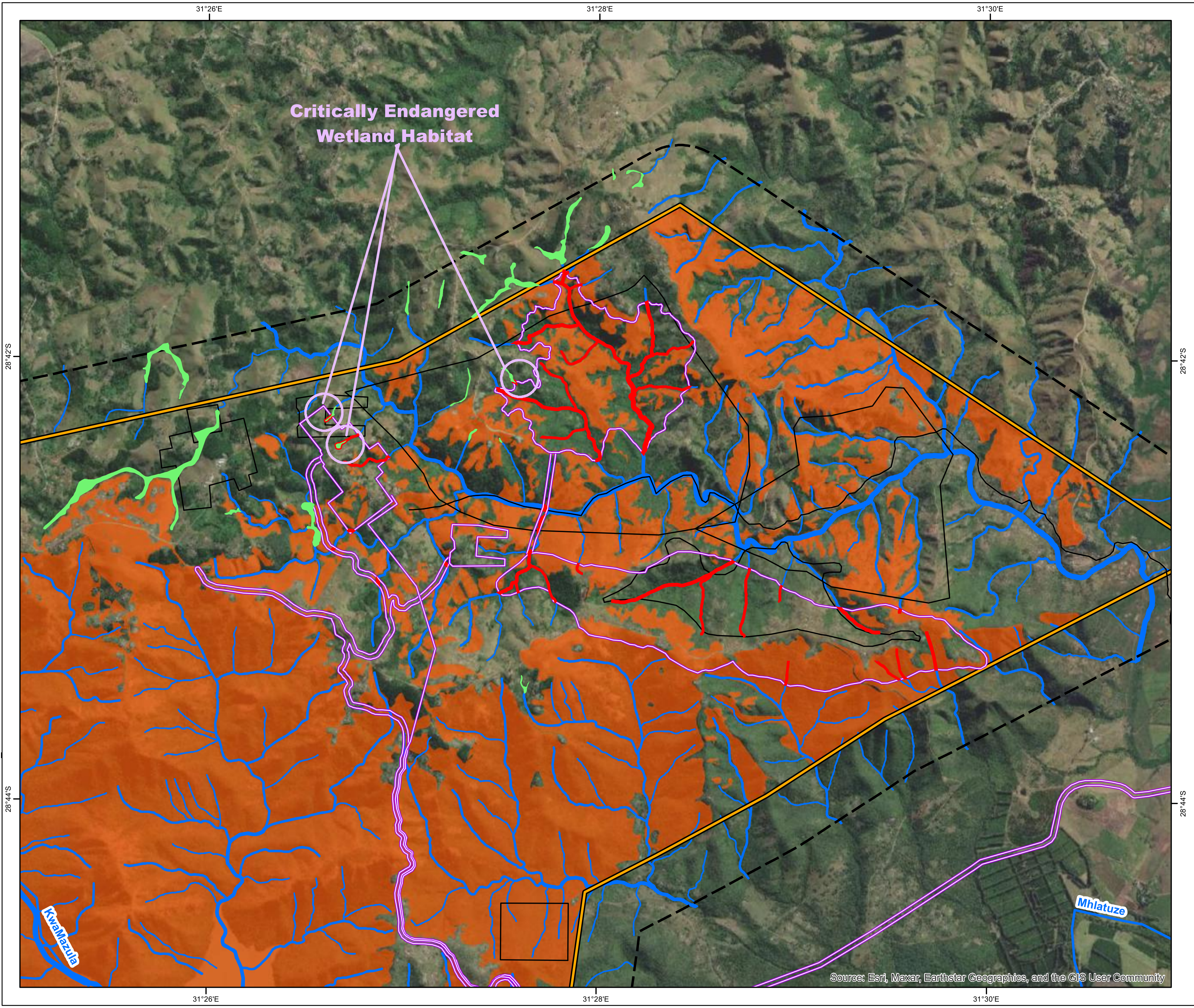
7.10.4 Access Roads and Pipelines

Access roads and pipelines have been designed as far as possible to align with existing roads to prevent/minimise further impacts due to the clearing of vegetation and the required maintenance of this infrastructure. The preferred option for the road, accesses the site from the south side of the pit and would need to cut through a section of private land. This section of road, although on private land, has fewer individual households that would be impacted by potential dust, noise and increased numbers of vehicles using the road. The plan is also to pave this road which would minimise the impact of dust on neighbouring farming areas.

Option 2 also accesses the Jindal MIOP from the south but is proposed to cross the Goedertrouw Dam wall. This could result in safety impacts as the wall was not designed for heavy traffic and the likely numbers of traffic using the ‘bridge’. This option is also in closer proximity to various tourist areas, including Shakaland which it would directly pass.

Option 3 accesses the site from the north and is the shortest route, but would require heavy vehicles having to navigate the already dangerous pass on the R66 and would require major culvert and embankment works making it both the most expensive route and also would likely have the most significant impacts on the aquatic and hydrological environments.

Due to the need to balance the potential identified environmental and social impacts and the potential economic benefits to the local communities and the larger region the possibility for implementing the various alternatives was considered and where possible taken into the design of the Jindal MIOP. However, due to the location of the iron ore resource, the mountainous topography of the area, and the economic viability of the project the feasible alternatives are limited and this has resulted in the layout as per Figure 7-46 being the preferred layout for the Jindal MIOP.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- ▭ Proposed South Block Mining Right Area
- ▭ Infrastructure Layout - Preferred Option
- ▭ Infrastructure Layout - Alternative Options
- ⬚ DWS 500m Regulated Area
- 🟦 Delineated Watercourses
- 🟥 Areas of Watercourse Habitat Loss
- 🟩 Wetlands

SEI Ratings (Eco-Pulse, 2022)

- 🟧 Very High

N

0 0,5 1
KM

Scale: 1:30 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-45
ENVIRONMENTAL SENSITIVITIES ASSOCIATED WITH THE ALTERNATIVES CONSIDERED FOR THE JINDAL MIOP

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Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 7-42	Date: 04/07/2023

720.10023.00001 ESIA 7-42 Environmental Sensitivities_Alternatives

7.11 IDENTIFIED IMPACTS AND RISKS OF THE PREFERRED ALTERNATIVE

The detailed impact assessment for the preferred alternative is included in Appendix D and is summarised in Chapter 9. As discussed in Section 7.10 there is limited potential for viable alternatives for the South East pit due to the location of the iron ore resource, the mountainous topography of the area, and the economic viability of the project. The preferred alternative is included in Figure 7 4 and the potentially significant impacts and risks are discussed in this section.

During the construction phase there are a number of both biophysical and socio-economic impacts that occur once development of the project site starts. For the Jindal MIOP, a significant impact associated with this phase would be the need to relocate people and communities from the area in order for the mine development to take place. The only scenario in which relocation would not be required is under the 'no-go' option. This would include the requirement for the relocation of graves and if possible, where necessary, the relocation of 'national estate' i.e. heritage resources of cultural significance. The relocation of people would be undertaken in accordance with best practice guidelines as part of the RAP (a separate process to the ESIA process). This could result in distress amongst then affected communities and is potentially a high risk to the project particularly if associated with community unrest. The RAP and the associated resettlement would have to be completed prior to any pre-construction work taking place. In addition to the relocation of communities, the relocation of associated cultural heritage and identified graves is a complex process and needs to be done in accordance with the NHRA and in consultation with the affected communities and individuals.

Groundwater is not expected to be significantly impacted during the construction phase, however, during the operational phase the mining of the open pit would result in ingress of groundwater to the open pit and the consequent dewatering of adjacent aquifers. Where drawdown exceeds 5 m, water supply may be influenced. The extent of drawdown where it is likely to exceed 5 m could extend up to 2.5 km in a westerly direction, 1.6 km in a southerly direction, 1.2 km in a northerly direction, and 1 km in an easterly direction, from the pit (Appendix D Figure 1 1). Groundwater users that fall within this area are expected to have a drawdown in water level in supply boreholes. The farm areas on which drawdown, exceeding 5 m, is expected to occur includes: Ntembeni 16921, Kromdraai 6110, Lot No 5 1038, Lot No 5 10383 GU, Lot 7 Umhlatuzi 10870, Lot 9 Umhlatuzi 10872, Hillcrest 15900, Loudwaters 11258, Lot 8 Umhlatuzi 10871, Maranqapawlu 15351. From the hydrocensus results, it is known that groundwater is used by some neighbouring farms for irrigation and drinking water (post-treatment). The larger commercial farms in the Nkwalini Valley use water from the Mhlatuze catchment. Post mining, a pit lake would develop at the Jindal MIOP. A post closure land use for the site would need to be identified and developed as part of the Closure Plan and included in the Financial Provision, however and if approved, this could provide the surrounding landowners and communities with an additional water resource sometime into the future.

A significant impact from the proposed project is the supply of water required for the processing plant. The DWS has indicated that as the Goedertrouw Dam and the Mhlatuze River are fully allocated in terms of water supply to the farms and industries that fall within the Mhlatuze catchment all the way down to Richards Bay. So, water supply of approximately 11.56 Gl/a is unlikely to be able to be provided from this catchment as it stands. As such other options for water supply would need to be considered (See Section 16.1). The application for water supply would form part of the WULA.

A number of sensitive vegetation communities as well as sensitive wetland and stream areas, as discussed in Section 7.10, have been identified within the Jindal MIOP site. The preferred site layout would impact on the footprint of the identified Vegetation Community 1 (Open Savannah) and Vegetation Community 2 (Thicket/Closed Woodland), both of which are assigned a very high SEI. The WRD, open pit, processing plant and access roads also impact on Mountain and Mountain Headwater Streams within the pit area, various watercourse habitat loss is also a likely outcome of the establishment and operation of the WRD and the proposed processing plant location coincides with the headwater areas of two Mountain Headwater Streams, a single wetland, and a single Mountain Stream (Figure 7-45). The impacts to terrestrial biodiversity in particular are considered of very high significance prior to any mitigation being implemented and once all reasonable mitigation measures have been considered, significant residual impacts to ecosystems would need to be offset in line with Provincial and National policy. In the case of impacts of high significance, the draft national biodiversity offset guidelines suggest that "Biodiversity offsets are likely to be required, unless there are compelling reasons why a biodiversity offset should not be required."

A preliminary summary of terrestrial habitat losses associated with the projects Area of Influence (AoI) has been included in Table 7-80. This indicates significant areas of transformation to give a high level indication of possible offset requirements. For the project to progress towards formal authorisation by the regulating authorities, a formal offset investigation would need to be undertaken. It is strongly recommended that offset investigations be initiated as soon as practically possible as both are important considerations for long-term project feasibility/ viability.

Table 7-80 Summary of preliminary habitat losses from the primary project area and associated activities

Vegetation Community	SEI	Area (Ha)
1.Ngongoni Veld/Eastern Valley Bushveld Open Savannah	Very High	123.59
2.Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	Very High	71.02
3.Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah	Low	37.09
4.Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	Medium	208.47
5.Secondary Open Savannah/Thicket/Closed Woodland	Very Low	85.85
	Grand Total	**526.02**

In terms of impacts to the aquatic and wetland habitat in the AoI a total of 28.5 Ha of freshwater habitat stands to be permanently altered (infilled or mined out) during the construction and operation of the mine. This includes 1.39 Ha of critically endangered wetland habitat. Given that the conservation / threat status of all wetlands in the study area is considered critically endangered with little to no protection of this wetland vegetation group, any further destruction of wetland habitat, is likely to require some form of an offset as compensation for the loss. The proposed loss of freshwater habitat across the mine site is considered a significant residual adverse impact on biodiversity which should be compensated for using offsets. With the majority of residual freshwater habitat loss at this stage of planning being river and streams features rather than wetland units, it is recommended that the residual impacts to freshwater habitat be investigated and addressed as part of an overall biodiversity offset investigation (terrestrial and freshwater), rather than through a specific wetland offset investigation.

Currently the agricultural sector is the major employer in the area and there is concern that the establishment and operation of the mine would not only impact productivity on farms resulting in job losses, but that the education and skill requirements of the mine would mean that any job losses in the agricultural sector would not be absorbed/ offset by employment in the mine.

The impact of dust to the commercial farming areas, which is discussed in Appendix D Section 5.1 (see also Table 7 76) during the construction phase is assessed to be of low risk other than due to vehicular movement to and from the site which would need to be carefully managed. During the operational phase, given the distance between the source (mine) and receptor (crops), and the larger size of the dust particles associated with dust deposition nuisance, the impact of dust fallout on agricultural crops is predicted to be very low after mitigation. It should, however, be noted that the mine access road passes through both citrus and cane fields and is likely to be used by the community as well as for mine vehicle access. Jindal has committed to paving the preferred main access road which would reduce TSP emissions by approximately 200 tonnes per annum. The impact on ambient air quality due to blasting is predicted to be low with mitigation implemented. Specialist studies for both ground and surface water show limited impacts to either the quantity or quality of the water coming into the Goedertrouw Dam or the Mhlatuze directly. This potential impact is discussed in detail in Section 2.1 and 2.2 of Appendix D.

It is therefore predicted that the impact on the productivity of the commercial farms as a result of the mine should be low and hence there should be limited job losses resulting from this. The mine will result in approximately 800 full time equivalent (FTE) job opportunities during operations which would include skilled, semi-skilled and unskilled jobs. Any potential job losses in the agricultural sector should be offset by employment opportunities presented by the mine.

Table 7-81 Construction and decommissioning impact assessment risk categories

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Track-out
Dust Fallout / Soiling	N/A	Low Risk	Low Risk	High Risk
Human Health	N/A	Low Risk	Low Risk	High Risk
Ecological and Agricultural	N/A	Low Risk	Low Risk	Medium Risk

Impacts on tourism have been considered in the context of a changing environment from a quiet rural area promoting cultural heritage as the main selling point to a site that would now be impacted by a changed visual landscape with additional traffic, noise and reduced air quality. However, should Jindal promote these tourism establishments and assist them in shifting their business model to capture a new market these establishments could be successful. The mine should actively promote and encourage its visitors to utilise the tourism products that are in the area, especially those offering board and lodging.

The other likely risks are very typical for mining projects of this scale and relate to impacts to soils through erosion and compaction and changed land use. These impacts can generally be managed to suitable levels of impact with good site management and implementation of mitigation measures in compliance with the EMPr (Section 28 – Management Actions). Noise impacts are also expected but should be able to be mitigated to acceptable levels provided they are properly managed.

Another concern for projects of this nature is the potential for an influx of job seekers from outside areas in search of employment as well as the impacts that this has on the local communities in terms of increased incidences of disease and the inherent burden on healthcare facilities, both in the mine communities and in their home communities. There is also likely to be an increased burden on bulk public service infrastructure such as water, electricity, and housing due to larger numbers of people being dependent on these services. Community police services are also placed under additional pressure due to a potential escalation in crime within the surrounding communities. The implementation of the project SLP which clearly stipulates the manner of awarding employment contracts should alleviate, to some extent, these issues. Clear communication on employment procedures would need to be circulated very early in the process.

The social impacts associated with the Jindal MIOP need to be understood within the socio-political context of the receiving environment and the directly impacted communities. The potential risk of social and political interference during the construction and operational phases of the Jindal MIOP could be high given the social unrest and 'localised' political instability with rural citizens questioning the accountability of traditional leaders in their advisory or ceremonial role in the community.

However, as with any project of this size and complexity and the potentially substantial financial investment that could be expected, there is the potential to change what could be a lot of negative impacts to positive benefits over the operational lifetime of the Jindal MIOP. With implementation of a sound SLP, good communication with jobseekers, stakeholders, traditional leadership and local communities, implementation of training programmes and investment into Municipal LED projects the Jindal MIOP could benefit the local communities and municipal areas. Ongoing communication with the local farming community is also essential to maintaining good relations and ensuring that both parties can work together to be mutually beneficial for the local economy. The social and political risks need to be carefully considered and adequately mitigated if the proposed MIOP were to be successfully rolled out.

Further positive impacts could be felt on a global scale as iron and steel will play a vital role in the global transition to a low-carbon economy, partially driven by the growth in demand for components used in renewable energy technologies. The iron ore, and subsequent steel, from Jindal is considered to be an enabler for moving the global economy to a 2-degree scenario. The global economy would not be able to move to a lower GHG emissions scenario without a substantial increase in renewable energy infrastructure development, which will require steel. The Project could, therefore, have an overall positive net climate change impact.

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

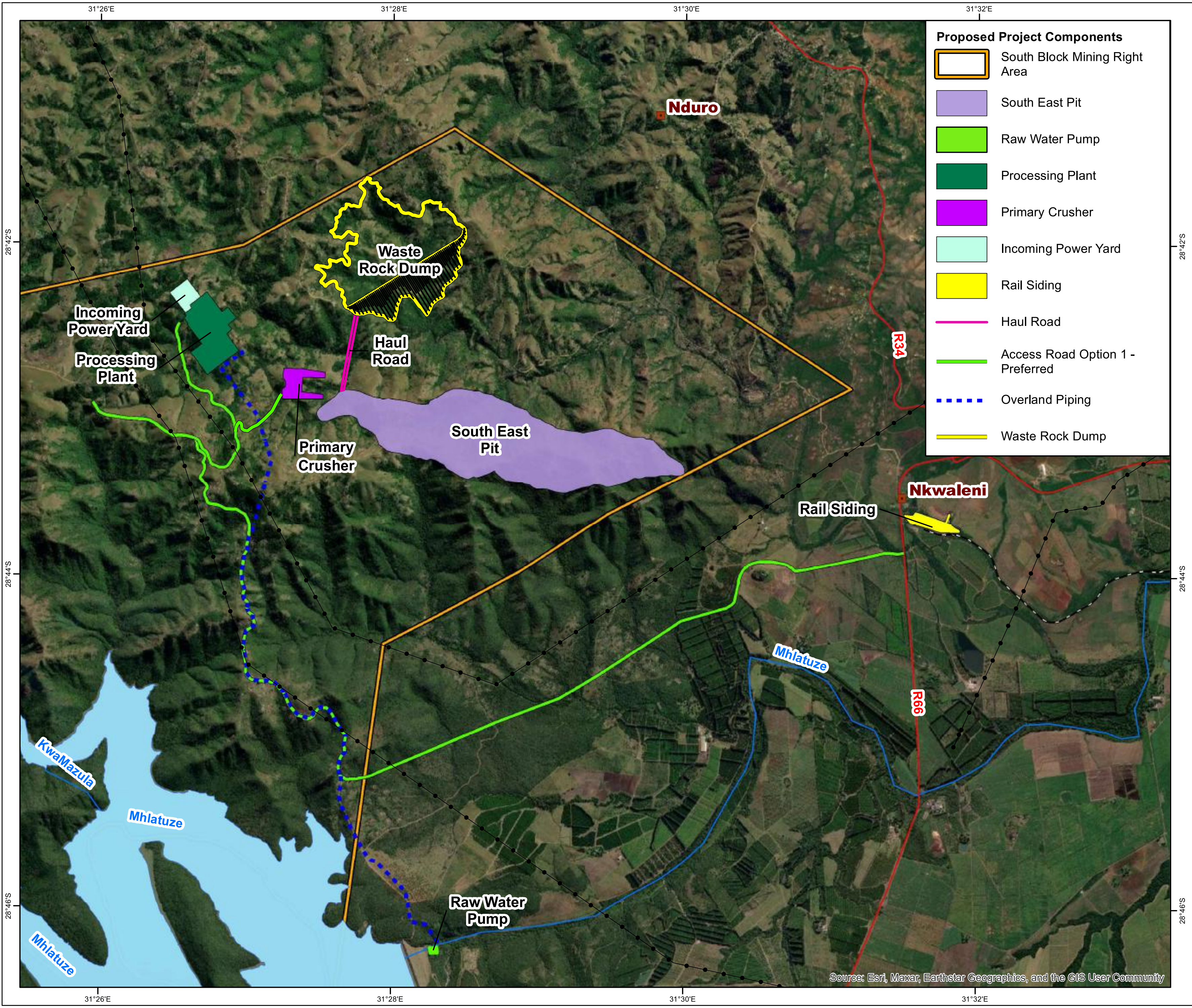
The risks associated with the preferred option are detailed in the section above. The preferred alternative has been fully assessed and mitigation measures are proposed in Appendix D and are summarised in Section 9. The full, detailed EMPr with the proposed management actions is in Section 28.

7.13 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

Although various alternatives were considered as part of the scoping phase of the project, there was little potential for an alternative site due to; the location of the iron ore resource, the volume of iron ore that needs to be extracted to be economically viable, and the hilly terrain.

7.14 THE PREFERRED ALTERNATIVE

The preferred alternative that was assessed for this EIA includes the infrastructure as discussed in Section 3.1.2 and as per Figure 7-46.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- ■ Towns / Villages
- — Roads
- — Railway Lines
- •—• Power Lines
- — Rivers
- ▭ Goedetrouw Dam

N

0 1 2

KM

Scale: 1:40 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 7-46
FINAL PREFERRED ALTERNATIVE

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Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 7-43	Date: 04/07/2023

720.10023.00001 ESIA 7-43 Final Preferred Alternative

8. FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE THROUGH THE LIFE OF THE ACTIVITY

8.1 DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY IMPACTS

Environmental and socio-economic impacts associated with the project were identified through use of the DFFE Screening Tool at the start of the process, site visits undertaken by SLR and various specialists, consideration of the project description (Section 3.1.2), site layout and the specialist studies. As part of the public participation process, I&APs (Section 7.2) were given an opportunity to provide input to the project at the public open day sessions and focussed meetings, and through the review of the BID, advertisements, site notices and the Scoping Report. The CRR is also included in Appendix C3. I&APs will be given a further opportunity to provide input through the review of the EIA and EMPr Report and/or NTS and the associated PPP. The feedback received from I&APs also provided input into the identification of environmental and socio-economic issues assessed in this report.

8.2 DESCRIPTION OF THE PROCESS UNDERTAKEN TO ASSESS AND RANK THE IMPACTS AND RISKS

A description of the assessment methodology used to assess the severity of identified impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated is provided in Section 7.9.

8.3 DESCRIPTION OF THE IMPACTS AND RISKS IDENTIFIED DURING THE ENVIRONMENTAL ASSESSMENT PROCESS

A description of the environmental impacts and risks identified during the EIA process are included in Section 9 and Appendix D. A summary of the impact assessment undertaken is included in Section 9.

8.4 ASSESSMENT OF THE SIGNIFICANCE OF EACH IMPACT AND RISK AND AN INDICATION OF THE EXTENT OF TO WHICH THE ISSUE AND RISK CAN BE AVOIDED OR ADDRESSED BY THE ADOPTION OF MANAGEMENT ACTIONS

A description of the environmental impacts and risks identified during the EIA process are included in Section 9 and Appendix D.

9. ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

The summary of the assessment of the environmental and socio-economic impacts associated with the proposed Jindal MIOP is provided in Table 9-1. The detailed impact assessment is included in Appendix D.

Table 9-1: Assessment of Significant Impacts and Risks

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
Biophysical Environment																	
1	• Localised water abstraction	Impact on groundwater quantity	Groundwater	Construction	L	L	L	L	VL-	• Drill boreholes in the pit area and collect current water level data. • Aquifer testing program must be undertaken. • Update of model with latest data. • Implement monitoring programme.	**Insignificant**					• Reversibility: Partial • Irreplaceable Loss: Medium • Avoidance: None • Mitigation: Low	• Insignificant
	• Pit dewatering			Operational	VH	H	M	VH	VH-	• Ongoing monitoring. • Supply of water to local water users if required.	L	VH	VH	L	H-		
	• Pit lake post closure			Decommissioning	M	VH	M	L	L-	• Ongoing monitoring for 5 years post closure.	**Insignificant**						
	• Oil leakages; • Fuel storage; and • Sewage and/ or effluent leakages	Impact on groundwater quality		Construction	M	L	M	M	L-	• Good housekeeping. • Implement waste management procedures. • Spill clean up.	**Insignificant**					• Reversibility: Partial • Irreplaceable Loss: None • Avoidance: High • Mitigation: High	• Insignificant
	• WRD • TSF			Decommissioning	**Insignificant**					• Good housekeeping. • Implement waste management procedures. • Spill clean up.	**Insignificant**						
	• TSF	Impact on groundwater quality - TSF		Operational	**Insignificant**					• Ongoing monitoring. • Supply of water to local water users if required.	**Insignificant**						
	• WRD	Impact on groundwater quality - WRD		Operational	**Insignificant**					• Ongoing monitoring. • Supply of water to local water users if required.	**Insignificant**						
2	• Surface clearance for site preparation. • Contaminated stormwater runoff. • Potential seepage.	Reduced surface water quality	Surface water	Construction & Decommissioning	VH	M	M	H	M-	• Good housekeeping. • Emergency response procedure (ERP). • Stormwater Management Plan • Ongoing rehabilitation.	L	M	M	H	L-	• Reversibility: Partial • Irreplaceable Loss: Low • Avoidance: High • Mitigation: Medium t- High	• Low -
				Operational	VH	H	M	H	H-		M	H	M	H	M-		
	• Earthworks and site clearance • Construction of stormwater management infrastructure.	Alteration of natural draining patterns		All phases	VH	H	VL	H	M-	• Implement a SWMP.	M	H	VL	H	L-	• Reversibility: Partial • Irreplaceable Loss: Low • Avoidance: Low • Mitigation: High	• Very low -

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
	- Ongoing use of stormwater management infrastructure. - Diversion of streams for the WRD. - Artificial surfaces resulting in increased runoff and reduced infiltration.																
	- Earthworks. - Mining of the South East Pit and associated activities - Dumping of waste rock onto the WRD.	Impact of flooding		All	H	H	VL	H	M-	- Relocate infrastructure where possible outside floodlines. - Implement flood protection measures. - Regular monitoring.	L	H	VL	H	L-	- Reversibility: Partial - Irreplaceable Loss: Low - Avoidance: Low - Mitigation: Low	- Very low -
3	- Earthworks and site clearance. - Uncontrolled runoff, erosion and sedimentation. - Activities within 'no-go' areas. - Uncontrolled release of water, clean or dirty. - Poor housekeeping.	Direct impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	Terrestrial Ecology	Construction	VH	VH	VH	VH	VH-	- Access control and site camps. - Stormwater management and erosion control. - Pollution control. - Topsoil management. - Managing flora and fauna. - Fire management. -	H	VH	VH	VH	H-	- Reversibility: Irreversible - Irreplaceable Loss: Moderately high - Avoidance: Low - Moderate - Mitigation: Low	- Medium -
				Operational	H	VH	M	VH	H-		M	VH	L	H	M-		
				Decommissioning	H	VH	M	M	M-		M	VH	L	L	L-		
		Indirect impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation		Construction, Operational	VH	M	H	VH	H-		M	M	H	VH	M-	- Reversibility: Partial - Irreplaceable Loss: Moderate - Avoidance: Moderate - Mitigation: Moderate	- Medium -
				Decommissioning	M	H	M	VH	H-		M	H	L	M			
		Direct impacts to species and		Construction and Operational	H	VH	M	VH	H-		M	VH	L	H	M-	- Reversibility: Irreversible	- Medium -

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
		threatened species conservation		Decommissioning	H	VH	M	H	M-		M	VH	L	L	L-	• Irreplaceable Loss: Moderately high • Avoidance: Low - Moderate • Mitigation: Moderate	
		Indirect impacts to species and threatened species conservation		Construction and Operational	M	H	M	VH	M-		M	H	M	H	M-	• Reversibility: Partial • Irreplaceable Loss: Moderate • Avoidance: Low - Moderate • Mitigation: Moderate	• Medium -
				Decommissioning	M	H	M	VH	M-		M	H	L	M	L-		
		Direct impacts to local and regional ecological processes		Construction	VH	VH	M	VH	H-		H	VH	M	VH	H-	• Reversibility: Irreversible • Irreplaceable Loss: Moderate • Avoidance: Moderate Mitigation: Moderate	• Medium -
				Operational	M	VH	L	VH	M-		M	VH	L	H	M-		
				Decommissioning	H	VH	M	M	M-		M	VH	L	L	L-		
		Indirect impacts to local and regional ecological processes		Construction and Operational	H	H	L	VH	M-		H	H	L	H	M-	• Reversibility: Partial • Irreplaceable Loss: Moderately high • Avoidance: Low - Moderate • Mitigation: Moderate	• Medium to Low -
				Decommissioning	M	H	M	VH	M-		M	H	L	M	L-		
4	• Earthworks. • Construction of road crossings. • Accidental leaks and spills. • Mining of the South East Pit and	Physical loss or modification of freshwater habitat	Freshwater Ecology Surface Water	Construction & Decommissioning	H	VH	VL	VH	M-	• Minimise impact footprint. • Avoid 'no-go' areas. • Implement runoff, erosion, and sediment control measures. • Implement hazardous substances / materials management measures. • Implement noise & dust pollution minimisation. • Implement landscaping recommendations.	M	VH	VL	VH	M-	• Reversibility: Irreversible • Irreplaceable Loss: High • Avoidance: Low • Mitigation: Low	• Medium -

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
	associated activities - Dumping of waste rock onto the WRD									- Implement alien plant monitoring and control. - Ongoing monitoring.							
				Operational	H	VH	H	VH	H-	- Implement storm water management. - alien plant monitoring and control. - Implement a contingency plan for freshwater ecosystems if required. - Ongoing monitoring.	H	VH	H	VH	H-		
		Alteration of hydrological and geomorphological processes		Construction & Decommissioning	M	M	H	VH	M-	- Minimise impact footprint. - Avoid 'no-go' areas. - Implement runoff, erosion, and sediment control measures. - Implement hazardous substances / materials management measures. - Implement noise & dust pollution minimisation. - Implement landscaping recommendations. - Implement alien plant monitoring and control. - Ongoing monitoring.	M	L	VL	H	L-	- Reversibility: Irreversible - Irreplaceable Loss: High - Avoidance: Low - Mitigation: Low	- Medium -
				Operational	M	VH	VH	VH	H-	- Implement storm water management. - alien plant monitoring and control. - Implement a contingency plan for freshwater ecosystems if required. - Ongoing monitoring.	M	VH	H	VH	M-		
		Impacts to wetlands and aquatic ecosystems due to reduced water quality		Construction & Decommissioning	H	L	H	VH	M-	- Minimise impact footprint. - Avoid 'no-go' areas. - Implement runoff, erosion, and sediment control measures. - Implement hazardous substances / materials management measures. - Implement noise & dust pollution minimisation. - Implement landscaping recommendations. - Implement alien plant monitoring and control. - Ongoing monitoring.	H	L	VL	H	L-	- Reversibility: Partial - Irreplaceable Loss: Medium - Avoidance: Low - Mitigation: Medium	- Medium -
				Operational	H	H	VH	VH	H-	- Ongoing stormwater management. - Ongoing monitoring.	H	H	H	H	M-		
		Impacts to ecological connectivity and/or ecological disturbance impacts		Construction & Decommissioning	M	L	H	VH	M to L-	- Minimise impact footprint. - Avoid 'no-go' areas. - Implement runoff, erosion, and sediment control measures. - Implement hazardous substances / materials management measures.	M	L	VL	H	L-	- Reversibility: Fully - Irreplaceable Loss: Low - Avoidance: Low	- Low -

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
										• Implement noise & dust pollution minimisation. • Implement landscaping recommendations. • Implement alien plant monitoring and control. • Ongoing monitoring.						• Mitigation: Medium	
				Operational	M	H	VH	VH	M-	• Avoid 'no-go' areas. • Ongoing rehabilitation. • Managing flora and fauna.	M	H	VL	VH	L-		
5	• Dust from earthworks and onsite vehicle movement activities • Emissions associated with construction vehicles transporting materials and personnel to and from the site • Emissions associated with construction activities onsite	Impact on ambient air quality	Air Quality	Construction & Decommissioning	M	L	M	VH	M-	• Implement air quality management measures. • Minimise dust from roads. • Implement best practice to minimise emissions. • Vehicle and equipment maintenance. • Air Quality Monitoring Plan. • Grievance mechanism.	L	L	L	H	L-	• Reversibility: High • Irreplaceable Loss: Low • Avoidance: Low • Mitigation: Medium	• Low -
	• Blasting • Earthworks and haul vehicle movement • Transport of workers to site on unpaved roads • Dumping onto the WRD • Stockpiling of ore, stripped soils etc.			Operational – Community health	H-M	H	H	VH	H to M-	• Implement Dust Management Plan. • Visual buffer between mining activities and community. • Reduce vehicle speeds. • Pave main access road. • While the processing plant will be enclosed, all bag filters on extraction points should be designed for 30 mg/Nm3.	M-L	H	H	VH	M to L-	• Reversibility: High • Irreplaceable Loss: Unlikely • Avoidance: Medium • Mitigation: High	• Low -
				Operational – Commercial crops	M	H	VH	M	L-	• Implement Dust Management Plan. • Visual buffer between mining activities and community. • Reduce vehicle speeds. • Pave main access road. • While the processing plant will be enclosed, all bag filters on extraction points should be designed for 30 mg/Nm3.	L	H	VH	M	VL-		

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
				Operational – Blasting	M	VL	H	H	M-	• Evacuate people and animals out of the danger zone prior to any blasting taking place (blast safety recommendation is 500m). • Inform the community of blasting dates and times, in addition to social media postings. • Undertake initial test blast and monitoring downwind to define blasting operations going forward. • Ongoing monitoring. • Blast Management Plan.	L	VL	H	H	L-		
6	• Earth-moving operations • Construction and delivery vehicles	Impact on noise levels	Noise	Construction & Decommissioning	L	VL	M	H	L-	• Implement Noise Management Plan • Ongoing Monitoring. • Grievance mechanism.	VL	VL	M	H	VL-	• Reversibility: High • Irreplaceable Loss: None • Avoidance: Medium • Mitigation: High	• Medium -
	• Blasting • Haul vehicle movement • Processing plant equipment and primary crusher • Dumping of waste rock			Operational	VH	H	M	VH	H-	• Implement Noise Management Plan • Ongoing Monitoring. • Grievance mechanism. • Use of noise barrier walls or berms if required. • Maintenance of vehicles and machinery. • As far as reasonably practicable, sources of significant noise should be enclosed. • Reduce vehicle speeds. Possible resettlement of residences within close proximity to the mining areas, primarily as a function of the minimum blast safety distance recommendation.	H	H	M	L	M-		
7	• Earth-moving operations. • Construction and delivery vehicles. • Blasting. • Haul vehicle movement • Processing plant equipment and primary crusher • Dumping of waste rock	Impact of change of land use from subsistence farming to mining	Land capability	All phases	M	VH	VL	VH	M-	• Limit the land use change to the infrastructure footprint of the mine. • Keep the infrastructure footprint as small as possible. • Ensure that RAP considers the resettlement of livestock to the areas where the current homestead owners will be resettled. • The RAP must ensure that the areas where homestead owners will be resettled, have soil that is suitable for subsistence-level crop production near the houses.	L	VH	VL	VH	L-	• Reversibility: Irreversible • Irreplaceable Loss: High • Avoidance: None • Mitigation: Medium	• Low -

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
	• Earth-moving operations. • Construction and delivery vehicles. • Blasting. • Haul vehicle movement • Processing plant equipment and primary crusher • Dumping of waste rock	Impact of loss and/or reduction of current land capability		All phases	M	VH	VL	VH	M-	• Keep the infrastructure footprint as small as possible. • In areas where infrastructure will be decommissioned and materials removed, topsoil must be put back at depths similar to the pre-mining topsoil depths during the land rehabilitation. • Land capability audits.	L	VH	VL	L	L-	• Reversibility: Irreversible • Irreplaceable Loss: High • Avoidance: None • Mitigation: Medium	• Low -
8	• Earth-moving operations. • Construction and delivery vehicles.	Impact of increased soil erosion	Soils	Construction & Decommissioning	VH	VH	L	H	H-	• Phased land clearance. • Restrict land clearance to demarcated areas. • Revegetation of soils which will be exposed for long periods, such as the topsoil stockpiles. • The Stormwater Management Plan must be designed to minimise soil erosion. • Revegetation as soon as infrastructure is removed. • No additional areas outside of the demarcated footprint must be affected by vegetation removal during decommissioning of infrastructure. • Rehabilitation according to Closure Plan	VH	VH	VL	M	M-	• Reversibility: Irreversible • Irreplaceable Loss: High • Avoidance: Medium • Mitigation: Medium	• Low -
	• Blasting. • Haul vehicle movement • Processing plant equipment and primary crusher • Dumping of waste rock			Operational	M	VH	L	H	M-	• Regularly maintain the SWMP. Revegetate areas where required..	L	VH	VL	M	VL-		
	• Earth-moving operations • Construction and delivery vehicles • Haul vehicle movement	Impact of soil compaction		All phases	VH	VH	L	VH	H-	• Remain within demarcated areas. • Materials must be off-loaded and stored in designated laydown areas. • Rip all compacted areas such as roads and stockpiles areas, during the last phases of site rehabilitation.	H	H	L	H	M-	• Reversibility: Partial • Irreplaceable Loss: Low • Avoidance: None • Mitigation: Low	• Low -

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
	• Processing plant and primary crusher • Dumping of waste rock								🟥						🟧		
9	• Land clearance and earthworks • Building of access and haul roads • Construction of the processing plant, crusher and power yard and associated infrastructure	Impact on landscape and visual aspects	Visual	Construction	VH	L	H	VH	H-	• Dust suppression. • Minimise footprint land clearance to demarcated areas. • Progressive rehabilitation. • Implement a Topsoil Management Plan. • Construction activities should be limited to between 08:00 and 17:00, where possible. • Building or waste material should be discarded at an authorised/ licensed location. • Paint all structures with colours that reflect and compliment the colours of the surrounding landscape.	VH	L	H	VH	H-	• Reversibility: Irreversible • Irreplaceable Loss: High • Avoidance: Low • Mitigation: Low	• Medium -
	• Blasting • Mining activities and pit creation • Waste Rock Dump • Movement of vehicles • Night lighting			Operational	VH	VH	H	VH	VH-	• Dust suppression. • Implementation of approved Rehabilitation Plan. • Progressive rehabilitation, where feasible. • Minimise number of lights and install precisely directed light fixtures to reduce light "spillage". • Avoid high pole top security lighting.	H	H	H	H	H-		
	• Demolition and dismantling activities • Rehabilitation activities			Decommissioning	M	H	H	H	H-	• Progressive rehabilitation. • At closure, all remaining exposed terraced areas should be formed, contoured, and revegetated according to the Rehabilitation Plan.	L	H	M	H	M-		
10	• Vehicles and other combustion sources	Impact of the project on climate change	Climate	Construction	L	L	H	M	L-	• Investigate low carbon alternatives, such as fuel additives in diesel vehicles or regular service intervals to ensure optimal vehicle efficiency.	L	L	M	M	L-	• Reversibility: N/A • Irreplaceable Loss: N/A • Avoidance: N/A • Mitigation: Low	• Very low -
	• Contribution to renewable energy sources through steel production			Operational	L	H	VH	VH	H+	• Some potential options for energy use reduction to be considered include decarbonisation of the electricity supply and electrification of the fleet.	L	H	VH	VH	H+		
Social Environment																	

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
11	• Earthworks and land clearance	Loss of cultural heritage resources	Cultural heritage	Construction & Operational	VH	VH	H	VH	VH-	• Complete survey of the Jindal MIOP footprint. • Engagement with affected families. • Implement a Chance Finds Protocol.	H	VH	L	M	M-	• Reversibility: Irreversible • Irreplaceable Loss: High • Avoidance: Medium • Mitigation: Medium	• Low -
	• Earthworks and land clearance • Resettlement	Relocation of graves		Construction & Operational	VH	VH	H	VH	VH-		H	VH	M	VH	H-	• Reversibility: Irreversible • Irreplaceable Loss: High • Avoidance: Medium • Mitigation: Medium	• Low -
12	• Blasting	Impact of ground vibration, air blast and fly rock due to blasting activities	Community health and safety	Operational	H	H	M	H	H-	• Consider relocation of households closest to the pit areas. • Good housekeeping practices. • Evacuating of people and animals out of the danger zone. • Ongoing monitoring of blasts.	M	H	M	M	L-	• Reversibility: Irreversible • Irreplaceable Loss: Low • Avoidance: High • Mitigation: Medium	• Insignificant
13	• Earthworks and excavations • Blasting and open pit mining	Loss of palaeontological resources	Palaeontology	Construction & Operational	**Insignificant**					• Implement the Fossil Chance Find Protocol.	**Insignificant**					• Reversibility: Irreversible • Irreplaceable Loss: Low • Avoidance: High • Mitigation: Medium	• Insignificant
14	• Employment at/ for the mine	Impact of changing farming practices, market options and sources of nutrition	Community	All phases	H	H	H	H	VH-	• Compensation for loss of agricultural land through provision of alternative fields or financial compensation. • Awareness training. • Liaison with local supermarkets to curb food inflation during the construction phase.	M	VH	H	M	M-	• Reversibility: Partial • Irreplaceable Loss: Low • Avoidance: Medium • Mitigation: Medium	• Very low -

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
	• Poor site management	Exposure to vector-borne and zoonotic disease		Construction & Operational	M	VH	H	L	M-	• Control of vector breeding sites. • Vector control in the local communities. • Effective domestic waste management. • Coordination with the relevant government departments (i.e. health and social development) to establish vector awareness programs.	L	VH	H	VL	L-	• Reversibility: Potentially irreversible • Irreplaceable Loss: Low • Avoidance: High • Mitigation: High	• Insignificant
	• Mine clinic/ investment in local emergency services	Changes in access to healthcare		Construction & Operational	VH	VH	V H	VH	VH-	• Provision/support of basic clinic services. • Provision/support of private ambulance services. • Support of local hospitals, particularly for emergency/casualty care. • Information campaigns to raise the baseline health level of the local community and limit the need for urgent healthcare. • Engagement with the Department of Health ensure alignment with state healthcare plans. • Potential engagement with flight emergency services.	H	H	VH	VH	VH +	• Reversibility: Potentially irreversible • Irreplaceable Loss: Low • Avoidance: High • Mitigation: High	• Insignificant
15	• Construction related traffic	Impact on road users and traffic safety	Traffic Community health and safety	Construction & Decommissioning	L	L	M	H	L-	• Implement road upgrades.	L	L	M	H	L-	• Reversibility: Irreversible • Irreplaceable Loss: Low • Avoidance: medium • Mitigation: Medium	• Low -
	• Transport of staff • Transport of concentrate Maintenance related traffic			Operational	H	H	M	H	H to M-		H	H	M	H	M to H+		

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
16	• Short-term employment opportunities	Labour influx / in-migration of jobseekers	Socio-economic Socio-economic Socio-economic Socio-economic	Construction & Decommissioning	M	L	H	H	L-	• Effective implementation of the SLP. • Job opportunities for local residents. • Increased security and proactive policing to prevent and combat escalation in crime within the surrounding communities. • Continuous engagement with local community and labour representatives, including traditional leadership and ward committees.	M	L	H	M	VL-	• Reversibility: Partial • Irreplaceable Loss: Low • Avoidance: Medium • Mitigation: Medium	• Very low -
	• Long-term employment opportunities			Operational	L	H	H	H	M-	• Effective implementation of the SLP. • Job opportunities for local residents. • Implementation of the SLP Skills Development Plan (SDP).	VL	H	H	H	L-		
	• Development of the processing plant and primary crusher • Planning for the South East Pit and WRD	Resettlement & relocation		Construction	H	H	H	H	H-	• The resettlement mitigation measures should be developed by qualified Resettlement Action Plan (RAP) specialist.	M	H	H	H	M-	• Reversibility: Irreversible • Irreplaceable Loss: N/A • Avoidance: None • Mitigation: Medium	• Insignificant
	• Mine development • Community development initiatives	Community development and lifestyle		Construction & Decommissioning	H	L	H	H	M-	• Continuous engagement wit local communities and stakeholders. • Skills audit at the pre-construction phase and ongoing throughout all phases. • Effective implementation of the SLP.	H	L	H	L	L-	• Reversibility: N/A • Irreplaceable Loss: Very low • Avoidance: N/A	• Low -
	• Ongoing mining activities • Community development initiatives			Operational	M	H	H	H	M+	• Effective implementation of the SLP. • Continually undertake skills audits.	H	H	VH	H	H+		
	• Jindal MIOP employment opportunities	Business and enterprise - impacts on the agricultural sector		All phases	VH	H	VH	H	H-	• Ongoing engagement. • Ongoing monitoring.	VH	L	VH	M	M-	• Reversibility: Partial • Irreplaceable Loss: Low • Avoidance: Low • Mitigation: Medium	• Low -
	• Vehicle movements • Earthworks and site clearance	Business and enterprise - impacts on tourism	Socio-economic	Construction & Decommissioning	M	L	VH	H	H-	• Apply mitigations aimed at other impacts such as blasting, air quality, traffic, visual etc.	L	L	VH	M	M-	• Reversibility: Low • Irreplaceable Loss: High	• Insignificant

#	Activity	Potential impact	Aspects affected	Phase	Unmitigated impact rating					Management actions type	Mitigated impact rating					Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated	Cumulative and latent impact
					Intensity	Duration	Spatial scale	Probability	Significance		Intensity	Duration	Spatial scale	Probability	Significance		
	- Construction of the processing plant and primary crusher															- Avoidance: Low - Mitigation: Low	
	- Blasting and mining activities - Vehicle movements			Operational	M	H	VH	H	M-	- Shift of business model to capture a new market. The mine should actively promote and encourage its visitors to utilise the tourism products that are present in the area, especially those offering board and lodging. - The Jindal MIOP to understand if there are opportunities for collaborating around mine tourism. - Jindal MIOP should participate in the R66 Zululand Heritage Route as well as engage with the tourism and local economic development (LED) officers at the King Cetshwayo District Municipality.	M	H	VH	M	M-		
17	- Employment creation Community investment	Impact on the local and regional economy	Socio-economic	Construction	H	L	VH	H	H+	- Effective implementation of the SLP.	H	L	H	VH	H+	- Reversibility: N/A - Irreplaceable Loss: N/A - Avoidance: N/A - Mitigation: medium	- Medium +
				Operational	H	H	VH	VH	H+	- Provision of relevant and effective training and skills development initiatives to residents of the local community. - Effective implementation of the SLP.	H	H	H	VH	H+		
	- Reduced employment and investment			Decommissioning	M	M	M	VH	M-	- Develop, regularly update and implement a Closure Plan.	L	M	M	M	L-		

10. SUMMARY OF SPECIALIST REPORTS

The main findings from the specialist studies are summarised in Table 10-1. The complete specialist reports have been attached in Appendix E to V.

Table 10-1 Specialist Recommendations

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report

Groundwater	The main findings and recommendations from the groundwater study are:
	- Findings:
	  - The hydrogeological conditions in the area of the South East Pit are complex with varied water levels measured over short distances. The mean hydraulic head in the pit area is 450 mamsl.
	  - Groundwater ingress; based on the conceptual model developed, to the open pit is expected to be low (< 5 l/s).
	  - Dewatering of the open pit would result in a cone of depression up to 2.5 km in a westerly direction, 1.6 km in a southerly direction, 1.2 km in a northerly direction and 1 km in an easterly direction. Groundwater users that fall within this area are expected to have a notable drawdown in water level in supply boreholes.
	  - Dewatering of the aquifers could result in a reduction in baseflow of up to 9 % reduction over the operational period of the mine. Relative to stream flow, a 0.5 % reduction in stream flow is expected in the catchment at life of mine.
	  - Post mining a pit lake is expected to develop in the open pit. In the first 16 years following completion of mining, the recovery in water level is anticipated to be rapid. The pit lake is expected to stabilise between 160 and 300 years. No decant/spillage is expected to occur.
	  - Two other features are of importance regarding groundwater, the WRD and the TSF. A source term characterisation was completed for the various types of waste rock expected to be deposited on the WRD. In all cases there are no potential contaminants of concern expected.
	  - Groundwater levels in the proximity of the TSF are shallow. The source term characterisation of the TSF found that only aluminium is a potential constituent of concern. However, the TSF is proposed to be lined and seepage beyond the footprint of the TSF during life of the operation is not expected. Post operation, the facility will be rehabilitated so that precipitation runs off and surface water and does not infiltrate the waste material.
	- Recommendations:
	  - Water level and water quality data:
	    - Water level data in the pit area is outdated as water level measurements were last measured in 2014. Access issues from the local community were experienced in attempts to obtain more current data. Access needs to be arranged to revisit the boreholes in the pit area and collect current water level data.
	    - A hydrocensus on farms adjacent to the mining areas that may potentially become impacted by mine dewatering is required.
	    - Monthly water level monitoring and quarterly quality monitoring should proceed to establish a sound baseline for potential future mining.
	    - A hydrogeological drilling programme needs to be undertaken for baseline establishment.
	  - Drilling and aquifer characterisation:
	    - Additional boreholes must be sited and drilled on the periphery of the pit to serve as long term monitoring boreholes.
	    - It is therefore recommended that a drilling and aquifer testing program within the pit area be undertaken to supplement the limited data available.
	    - Packer testing should be completed in existing boreholes within the pit area to characterise the hydraulic conductivity at various depths throughout the formations.
	    - Borehole drilling and aquifer testing is required and recommended in the site of the WRD to characterise the lithology and hydrogeology as well as serve as long term monitoring locations.
	    - The boreholes recently drilled at the TSF must be tested to confirm the hydraulic conductivity values assumed within the modelling.
	  - Water supply requirements for the project at construction are uncertain. Therefore, clarification on whether groundwater will be required for water supply needs to be addressed.
		X	- Section 9 (summary of impact finding and management actions)
			- Section 28 (management actions)
			- Appendix D (detailed impact assessment)
			- Appendix E (specialist study)

Surface Water	The main findings and recommendations from the surface water study are: - Findings: - Flood Peaks and Floodlines Determination - Sub catchments were delineated for modelling purposes for the streams that would be influenced by the proposed Jindal MIOP. The proposed mine infrastructure, WRD and the pit area located within the 1:100-year floodlines and most of the infrastructure traverses watercourses. Several water courses will need to be diverted away from their natural courses to allow for the development of mine infrastructure.	X	- Section 9 (summary of impact finding and management actions)

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report
	- Surface water sampling was undertaken by a SLR hydrologist on the 14th of May 2021 from the proposed site of development. The water quality analysis results were compared against the Department of Water and Sanitation (DWS) guidelines for irrigation, livestock watering and aquatic ecosystems including the SANS241 guidelines for drinking water and were mostly within the water guidelines range except for a few exceedances. From the DWS Database exceedances have been recorded in pH, Electrical Conductivity (EC) and Total Cyanide in all monitoring points. - A SWMP has been developed to divert and allow clean water within the mine area to flow across the site as free surface flow. Dirty water runoff will be directed and discharged into lined conveyance and storage facilities. Based on the proposed infrastructure design, the plant and processing areas (dirty water producing areas) are self-contained and have stormwater infrastructure (channels, berms and pollution control dams) built-in to these areas. - Goedertrouw and Neighbouring Catchments - The infrastructure proposed falls outside of the catchment area of the Goedertrouw Dam. The proposed development would therefore not impact on the runoff entering the Goedertrouw Dam. The loss in area to the catchment directly downstream of the development is minimal. - Cumulative impacts on surface water quality and quantity were assessed to be low. - Recommendations: - The findings of the baseline assessment and floodline modelling should be incorporated into the detailed design of the mine infrastructure and general layout. - Several water courses would need to be diverted away from their natural courses to allow for the development of mine infrastructure. Floodlines have not been determined for these expected diversion channels as this would form part of engineering design. The channels would need to be designed and sized according to design criteria adopted by engineers to ensure they can accommodate design flood peaks. - Suitable flood protection measures (berms and diversions) are recommended to protect the infrastructure from being flooded. The flood protection berms would need to be relatively high along their full alignment in order to withstand the flood level and flood velocities. - A SWMP has been conceptualized for the proposed plan layout of the South Block to meet the requirements of the applicable legislation. - Additional studies like geochemical waste assessments, geotechnical investigations and structural detailing may be required to further the conceptual stormwater management designs. - Recommended mitigation measures should be implemented and reviewed regularly as a best practice and compliance with various licenses issued on site by authorities. A surface water monitoring plan should be reviewed periodically to ensure the appropriateness of sites and sampling frequency during operation.		- Section 28 (management actions) - Appendix D (detailed impact assessment) - Appendix F (specialist study)
Terrestrial Biodiversity	The main findings and recommendations from the terrestrial biodiversity study are: - Findings: - Five broad but distinct terrestrial vegetation communities were identified and described for the South Block. An additional five were also identified and described for the North Block. - Four of the 10 vegetation communities mapped are considered to be in fair to natural condition and have a Very High Site Ecological Importance (SEI). The remaining six vegetation communities on site range in SEI from Medium to Very Low. In addition to being in good to fair ecological condition the four largely intact vegetation communities are highly likely to support several floral Species of Conservation Concern (SCC) that are either red-listed, rare, or endemic. - Following the initial site inspection, two SCC were confirmed to occur within open savannah/grassland vegetation on-site, namely Sensitive Species 191 (Vulnerable) and *Moraea graminicola* subsp. graminicola (Near Threatened, South African Endemic). In addition to the two threatened plant species occurring on site, which are protected under the National Environmental Management: Biodiversity Act, there are a number of plant species that are protected under the Natal Conservation Ordinance and National Forest Act that would also require relevant plant permits. - The most significant impacts are associated with the initial development of the Jindal MIOP leading to direct loss of habitat, loss of species of conservation concern and impacts of ecological processes. The risk of erosion and slumping and continued and increasing levels of pollution and alien plant invasion during the decommissioning phase are the most prominent risks during this phase. - Development of the Jindal MIOP would likely have a significant detrimental impact on biodiversity which has been rated as being of high significance, even under a good mitigation scenario. If approved, compensation would be required to offset the residual impacts both on species of conservation concern and on terrestrial habitats. Such a plan would need to be informed by further supplementary assessments to ensure that impacts can be quantified more accurately and to inform the offset design process.	X	- Section 9 (summary of impact finding and management actions) - Section 28 (management actions) - Appendix D (detailed impact assessment) - Appendix G (specialist study)

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report

	• Recommendations:
	  • Several faunal SCC have been flagged as potentially occurring within the study area and therefore faunal surveys by appropriately qualified specialists for avifauna, mammal, frog, reptile, and invertebrate species would need to be conducted to address any potential impacts associated with the Animal Species Theme.
	  • However, sampling was undertaken at the end of the appropriate seasonal window (April 2021) and it is recommended that additional in-field sampling during mid-summer is undertaken and an update of the floral component of this report used to better inform the EIA for the project.
	  • Implement an offset design process for the impacted biodiversity.		

Wetland & Aquatic Ecology	The main findings and recommendations from the wetland and aquatic study are:
	• Findings:
	  • The majority of the South Bock is located within the quaternary catchment W12B. A portion of the eastern extent of the South Block crosses into W12D. The primary river draining both catchments is the Mhlatuze River. The Goedertrouw Dam, located along the Mhlatuze River forms part of the South block and is a regional water supply dam built in the 1980s. A large tributary of the Mhlatuze River, the KwaMazula River, drains much of the central portion of the South Block.
	  • The North Block is located within the quaternary catchment W12C. the primary river draining this catchment is the Mfule River.
	  • South Block: A total of 599 river / stream units and 22 wetland units were identified and classified in the South Block study area.
	  • North Block: A total of 331 river / stream units and 63 wetland units were identified and classified in the North Block study area.
	  • The most significant construction phase impacts are likely to be the direct physical loss or modification of freshwater habitat at road crossing locations and in instances were infrastructure advances into delineated watercourses.
	  • The most significant operational phase impacts are likely to be associated with notable direct physical destruction of freshwater habitat at the location of the mine pit and WRD, the potential for appreciable hydrological and geomorphological modifications to watercourses during the mining operational phase, and the inherent risks of pollution emanating from the mine operation.
	  • Based on the mine layout included in this application a total of 10.43 ha of freshwater habitat stands to be permanently altered (infilled or mined out) during the construction and operation of the Jindal MIOP. This includes 0.3 ha of critically endangered wetland habitat.
	  •
	• Recommendations:
	  • The proposed loss of freshwater habitat across the mine site is considered a significant residual adverse impact on biodiversity which should be compensated for using offsets. An offset is therefore likely to be required to mitigate the residual biodiversity losses associated with this proposed Jindal MIOP. Ultimately, prior to initiation of the project an Offset Report would need to be produced and approved followed by an Offset Management Plan, as per the Ezemvelo Kwa-Zulu Natal Wildlife minimum requirements for biodiversity offsets.
	  • This project will trigger several water uses beyond (c) and (i), and will require a full WULA on that basis.
	  • Under a ‘with mitigation’ scenario final buffer model outputs for rivers and wetlands recommend a 61m and 54m buffer width respectively for any heavy industrial activities planned, a 33m and 34m width respectively for any high-density residential activities planned and a 17m buffer width for both wetlands and rivers for any low impact mixed-use activities planned. It is important to note that the 17m buffer recommended by the buffer tool for rivers under a low-impact mixed use scenario with best practice mitigation applied, is lower than the standard 30m buffer recommended in the draft Guidelines for Biodiversity Impact Assessment (EKZNW, 2011) and therefore the buffer has been revised to 30m for rivers under this land-use scenario in accordance with these provincial guidelines.
	  • Where possible every attempt should be made to avoid/prevent impacts to important water resources through refinements to project design and the siting of mining infrastructure, mining areas, site camps and material storage, stockpiling and dump sites.
	  • Should existing road crossings be deemed inadequate or inappropriate to allow for flow to pass unimpeded, the crossing should be upgraded. For all crossing types and designs, flow through road crossings should not be unnecessarily concentrated and flow velocity should not be increased. Pipe culverts should be avoided.
	  • For new and upgraded road crossings, the decision between bridges and box culvert crossings should be a trade-off between the cost, importance, and sensitivity of the watercourse, and predicted impact of the crossing to watercourse hydrology.
	  • Erosion protection and energy dissipation measures should be established at all crossing outlets.
		X	• Section 9 (summary of impact finding and management actions)
			• Section 28 (management actions)
			• Appendix D (detailed impact assessment)
			• Appendix H (specialist study)

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report
	- A SWMP must be developed by a suitably qualified engineer with input from a wetland / aquatic ecologist, and a hydropedologist. The stormwater system should be designed to handle flows associated with the full range of expected storm events (1:1-year – 1:100-year flood / storms). It is important that clean and dirty stormwater separation systems be in place prior to construction commencing and must be maintained until rehabilitation of the site is complete.		
Air Quality	The main findings and recommendations from the air quality study are: - Findings: - An ambient air quality baseline survey was conducted for dust fallout and PM at sensitive receptors located near the Project area. The dust fallout results were obtained over two one-month periods (Cycle 1 and Cycle 2) at seven locations. All seven dust fallout units showed values below the applicable Dust Control Regulations for Cycle 1. Similarly, Cycle 2 was the same, with exception of the sample collected at monitoring location at the Mxosheni Combined School Region. The month two values at this location were an order of magnitude higher than the other locations, which indicates a highly localised event (in proximity to the fallout gauge). - The monitoring results for PM_{10} showed no exceedances relative to the NAAQS value of 75 µg/m^3. The monitoring results for $PM_{2.5}$ also showed no exceedances relative to the NAAQS 24-hour standard of 40 µg/m^3. - The ambient air quality measured is considered to be reflective of a rural environment, not heavily influenced by anthropogenic background emission sources, with the key exception of agricultural activities. This is reflected by the relatively low levels of dust fallout collected (i.e. below 600 mg/m^2/day). - Modelled exceedances of the short and long-term standards for both PM_{10} and $PM_{2.5}$ were observed to be near to the haul routes and South East Pit. With design mitigation no exceedances of the dust fallout standards are predicted at the nearby SR's. - When considering the minimum distance between the community and the mine (500m), and the implementation of mitigation measures, no fatal flaws were identified from an air quality perspective. - Recommendations: - It is recommended that a Dust Management Plan be prepared to control emissions from material handling, water and dust suppressant application and restriction of vehicle speeds among others. - Monitoring needs to be implemented to ascertain levels of impact. - An air quality and dust complaints/ incident reporting procedure should be implemented as part of the community engagement and grievance mechanism for the surrounding communities to report any complaints. The analysis of the complaints received should aid in identifying and actioning more specific and appropriate mitigation or remediation measures.	X	- Section 9 (summary of impact finding and management actions) - Section 28 (management actions) - Appendix D (detailed impact assessment) - Appendix I (specialist study)
Noise	The main findings and recommendations from the noise study are: - Findings: - From baseline undertaken, all the daytime and night-time recorded noise measurements were above the relevant SANS 10103 limit values prescribed for rural land use types with the exception of one monitoring location. Based on the results of the measurements the average daytime noise level is 51.7 dB(A) and the average night-time noise level is 47.8 dB(A). - The construction noise assessment shows that there is expected to be an exceedance of the construction noise limit at SR's located within approximately 600 m of the processing plant and crushing area. The closest assessed SR is located approximately 533 m away resulting in an exceedance of the limit of 0.9 dB(A). - The operational noise impact assessment of the Jindal MIOP found that operation of all project related activities is anticipated to have a severe impact at three sensitive receptor locations. These impacts would warrant noise mitigation measures being required in order to reduce the impacts to acceptable levels. These impacts can be attributed to the close proximity of the sensitive receptors to the project area, with some being within the project boundary, and the rural nature of the area with low baseline noise levels and low noise limits. - When looking at the Noise Control Regulations the mining activities are anticipated to result in increases in ambient noise levels that are greater than 7 dB(A) at SR7, SR8 and SR9 during the daytime and night-time periods and SR5 and SR6 during the night-time periods. Therefore, as per the regulations mitigation would be required. - In order to minimise the potential impacts to sensitive receptors, a number of noise mitigation measures have been proposed. - No fatal flaws were identified in terms of noise impacts. - Recommendations: - It should be noted that the noise assessment was conducted in a conservative manner for a reasonable worst-case scenario. It is recommended that the assessment be updated once more data is available, such as detailed plot plans, equipment vendor specifications and detailed equipment specifications.	X	- Section 9 (summary of impact finding and management actions) - Section 28 (management actions) - Appendix D (detailed impact assessment) - Appendix J (specialist study)

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report
Soils, Land Capability & Land Use	The main findings and recommendations from the soils, land capability and land use study are: - Findings: - Eight soil associations were identified within the South Block. These are: Glenrosa, Hutton, Katspruit, Dundee, Mispah, Oakleaf, Swartland and Valsrivier. Seven of the eight soil associations are present within and around the infrastructure footprint. The texture of the topsoils are sandy clay loam, clay loam and clay. The subsoils have sandy clay loam, clay and clay loam texture. - The South Block area has five different land capability classes. - The current main land use of the South Block, including the proposed development footprint, is subsistence farming. The subsistence farming consists of livestock grazing and crop cultivation. However, the crop fields are small and scattered alongside the homesteads. No large commercial agricultural fields are present within the South Block. - The most prominent production area located southeast of the south-eastern boundary of the South Block, is the Nkwalini valley. In this area, a variety of horticultural crops are produced under irrigation that include citrus, macadamias, bananas and passion fruit. Other areas consist of irrigated sugar cane. Irrigation systems used in the area include micro and drip irrigation as well as centre pivot irrigation used for sugar cane. - The entire South Block area is dominated by land with low agricultural sensitivity (a total area of 7 542 ha), followed by land with medium agricultural sensitivity (3 716 ha) and with high agricultural sensitivity delineated for a total area of 456 ha. The proposed infrastructure layout of the Jindal Melmoth Iron Ore project includes areas of all three sensitivity classes. - The main impacts of the Jindal Melmoth Iron Ore project from the perspective of agriculture, centres around the permanent change in land use from subsistence agriculture to mining, the permanent reduction of the land capability of the area as well as degradation of soil quality through soil erosion and compaction. - The impacts on land use and land capability have medium significance when not mitigated but with mitigation measures, can be reduced to low significance. - From the perspective of soil and agricultural potential, the proposed Jindal MIOP is considered acceptable within the current proposed development footprint. - Recommendations: - Once the rehabilitation of a specific area is completed, a SACNASP registered soil or agricultural scientist must conduct a land capability audit of the rehabilitated area. - A land capability audit is also required after the final land rehabilitation of the mined area following the decommissioning phase. - Regular monitoring must be undertaken and should there be signs of erosion detected, these areas must be rehabilitated using a combination of geo-textiles and re-vegetation to prevent the eroded area(s) from expanding.	X	- Section 9 (summary of impact finding and management actions) - Section 28 (management actions) - Appendix D (detailed impact assessment) - Appendix K (specialist study)
Visual	The main findings and recommendations from the visual study are: - Findings: - Most of the study area's scenic quality has been rated moderate to high within the context of the sub-region, and sensitive viewing areas and landscape types were identified, indicating potential receptor sensitivity to the project. Proposed Project footprints are in landscape types rated as moderate to high. - Impacts on views are the highest when receptors are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the changes to the landscape. - The Project will introduce a land use currently not occurring in the sub-region and would therefore cause a significant loss of and alteration to the baseline's key features and characteristics. High visual and sense of place impacts would result. - The Project would negatively affect receptors travelling through the study area on the R66, local roads, and those living in homesteads and visiting tourist facilities within a 3 km radius of project activities. - The impact on the visual environment during the construction and operational phases is assessed to be high but would slightly reduce once operations cease. . - Recommendations: - Ongoing discussions should be undertaken with local landowners and business owners affected by the project to determine potential impacts.	X	- Section 9 (summary of impact finding and management actions) - Section 28 (management actions) - Appendix D (detailed impact assessment) - Appendix L (specialist study)
Greenhouse Gas & Climate Change	The main findings and recommendations from the GHG and climate change study are: - Findings:	X	- Section 9 (summary of impact finding and

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report
	- The assessment of the project's impact on climate change was based on the project's GHG emissions, as calculated according to SANS 14064:2021 Part 1 and the Regulations and Technical Guidelines published by the DFFE. - The assessment of the project's resilience to climate change was guided by the DFFE's Framework for Climate Change Vulnerability Assessments and the Equator Principles. The project's vulnerability was assessed across core operations, value chain (upstream and downstream), and the broader social and environmental context. - The impact of the project on climate change was assessed in the context of both GHG emissions from the project, as well as the potential positive impact the project can have through the avoidance of emissions. The project would emit 326 ktCO$_2$e during the construction phase, 19 850 ktCO$_2$e/year during the operational phase and 496 100 ktCO$_2$e over its lifetime. - However, the iron and steel industry are already and will continue to play a critical role in the global transition to a low-carbon economy. The World Bank predicts a steel demand of 2.5 billion tonnes under a 2°C scenario, driven by the growth in demand for components used in renewable energy technologies. The global economy would not be able to move to a lower GHG emissions scenario without a substantial increase in renewable energy infrastructure development which require steels. The Project is therefore determined to have a positive net climate change impact. - No fatal flaws have been identified with respect to climate change for the Jindal MIOP. - Recommendations: - Consider potential options for energy use reduction to include: - Decarbonisation of the electricity supply; and - Electrification of the fleet.		management actions) - Section 28 (management actions) - Appendix D (detailed impact assessment) - Appendix M (specialist study)
Blasting & Vibration	The main findings and recommendations from the blasting and vibration study are: - Findings: - Ground vibration, air blast, fly rock and fumes are some of the impacts as a result of blasting. - The evaluation of effects yielded by blasting operations was evaluated over an area far as 3 500 m from the pit. - The location of structures around the pit area is such that the charge evaluated showed possible influences due to ground vibration. Ground vibrations predicted for the pit area ranged between low and very high. Ground vibration at structures and installations other than the identified problematic structures is well below any specific concern for inducing damage. - Predicted air blast showed similar concerns. The current accepted limit on air blast is 134 dBL with damage only expected at levels greater than 134 dBL. With charges being considered it is expected that air blast would be greater than 134 dB at a distance of 393 m and closer to pit boundary. - Fly rock remains a concern for blasting operations. The absolute minimum unsafe zone is modelled to be 412 m from the blast. This calculation is a guideline and any distance cleared should not be less. The occurrence of fly rock can however never be 100% excluded and best practices should be implemented at all times. - Specific actions will be required for the pit area such as Mine Health and Safety Act requirements when blasting is done within 500 m from structures and mining within 100 m of structures. - No fatal flaws are assumed provided all recommendations/ mitigations are implemented. - Recommendations: - Regulatory requirements indicate specific requirements for all non-mining structures and installations within 500 m from the mining operation. Jindal would have to apply for the necessary authorisations as prescribed in the various acts, and specifically Mine Health and Safety Act. - Blast designs should be reviewed prior to first blast planned and done. - It is recommended that a test blast and detailed monitoring be undertaken and used to help define blasting operations going forward. - The current proposed stemming lengths used provides for limited control on fly rock. Consideration can be given to increase this length for better control. - For safe blasting a minimum safe distance is calculated is 412 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. - Rerouting of the D395 road would be required. Future route of the road must be considered. Clearance distances and road travel would need to be managed during blasting operations. - A photographic survey of all structures up to 1 500 m from the pit area is recommended. This will be important for any negotiations with regards to complaints from neighbours on structural issues due to blasting.	X	- Section 9 (summary of impact finding and management actions) - Section 28 (management actions) - Appendix D (detailed impact assessment) - Appendix N (specialist study)

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report

Palaeontology	The main findings and recommendations from the palaeontology study are:
	- Findings:
	  - The site proposed for development is in the unnamed granitic gneiss and the Mhlatuze Formation of the Nondweni Group. These rocks are ancient volcanic rocks but single-celled algae or bacteria have been found in other exposures of this group, to the north.
	  - The impact on the palaeontological heritage would be low, so as far as the palaeontology is concerned, the project should be authorised.
	- Recommendations:
	  - It is recommended that the site geologist retains samples of the black rocks from the Nondweni Group for future research.
		X	- Section 9 (summary of impact finding and management actions)
			- Section 28 (management actions)
			- Appendix D (detailed impact assessment)
			- Appendix O (specialist study)

Community Health	The main findings and recommendations from the community health study are:
	- Findings:
	  - The key Environmental Health Areas (EHAs) in order of priority for the Project are: social determinants of health, specifically arising from the resettlement process, then potentially hazardous environmental and occupational exposures to nearby residents and project employees, followed by impacts on the health care system and its capacity and accessibility to community residents.
	- Recommendations:
	  - The various mitigation measures for all studies undertaken for the Jindal MIOP must be implemented.
		X	- Section 9 (summary of impact finding and management actions)
			- Section 28 (management actions)
			- Appendix D (detailed impact assessment)
			- Appendix P (specialist study)

Cultural Heritage	The main findings and recommendations from the cultural heritage study are:
	- Findings:
	  - It was confirmed through on-site meetings that burials were conducted under traditional rites and that graves are mostly located at family homesteads. A single extended family's graves is said to contain around 27 graves predating 1962. These are potentially located within the boundaries of the proposed WRD. In addition some of the abandoned and oldest homesteads may include graves predating 1960 but that this would have to be confirmed by respective homestead residents during the proposed surveys.
	- Recommendations:
	  - Complete survey of the mining right area is required in order to identify any graves or other archaeological sites as due to a lack of access during the EIA process this survey has not been undertaken.
		X	- Section 9 (summary of impact finding and management actions)
			- Section 28 (management actions)
			- Appendix D (detailed impact assessment)
			- Appendix Q (specialist study)

Traffic	The main findings and recommendations from the traffic study are:
	- Findings:
	  - Most of the existing road network and intersections under investigation are considered to have a low sensitivity from a traffic engineering perspective.
	  - In terms of existing conditions the intersection of the R66, shop access and road PROW314 is considered to have a medium sensitivity, from a traffic engineering perspective, due to the retail activities at this intersection which create vehicular traffic and pedestrian movements. Implementing road safety mitigating measures, which include traffic calming and pedestrian crossings/walkways regardless of the Jindal MIOP, would improve the sensitivity to low.
		X	- Section 9 (summary of impact finding and management actions)

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report
	• In terms of anticipated future conditions with the Jindal MIOP, most of the existing road network and intersections would still be considered to have a low sensitivity from a traffic engineering perspective. • A change in sensitivity for sections of Road D395 and Road L745 are envisaged due to potential heavy vehicle movement as part of the Jindal MIOP, as these road sections contain residential areas along the road sections. • From a road safety perspective, a change in sensitivity for the intersection of Road R66 and Road PROW15 is envisaged due to potential heavy vehicle movement as part of the Jindal MIOP (right-turn movements by heavy vehicles), and due to the lack of a dedicated right-turn lane on the northern approach of Road R66. Implementing a right-turn lane along Road R66 on the northern approach at Point F is envisaged to improve the sensitivity of the relevant intersection to a low sensitivity. • ROM ore is transported within the mine site boundaries (not making use of public roads). • The iron ore concentrate would be exported to the Nkwalini Railway Siding by road and further transported by rail. • The Jindal MIOP is therefore recommended to be granted authorisation in terms of the Traffic Impact Assessment. • Recommendations: • Public transport loading and off-loading bays along Road R66 should be identified and assessed as part of the detailed design phase in order to minimise conflict between heavy vehicles and public transport. • Access to and from the Jindal MIOP infrastructure from Road D395 would require further investigation as part of the detailed design phase in terms of re-routing or diverting the relevant section of Road D395. • The proposed access route to the Jindal MIOP would need detailed investigation as part of the detailed design phase, which should include consultation with roads authorities and the local community. • Due to limited public transport available within the area where the Jindal MIOP is proposed there could be a shortage of public transport available for workers to and from the Jindal MIOP. Therefore, contracted transport to strategic points where public transport is readily available is recommended. It is also recommended that existing operators within the area should be approached in order to build capacity and support local empowerment. • On-site circulation which includes parking, access gates, security and operations, with specific reference to heavy vehicles, should be further addressed as part of the detailed design phase. • Due to slow travelling heavy vehicles transporting concentrate between the proposed plant and railway siding, it is recommended that investigations should be conducted as part of the detailed design phase in terms of the potential requirement for climbing/ passing lanes.		• Section 28 (management actions) • Appendix D (detailed impact assessment) • Appendix R (specialist study)
Socio-economic	The main findings and recommendations from the socio-economic study are: • Findings: • The national and local levels of government policy acknowledge the need to develop the mining sector and promote private investment to stimulate growth in the area but also seek to promote and enhance sustainable land use practices, which the agricultural and tourism sector play significant roles in terms of economic activity and job creation in the region. • The planned mining activities should further promote the development of an area with a small economy, a high unemployment rate, and a largely rural population with limited economic opportunities. • Stimulation of the national economy would occur as a result of the increase in production. This has numerous benefits, such as employment creation, a rise in consumption levels, new business sales and a contribution to GDP. • The economic baseline revealed that the agricultural sector is currently one of the largest contributors to GDP within the region, thus creating a potential conflict with the pre-existing economic conditions in the region. One of the major concern is the potential impact on the agricultural sector through potential changes in water quality and quantity, and loss of labour. • The mine is likely to fundamentally alter the sense of place in the area, which could result in a loss of economic activity, especially in the tourism sector for those establishments that target nature-based and cultural tourists. However, those establishments catering to business tourism would likely see a boost. • The population influx and related social ills are regarded as major impacts of the proposed development. • Recommendations:	X	• Section 9 (summary of impact finding and management actions) • Section 28 (management actions) • Appendix D (detailed impact assessment) • Appendix S (specialist study)

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report
	- On the basis of this socio-economic impact assessment investigation, it is suggested that although there are many drawbacks to establishing and operating the proposed Jindal MIOP, the socio-economic benefits that are likely to materialise would outweigh many of the potentially negative impacts. Significant and meaningful mitigation measures which aim to localise as many of the positive benefits as possible while limiting or even avoiding some of the potentially negative impacts that would be felt at a local level, would be necessary. - From a socio-economic perspective, subject to all mitigation and enhancement measures recommended being strictly applied and implemented, the Jindal MIOP could proceed.		

Closure	The main findings and recommendations from the closure and financial provision study are:
	- Closure Objectives and Post Mining Land Use
	  - No feasibility study was conducted to determine a sustainable post mining land use. It is recommended that stakeholder engagements, specialist studies and land capability studies be conducted with regards to this issue to assess the most feasible land use Post Closure.
	  - The local community should be involved in the development of the closure vision and development of Post Closure land use. Community participation is critical to ensure the local community's ownership of the results. Mining companies should guide conversations and provide examples of realistic options for Post Closure land use, considering both technical and economic feasibility.
	- Rehabilitation and Closure Criteria & Risk Assessment
	  - All potential risks, associated with the closure of the Jindal MIOP operations, were identified.
	- Current and Post Closure Monitoring
	  - Closure liability / costs are not included for this document. Only Care and Maintenance is included for this liability.
	- Closure Cost Estimation
	  - The financial provision has been compiled to support the minimum requirements of Government Notice Regulation (GNR 1147). This report provides the financial provision required for a 10-year closure forecast. The total financial provision required for the Jindal proposed activities (including P&G's, Contingencies and value added tax (VAT)) has been estimated to be R 241 753 945.22.
		X	- Section 9 (summary of impact finding and management actions)
			- Section 28 (management actions)
			- Appendix D (detailed impact assessment)
			- Appendix T (specialist study)

11. ENVIRONMENTAL IMPACT STATEMENT

11.1 SUMMARY OF THE KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

This section provides a summary of the findings of identified and assessed potential impacts on the receiving environment due to the preferred alternative in both the unmitigated and mitigated scenarios. A summary of the potential impacts associated with the preferred alternatives for all project phases are included in Table 11-1, Table 11-2 and Table 11-3.

Table 11-1 Summary of Construction Phase Impacts

Potential Impact	Unmitigated	Mitigated
Biophysical		
Impact on groundwater quantity	**Very low -**	**Insignificant -**
Impact on groundwater quality	**Low -**	**Insignificant**
Reduced surface water quality	**Medium -**	**Low -**
Alteration of natural drainage patterns and flow	**Medium -**	**Low -**
Impact of flooding	**Medium -**	**Low -**
Direct - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	**Very high -**	**High -**
Indirect - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	**High -**	**Medium -**
Direct - Impacts to species and threatened species conservation	**High -**	**Medium -**
Indirect - Impacts to species and threatened species conservation	**Medium -**	**Medium -**
Direct - Impacts to local and regional ecological processes	**High -**	**High -**
Indirect - Impacts to local and regional ecological processes	**Medium -**	**Medium -**
Physical loss or modification of freshwater habitat	**Medium**	**Medium**
Alteration of hydrological and geomorphological processes	**Medium**	**Low -**
Impacts to wetlands and aquatic ecosystems due to reduced water quality	**Medium**	**Low -**
Impacts to ecological connectivity and/or ecological disturbance impacts	**Moderate-Low**	**Low -**
Impact on ambient air quality	**Medium**	**Low -**
Impact on ambient noise levels	**Low -**	**Very low -**
Impact of change of land use from subsistence farming to mining	**Medium -**	**Low -**
Impact of loss and/or reduction of current land capability	**Medium -**	**Low -**
Impact of increased soil erosion	**High -**	**Medium -**
Impact of soil compaction	**High -**	**Medium -**
Impact on landscape and visual aspects	**High -**	**High -**
Impact of the project on climate change	Low -	Low -
Socio-economic		

Loss of palaeontological resources	Insignificant	Insignificant
Impact of changing farming practices, market options and sources of nutrition	Very high -	Medium -
Exposure to vector-borne and zoonotic disease	Medium -	Low -
Changes in access to healthcare	Very high -	Very high +
Loss of cultural heritage resources	Very high -	Medium -
Relocation of graves	Very high -	High -
Impact on road users and traffic safety	Low -	Low -
Labour influx / in-migration of jobseekers	Low -	Very Low -
Resettlement and relocation	High -	Medium -
Community development and lifestyle	Medium -	Low -
Business and enterprise - impacts -on the agricultural sector	High -	Medium -
Business and enterprise - impacts on tourism	High -	Medium -
Impact on the local and regional economy	High +	High +

Table 11-2 Summary of Operational Phase Impacts

Potential Impact	Unmitigated	Mitigated
Biophysical		
Impact on groundwater quantity	Very high -	High -
Impact on groundwater quality	Insignificant	Insignificant
Reduced surface water quality	High -	Medium -
Alteration of natural drainage patterns and flow	Medium -	Low -
Impact of flooding	Medium -	Low -
Direct - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	High -	Medium
Indirect - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	High -	Medium -
Direct - Impacts to species and threatened species conservation	High -	Medium -
Indirect - Impacts to species and threatened species conservation	Medium -	Medium -
Direct - Impacts to local and regional ecological processes	Medium -	Medium -
Indirect - Impacts to local and regional ecological processes	Medium -	Medium -
Physical loss or modification of freshwater habitat	High	High
Alteration of hydrological and geomorphological processes	High	Medium
Impacts to wetlands and aquatic ecosystems due to reduced water quality	High	Medium
Impacts to ecological connectivity and/or ecological disturbance impacts	Medium -	Low -
Impact on ambient air quality - community health	High - to Medium	Medium - to Low -
Impact on ambient air quality - commercial crops	Low -	Very Low -
Impact on ambient air quality - blasting	Medium -	Low -

Impact on ambient noise levels	High -	Medium -
Impact of change of land use from subsistence farming to mining	Medium -	Low -
Impact of loss and/or reduction of current land capability	Medium -	Low -
Impact of increased soil erosion	Medium -	Very Low -
Impact of soil compaction	High -	Medium -
Impact on landscape and visual aspects	Very high -	High -
Impact of the project on climate change	High +	High +
Impact of ground vibration, air blast and fly rock due to blasting activities	High -	Low -
Socio-economic		
Impact of changing farming practices, market options and sources of nutrition	Very high -	Medium -
Exposure to vector-borne and zoonotic disease	Medium -	Low -
Changes in access to healthcare	Very high -	Very high +
Loss of cultural heritage resources	Very high -	Medium -
Relocation of graves	Very high -	High -
Impact on road users and traffic safety	High to Medium -	Medium to High +
Labour influx / in-migration of jobseekers	Medium -	Low -
Community development and lifestyle	Medium +	High +
Business and enterprise - impacts on tourism	Medium -	Medium -
Impact on the local and regional economy	High +	High +

Table 11-3 Summary of Decommissioning and Closure Phase Impacts

Potential Impact	Unmitigated	Mitigated
Biophysical		
Impact on groundwater quantity	Low -	Insignificant -
Impact on groundwater quality	Insignificant	Insignificant
Reduced surface water quality	Medium -	Low -
Alteration of natural drainage patterns and flow	Medium -	Low -
Impact of flooding	Medium -	Low -
Direct - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	Medium -	Low -
Indirect - Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	High -	Medium -
Direct - Impacts to species and threatened species conservation	Medium -	Low -
Indirect - Impacts to species and threatened species conservation	Medium -	Low -
Direct - Impacts to local and regional ecological processes	Medium -	Medium -
Indirect - Impacts to local and regional ecological processes	Medium -	Low -
Physical loss or modification of freshwater habitat	Medium -	Medium -

Alteration of hydrological and geomorphological processes	**Medium -**	**Low -**
Impacts to wetlands and aquatic ecosystems due to reduced water quality	**Medium -**	**Low -**
Impacts to ecological connectivity and/or ecological disturbance impacts	**Moderate-** **Low -**	**Low -**
Impact on ambient air quality	**Medium -**	**Low -**
Impact on ambient noise levels	**Low -**	**Very low -**
Impact of change of land use from subsistence farming to mining	**Medium -**	**Low -**
Impact of loss and/or reduction of current land capability	**Medium -**	**Low -**
Impact of increased soil erosion	**High -**	**Medium -**
Impact of soil compaction	**High -**	**Medium -**
Impact on landscape and visual aspects	**High -**	**Medium -**
Impact of the project on climate change	Not assessed	
Socio-economic		
Impact of changing farming practices, market options and sources of nutrition	**Very high -**	**Medium -**
Impact on road users and traffic safety	**Low -**	**Low -**
Labour influx / in-migration of jobseekers	**Low -**	**Very Low -**
Community development and lifestyle	**Medium -**	**Low -**
Business and enterprise - impacts on tourism	**High -**	**Medium -**
Impact on the local and regional economy	**Medium -**	**Low -**

The detailed impact assessment for the preferred alternative is included in Appendix D and is summarised in Chapter 9. As discussed in Section 7.10 there is limited potential for viable alternatives for the Jindal MIOP due to the location of the iron ore resource, the mountainous topography of the area and the economic viability of the project. The preferred alternative is included in Figure 7-46 with the potentially significant impacts and risks discussed in Section 7.11.

11.2 FINAL SITE MAP

The final preferred site layout plan is included in Figure 7-46.

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

The positive and negative impacts of the proposed alternatives have been assessed in Section 7.1.2 and further discussed in Section 7.10. The positive and negative impacts of the preferred alternative have been assessed in Section 7.11, Section 9 and Appendix D.

12.PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR

Based on the outcome of the EIA process and, where applicable, the recommendations from specialists, the proposed management objectives and outcomes specific to the proposed project and for inclusion into the EMPr are detailed in this section. Specific environmental objectives to control, remedy or prevent potential impacts emanating from the proposed project are provided in Table 12-1.

Table 12-1 Management Objectives and Outcomes

Aspect	Management objective	Outcome
Groundwater	• To prevent pollution of groundwater or changes to groundwater levels and related harm or losses to third party water users.	• Groundwater quality remains within acceptable limits as defined by domestic and agricultural water quality parameters. • Groundwater levels remain within an acceptable range of baseline levels.
Surface water	• To prevent unacceptable alteration of drainage patterns and related reduction of downstream surface water flow. • To prevent pollution of surface water resources. • To prevent flooding of mine related infrastructure.	• Surface water quality remains within acceptable limits for both domestic and agricultural purposes . • The area of disturbance is limited as far as possible. • Natural drainage patterns are re-established as far as possible as part of rehabilitation activities.
Terrestrial biodiversity	• To prevent unacceptable disturbance and loss of biodiversity, particularly SCC's and related ecosystem functionality through physical and general disturbance. • Minimise fragmentation of intact vegetation and the consequent loss of ecological processes.	• Limited loss of terrestrial biodiversity in the area surrounding the actual footprint of the proposed Jindal MIOP.
Wetland & aquatic biodiversity	• To prevent unacceptable disturbance and loss of aquatic biodiversity and related ecosystem functionality through physical and general disturbance. • Minimise fragmentation/ connectivity of intact aquatic ecosystems and the consequent loss of ecological processes.	• Limited loss of wetland and aquatic biodiversity within the footprint of the proposed Jindal MIOP and downstream areas.
Air	• To prevent health and nuisance impacts on sensitive receptors due to reduced air quality.	• Dust and chemical substances emitted into the air remain within legislated or best practice limits (NAAQS). •
Noise	• To prevent disturbing noise for sensitive receptors.	• Noise generated as a result of the Jindal MIOP to remain within acceptable, and where applicable, legislated limits.
Soils, land use and land capability	• To minimise the loss of soil resources and related land capability through physical disturbance, erosion, compaction and soil pollution.	• Soil resources to be handled, managed and conserved in line with measures identified in this EIA.

Aspect	Management objective	Outcome
Visual	• To limit negative visual impacts associated with the Jindal MIOP.	• Dust emissions are managed in line with legal and best practice limits to reduce the visual impact of dust. • All infrastructure is maintained throughout the operational phase to reduce the visual impact. • Processing plant is decommissioned and removed once operational phase is complete. • South East Pit, WRD and other terraced areas are rehabilitated to minimise visual impact.
Climate change	• To limit the contribution of the Jindal MIOP to climate change through the emission of GHGs as well as the emissions released through the value chain. • Maximise the potential for offset through the development of renewable energy infrastructure.	• GHG emissions remain within levels quantified in this EIA and reduced where possible. • Energy saving infrastructure implemented into the process where ever possible.
Blasting and vibration	• Minimise the impacts due to blasting of the open pit during mining. • Nearby sensitive receptors are forewarned of blasting and the area evacuated as required.	• A limited number of grievances are lodged regarding blasting. • No blasting related injuries.
Palaeontology	• Prevent the impact to fossils during all; earthworks and excavations.	• Reported fossils can be excavated and used to further scientific knowledge of the area.
Community health	• Limit the impact of changed farming practices and nutrition of local communities. • Prevent exposure to vector borne and zoonotic diseases. • Maximise access to healthcare facilities.	• Healthy local population.
Heritage and cultural	• To minimise the disturbance of heritage resources. • Graves to remain in situ unless there is no other option.	• Unexpected discovery of heritage resources immediately triggers the chance finds procedure and the resources are protected until further instructions are received from the SAHRA/ Amafa. • If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements. • If graves need to be relocated Amafa is to be contacted and the full process followed and agreements put in place.
Traffic	• To prevent transport related accidents and/or injury to people and livestock.	• All commercial and private vehicles utilising public roads on behalf of the Jindal MIOP obey the rules of the road and be roadworthy at all times.
Socio-economic	• To limit the potential for inward migration and related social impacts; and • To enhance positive economic impacts.	• A good working relationship is established and maintained with surrounding communities, local authorities and landowners.

Aspect	Management objective	Outcome
		• Assistance is provided to local authorities to manage unplanned inward migration related to the Jindal MIOP. • Local Economic Development (LED) programmes are supported and are successful. • Positive economic impacts are achieved and enhanced where possible through working with local authorities and existing structures and organisations.
Closure	• To minimise long term impacts post closure of the Jindal MIOP.	• The site is made safe for both humans and animals. • The site is rehabilitated to be physically safe, chemically stable and ecologically self-sustaining. • The residual impacts are identified and managed to acceptable levels and do not deteriorate over time. • Rehabilitation enables fulfilment of the pre-determined end land use. • Socio-economic mine closure success criteria are achieved.

13.FINAL PROPOSED ALTERNATIVES

The final preferred layout is included in Figure 7-46 and has been discussed in Section 7.11.

14.ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

Management actions (Section 28) including monitoring requirements (Section 30) should form part of the conditions of the Environmental Authorisation. With reference to Regulation 26 of GNR 982 of NEMA, additional conditions that should form part of the Environmental Authorisation that are not specifically included in the EMPr report include compliance with all applicable environmental legislation whether specifically mentioned in this document or not and which may be amended from time to time.

15.ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

Any assumptions and/ or gaps identified during the EIA process are included in Table 15-1.

Table 15-1 Assumptions, Uncertainties and Gaps in Knowledge

Study	Assumptions, Uncertainties and Gaps in Knowledge
Groundwater	Following completion of the hydrogeological study the following data limitations and gaps need to be addressed before proceeding with the mining operation. • Gaps in water level and water quality data: ○ Water level data in the pit area is outdated as water level measurements were last measured in 2014. Access issues from the local community were experienced in attempts to obtain more current data. Access needs to be arranged to revisit the boreholes in the pit area and collect current water level data. It was also observed that core holes had, in some case, deeper than expected water levels and re-examination of these water levels is required. ○ There is currently no hydrocensus information on adjacent farms to the mining areas. In particular, the current water users and characteristics of boreholes on the farms Kromdraai 6110, Lot No 5 1038, Lot No 5 10383 GU, Lot 7 Umhlatuzi 10870, Lot 9 Umhlatuzi 10872, Hillcrest 15900, Loudwaters 11258, Lot 8 Umhlatuzi 10871, Maranqapawlu 15351. These areas may potentially become impacted by mine dewatering thus a hydrocensus to ascertain the current status is required to provide mitigation measures to water users in this area. ○ Currently, only once off water levels are available in the study area and many date to the Golder (2015) study. Therefore, monthly water level monitoring and quarterly quality monitoring should proceed to establish a sound baseline for potential future mining. ○ No water quality monitoring is currently available for the pit area (Pit and WRD). This information is necessary for baseline establishment. • Drilling and aquifer characterisation: ○ Existing boreholes in the pit area occur within the pit footprint. Therefore, additional boreholes must be sited and drilled on the periphery of the pit to serve as long term monitoring boreholes. ○ Currently aquifer characterisation in the pit area is based on two pumping tests and two slug tests. Due to very limited data, there is significant uncertainty regarding hydraulic conductivity of the formations present within the pit. It is therefore recommended to undertake a drilling and aquifer testing program within the pit area. ○ Packer testing should be completed in existing boreholes within the pit area to characterise the hydraulic conductivity at various depths throughout the formations. • There are currently no water level or aquifer parameters for the granites north of the pit where the WRD facility is proposed. Therefore, borehole drilling and aquifer testing is required and recommended in this area to characterise the lithology and hydrogeology as well as serve as long term monitoring locations up and downgradient of the WRD facility. ○ The boreholes recently drilled at the TSF must be tested to confirm the hydraulic conductivity values assumed within the modelling.

Study	Assumptions, Uncertainties and Gaps in Knowledge
	The following limitations were identified in the conceptualisation and setup of the numerical model: • Although there was a recommendation made for new boreholes to be drilled in the mining area; this was not completed due to accessibility issues. • Recharge was estimated by the chloride mass balance for the shales. Due to limited water quality data, quantification of recharge based on measured data was not possible. Therefore, the recharge was estimated and calibrated within the model. • Only four aquifer tests have been completed in the study area. All four boreholes are located within the pit area. The transmissivities obtained varied between 7 m^2/d and 53 m^2/d. High variability is typical of fractured rock aquifers. The Golder (2015) study reported that the confidence of the test at MWGA03 is low due to artesian conditions within the borehole. The variability in results, however, reduces the certainty when applying a representative hydraulic conductivity in the pit area. To address the uncertainty, a range in hydraulic conductivity values for the pit area was included in the assessment to improve model outcomes. • The current aquifer parameter data for the pit is very limited and the modelling presented is suitable for EIA level impact prediction and high-level estimation of ingress to the pit. The model is not suitable for developing a detailed dewatering strategy for the pit i.e., quantifying pore pressure difference in the pit wall and recommending suitable locations for dewatering boreholes. • Records of water strikes in the pit boreholes indicated that there were very few water strikes obtained between surface and 180 mbgl. It has been assumed that the upper aquifer zones are less conductive than the deeper zones within the pit. The available aquifer testing does not, however, differentiate the two zones and hence the conductivity values for the upper and lower zone are required to be assumed. • For the current study, three water levels were measured at the TSF boreholes that were recently drilled. TSF05-2, TSF05-03 and TSF05-01. No water level data was available for TSF05-01 and TSF05-05. • Historical water levels collected by Golder (2015) were used to characterise the pit area. Access issues prevented an update of water levels in the pit area. The water levels have been plotted against elevation to determine if any deviations occur from the expected trend. The diamond drill holes STH-69, STH-57, STH-71, are considered outliers (i.e., not following the trend) – showing deeper water levels than expected. It is likely that these water levels are not in line with the regional water levels for the aquifer and were still recovering at the time of sampling. This should be validated by remeasurement of the water levels in the boreholes. • There is no water level information in the proximity of the WRD and consequently the water level conditions are inferred from water levels in the pit area.
Surface water	In-line with the development of the floodlines, the following assumptions were made: • The topographic data (1m resolution) provided by Jindal is deemed sufficient for hydraulic modelling and able to generate cross sections that are suitable to contain flow. • Suitable Manning's 'n' values were used to represent the boundary conditions of both the channel and floodplain. • Levees (hydraulic feature in model) have been added to confine flow to the main channels and better represent channel topography. • Steady-state hydraulic modelling was undertaken, which assumes the flow is continuous at the peak rate. The steady state hydraulic modelling was selected because it is more conservative and will ensure that development is located further away from the probable flood.

Study	Assumptions, Uncertainties and Gaps in Knowledge
	• A mixed flow regime, which is tailored to both subcritical and supercritical flows, was selected for running of the steady state model. • The most recent layout of the proposed infrastructure was used.
Terrestrial biodiversity	The following limitations and assumptions apply to this assessment: • Sampling limitations and assumptions: ○ The study focused on 'terrestrial' or dryland vegetation occurring within the study area. ○ The location of floral SCC was recorded using a Garmin MonterraTM Global Positioning System (GPS). GPS accuracy was limited to 3 – 5m. ○ The field assessment was undertaken in mid-autumn (April 2021) and outside of the recommended sampling season (October to December) for the summer rainfall region as prescribed in both the "Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols" compiled by SANBI (2020) as well as the "Guidelines for Biodiversity Impact Assessments in KZN" compiled by EKZNW (2013a). As such, further fieldwork is required to obtain a more robust understanding of the occurrence and distribution of floral SCC on the site. ○ Large portions of the study area comprise steep topography often covered in dense thicket vegetation, some of which is practically impenetrable and as a result accessibility across large areas was an issue, this along with the fact that very few areas were ground-truthed relative to the large size of the study area (~20 000 ha in total) increase the likelihood that red listed species or other SCC on site were under-sampled and under-represented during the site visit. ○ In light of the two points above additional fieldwork would be required to sample the entire northern block and further ascertain the condition of vegetation located within the southern blocks and the presence of additional red-listed species during appropriately timed seasonal sampling. • Vegetation community mapping limitations and assumptions: ○ Limited GPS data and the SANLC 2020 layer were used to inform the mapping of vegetation communities and assign their condition classes. Therefore, it should be noted that a high degree of uncertainty is associated with this coarse-scale mapping, which will need to be revised following further sampling. • Potential Occurrence Assessment: ○ Information on the threat status of plants species was informed largely by the SANBI Threatened Species Online database, which was assumed to be up to date and accurate at the time of compiling this report. Any changes made after the compilation of the report are therefore not covered. ○ The assessment of the POC of fauna was informed by the presence and condition of ideal habitat for each faunal species. The habitat condition / integrity was used as a surrogate indicator of the likelihood of a particular species being present. ○ Additional information used to inform the assessment was limited to data and Geographic Information System (GIS) coverage's available for the province and district municipality at the time of the assessment.

Study	Assumptions, Uncertainties and Gaps in Knowledge
	○ In terms of faunal surveys and assessments, no formal faunal sampling or surveys were undertaken, and this report does not serve as a substitute for detailed and taxon-specific specialist reports required for faunal species flagged as being of very high – medium sensitivity and where these are likely to occur at the site. • General assumptions and limitations: ○ This report deals exclusively with a defined area and the extent and the nature of terrestrial habitat and ecosystems in that area. ○ Additional information used to inform the assessment was limited to desktop data and GIS coverage's available for the Province at the time of the assessment. ○ It is assumed that all limitations will be clearly communicated by the EAP to the Commenting and Competent Authorities responsible for reviewing the EIA. ○ It is assumed that all relevant Commenting Authorities will be consulted as part of the Application for EA process to establish their requirements for the site and that they will be provided the opportunity to make an input into the formal EIA process required prior to the development of the site. • Impact Assessment: ○ At the time of this impact significance assessment finalised site plans were not available. As such, the impact assessment was based on the best available spatial layout information for the project which includes the location of the South East Pit, primary crusher, processing plant, incoming power yard, WRD, overland piping for bulkwater (raw) supply and raw water pump to the processing plant, conceptual plant access road, conceptual railway line. ○ Also not taken into consideration in this report are incidental issues such as those related to all new roads, powerlines, pipelines and the like. The omission of these items is not an oversight but, because the development planning process was still in its early stages, limited details of such infrastructure were available at the time of this study. ○ The assessment of impacts and recommendation of mitigation measures was undertaken at a desktop level and based on the assessor's working knowledge and experience with similar mining projects. ○ The impact assessment was only undertaken for a single development scenario under two mitigation scenarios referred to as the 'realistic poor mitigation' and 'realistic good mitigation' scenarios. ○ The assessment of impacts and recommendation of mitigation measures was informed by the site-specific ecological concerns arising from the field survey and based on the assessor's working knowledge and experience with similar development projects. ○ The impact descriptions and assessment are based on the author's understanding of the proposed development based on information provided. ○ Evaluation of the significance of impacts with mitigation considers mitigation measures provided in this report and standard mitigation measures included in the Environmental Management Programme (EMPr). ○ All direct loss in extent associated with the footprint provided was assessed as part of the construction phase only.

Study	Assumptions, Uncertainties and Gaps in Knowledge
	○ Accidental direct loss in extent impacts outside the mining footprint provided were assessed as part of the operational phase and the decommissioning phase. ○ Permanent loss calculations are based on the direct footprint for non-linear infrastructure and a 20m servitude for linear infrastructure (i.e. roads). When more detail is available regarding the width of roads planned, the permanent loss in extent calculations will need to be revised based on this more accurate and updated information, particularly in the event this project progresses further in terms of the planning process and offset investigations are pursued. Secondary/indirect impacts and disturbances are not accounted for in the direct loss calculations. ○ At the time of this impact assessment, no faunal baseline assessment had been undertaken for the study area, only a very rapid desktop based potential occurrence assessment. In addition, the vegetation assessment undertaken, was conducted at the end of the appropriate seasonal window and therefore some threatened plant species are likely to have been overlooked and large portions of the study area are steep and inaccessible. As such the Site Ecological Importance assessment followed the guidance prescriptively and was based largely on available desktop information and mapping. Therefore, impact significance ratings should be considered preliminary and may need to be revised following completion of a faunal baseline assessment and an additional vegetation assessment. ○ At the time of this impact assessment the geo-hydrological report for the project was still in the process of being compiled and therefore significance ratings assigned to indirect impacts should be considered preliminary until the geo-hydrological report is reviewed in order to inform the assessment of acid mine drainage and decant risks. ○ Cumulative impacts were assessed at a very high level and coarse resolution and these significance ratings should be considered of low confidence.
Wetland & aquatic ecology	The following limitations and assumptions apply to this assessment: • General assumptions and limitations: ○ This report deals exclusively with a defined area and the extent and nature of watercourses in that area. ○ Additional information used to inform the assessment was limited to desktop data and GIS coverage's available for the province at the time of the assessment. ○ All field assessments were limited to day-time assessments. ○ No field visit was taken to the North Block study area. All watercourse delineations and baseline assessments for that area were done at a desktop level. • South Block sampling limitations and assumptions ○ Given the size of the study area, and time and access constraints, most watercourses in the study area could not be verified in the field. ○ Sampling by its nature means that not all parts of the study area were visited. The assessment findings are thus only applicable to those areas sampled, which were extrapolated to the rest of the study area. ○ Systematic sampling of selected watercourses was undertaken. The outer boundary of the riparian and wetland zones identified can be considered accurate in the vicinity of these

Study	Assumptions, Uncertainties and Gaps in Knowledge
	transects. Between transects the outer boundary had to be extrapolated using aerial photography and 20m elevation contours and, as such, the accuracy of such extrapolated sections has limitations and is open to the interpretation of the delineator. ○ A Soil Munsell Colour Chart was used to determine the soil matrix colour of the soil sampled. However, it is important to note that the recording of the colours using the soil chart is highly subjective and varies significantly depending on soil moisture and the prevailing light conditions. In this case, all the soils sampled were dry and sampling was undertaken in sunny conditions. ○ Soil wetness indicators (i.e., soil mottles, grey soil matrix), which in practice are primary indicators of hydromorphic soils, are not seasonally dependent (wetness indicators are retained in the soil for many years) and therefore seasonality has no influence on the delineation of wetland areas. ○ The accuracy of the delineations is based solely on the recording of the onsite wetland and riparian indicators using a GPS. GPS accuracy will therefore influence the accuracy of the mapped sampling points and therefore water resource boundaries, and an error of 1-5m can be expected. All soil/vegetation/terrain sampling points were recorded using a Garmin MontanaTM GPS and captured using GIS for further processing. ○ All vegetation information recorded was based on the onsite visual observations of the author and no formal vegetation sampling was undertaken. Furthermore, only dominant, and noteworthy plant species were recorded. Thus, the vegetation information provided has limitations for true botanical applications. ○ Although every effort was made to correctly identify the plant species encountered onsite, wetland plants, particularly the *Cyperaceae* (sedge) family, are notoriously difficult to identify to species level. Every effort was made to accurately identify plants species but where identification to species level could not be determined, such species were only identified to genus level. ○ With ecology being dynamic and complex, there is the likelihood that some aspects (some of which may be important) may have been overlooked. ○ While disturbance and transformation of habitats can lead to shifts in the type and extent of freshwater ecosystems, it is important to note that the current extent and classification is reported on here. ○ Infield soil sampling and vegetation observations were only undertaken at strategic sampling points within the habitats likely to be negatively affected. Sampling by its nature, means that generally not all aspects of ecosystems can be assessed and identified. • 'Seasonality' of the Assessment ○ Eco-Pulse undertook an infield watercourse delineation in April 2021. One infield visit does not fully cover the seasonal variation in conditions at the site. Nevertheless, seasonality is not a key factor for the target study area surveyed, and no further seasonal surveys will be required. ○ While aquatic invertebrate and fish populations and communities may vary seasonally linked with breeding and/or temperature changes (to name a few), these were not

Study	Assumptions, Uncertainties and Gaps in Knowledge
	accounted for in a once-off survey undertaken and are not deemed necessary for a project of this nature and based on the nature of the receiving environment. • Baseline Ecological Assessment ○ The mapping, description, and assessment of wetland/river PES & EIS was undertaken at desktop level with limited field verification. Collected data was extrapolated for the broader project area. Areas assessed only at a desktop level therefore have a relatively low level of confidence. ○ The PES and EIS assessments make use of qualitative assessment tools and thus the results are open to professional opinion and interpretation. Eco-Pulse has tried to substantiate all claims where applicable and necessary. ○ The EIS assessment did not specifically address in detail all the finer-scale ecological aspects of the water resources such as a list of aquatic fauna likely to occur (i.e. invertebrates, amphibians and fish) within and make use of these systems. ○ With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. ○ The vegetation information provided is based on observation not formal vegetation plots. As such species documented in this report should be considered as a list of dominant and/or indicator wetland/riparian species and only provide a very general indication of the composition of the wetland/riverine vegetation communities. • Impact Assessment ○ Given the early planning stage of this project key information required to accurately assess potential impacts and risks to freshwater ecosystems is not available. It should therefore be noted that this impact assessment has been completed at a broad project level and only considers the layout plan provided. As such, this impact assessment should be regarded as preliminary and indicative, and subject to more detailed impact evaluations once appropriately detailed information becomes available. In particular, more detailed information is required regarding the stormwater management plan for all proposed infrastructure, the plan and design for infrastructure required to treat domestic wastewater, contaminated runoff, and other polluted water that may be discharged into the environment and plans and processes to handle potential acid mine drainage (AMD) associated with the operation of the mine. ○ Key Omissions from the Impact Significance Assessment include: • The establishment and operation of the conveyor system that will transport crushed material to the ROM stockpile. • The TSF (part of a separate application process). • The transport of tailings from the plant to the TSF (part of a separate application process). • Construction and operation of the office complex that is to include all staff accommodation, a car park, canteen, meeting rooms, etc. • Establishment of powerlines to provide electricity to the operation. Establishment and operation of any required railway lines and / or slurry pipelines required to transport the processed iron ore concentrate away from the site.

Study	Assumptions, Uncertainties and Gaps in Knowledge
	○ The assessment of impacts and recommendation of mitigation measures was undertaken at a desktop level and based on the assessor's working knowledge and experience with similar mining projects. ○ The impact assessment was only undertaken for a single development scenario under two mitigation scenarios referred to as the 'realistic poor mitigation' and 'realistic good mitigation' scenarios. ○ The assessment of impacts and recommendation of mitigation measures was informed by the site-specific ecological concerns arising from the field survey and based on the assessor's working knowledge and experience with similar development projects. ○ The impact descriptions and assessment are based on the author's understanding of the proposed development based on information provided. ○ Evaluation of the significance of impacts with mitigation considers mitigation measures provided in this report and standard mitigation measures included in the Environmental Management Programme (EMPr).
Air quality	The following assumptions have been made for the dispersion modelling assessment, and wherever possible, a conservative approach has been taken: • The peak model year 2022 is representative of the reasonable worst case scenario. • As the exact plant boundary has not yet been defined, and given the populated nature of the surrounding area, a 500 m buffer was established around the key mining areas (i.e. pit, internal roads, crusher and WRD). The assessment excluded all existing receptors within this zone. • The trips per hour and associated dust emission rates of trucks hauling overburden have been based on the specific truck load capacities, and annual overburden volumes. • UTM co-ordinates have been based on best approximation of the source locations from the Plot Plans provided. • The moisture content of the ore has been established as approximately 7%. Therefore, high ore moisture content was considered for the development of the inventory. • The particle size distribution (PSD) for ROM, overburden, discard and product material was based on information from similar mining processes. • The average heights and width of haul route vehicles were sourced from the Caterpillar vehicle specification sheets for CAT748C vehicles. • The approach to $PM_{2.5}$ quantifications is based on a percentage of PM_{10} emissions, which conservatively assumes that for grinding activities and fugitive dust sources (haul roads, material handling and transfer), just under 30% of the total PM_{10} emitted is composed of $PM_{2.5}$ fraction. • It must be noted that although AERMOD is equipped with algorithms for modelling dry deposition (dust fallout), there are inherent inaccuracies associated with the modelling of this pollutant. This is due to many limitations and uncertainties associated with model predicted deposition, and therefore model results should be treated as indicative. Additional information relating to the model uncertainties are outlined in the following points. • Air quality models attempt to predict concentrations at a specific point and time based on "known" or measured values of various parameters input into the model, such as wind speed, temperature profiles, solar radiation. There are, however, variations in the "unknown" parameters that are not measured, as well as unresolved details of atmospheric turbulent flow. Variations in these "unknown" parameters can result in deviations of the predicted

Study	Assumptions, Uncertainties and Gaps in Knowledge
	concentrations of the same event, even though the "known" parameters are fixed. As a result of the deviations of the "unknown" parameters, a "perfect" model may be able to predict an average of identical events well, while each repetition of that event will provide somewhat different results. The statistics of these concentration residuals are termed ''inherent'' uncertainty of a model. • In addition, there are "reducible" uncertainties due to inaccuracies in the model, errors in input values and errors in the measured concentrations. "Reducible" uncertainties include inaccuracies in the input values of the known conditions (for example, poor quality or unrepresentative meteorological, geophysical and source emission data); errors in the measured concentrations that are used to compare with model predictions and inadequate model physics and formulation used to predict the concentrations. As the term indicates, "reducible" uncertainties can be controlled or minimised by collecting accurate input data, preparing the input files correctly, checking and re-checking for errors, correcting for unexpected model behaviour, ensuring that the errors in the measured data are minimised and applying better model physics. • With regards to the modelling of mining activities, the confidence in model data is much lower than for the assessment of stationary combustion sources, where emission estimates are based on vendor data or legislated emission limits, with well-known parameters (such as exhaust volume flow rates, velocity, temperature and a fixed release height). In contrast the mining activities, vehicles, schedules and activities cover a much wider area, with an assumed extraction and operation schedule at a point in the future. Therefore, results should be treated as indicative, and not absolute. It is acknowledged that there will always be some error in any geophysical model, however, notwithstanding the limitations and assumptions detailed, the structure of the modelling approach has been prepared in such a way as to minimise the total error.
Noise	The following assumptions were applied when conducting the construction phase impact assessment: • To represent a conservative worst-case scenario, construction activities occur at the plant boundary nearest to the receptor. • Partial screening adjustment was considered. • Reflection adjustment was considered. • All equipment was assumed to be operating for 100% of the construction hours (daytime only). • A single occurrence of each item in the inventory is assumed to be operating at a single location. The following assumptions have been made for the operational modelling assessment: • Normal operations have been modelled. • Equipment list was derived from the following documents "Amec Equipment List" and "Amec Opex Details Power etc.". • 100% of equipment items have been assumed to be operating at any given point in time to ensure a conservative assessment. • All noisy equipment operating in the processing plant area will be enclosed within a building, therefore transmission loss has been applied to the overall sound power level. • All modelled equipment sound power levels were summed to establish total sound power levels for each of the areas (South East Pit, crusher, processing plant and WRD). The resulting sound power level was spread across the various operational footprint areas. Therefore, all equipment has been modelled as aggregated areas sources with the exception of haul routes, haul routes / trucks were modelled as moving points sources and the access road has been modelled as a road source.

Study	Assumptions, Uncertainties and Gaps in Knowledge
	• Truck traffic noise along routes for hauling to the processing plant and WRD were modelled as moving points sources based on the number of trips per hour. • All equipment items have had spectrum and noise levels applied based on the SoundPLAN Library, BS5228 or ENC. • Terrain contours were included in the model from USGS Earth Open source library. • All sources across the areas have been modelled at surface level in-line with a worst-case operating scenario. • The model does not incorporate features which might provide partial screening (e.g., columns, pipe racks, structural steelwork, small equipment, overburden dumps, topsoil berms, pit bench walls etc.). • Ground absorption has been modelled as medium ground (having an absorption coefficient of 0.6) to maintain a conservative assessment. • Transmission loss for “sheet-steel, trapeze profile” was applied to the Operation Plant noise level, with and Rw = 25dB. • Reasonable worst-case meteorological conditions have been applied, i.e. steady wind conditions blowing in each direction.
Soils, land use and land capability	The following limitations and assumptions apply to this assessment: • It is assumed that the development footprint will remain within the boundaries of the project site and be located where the current infrastructure layout indicates (see Figure 2-2). • It is assumed that the areas where subsistence farming is present near homesteads, will be considered in any resettlement action planning and that the discussion of resettlement, falls outside the scope of this assessment. • Soil categories were created for the soil mapping to integrate soil classification data from the land type data set that originates from 1977, with the most recent soil classification system (Soil Classification Working Group, 2018).
Visual	The following limitations and assumptions apply to this assessment: • The description of project components is limited to what has been supplied to the author before this report's completion date. • No specific layouts were available at the time for the processing plant, power yard and primary crusher. The simulations have therefore been produced based on typical designs of similar projects. The layout is, therefore, indicative, and the detailed layouts could change, however, the various components would remain in the general vicinity of the areas currently shown in the figures in this report. • The extent of the WRD was determined in discussions with Jindal and has been modelled accordingly. The assumption is that the WRD would fill the valleys to a final level equivalent to the contour associated with the northern edge of the pit. • It was also determined in discussions with Jindal that the western section of the pit would be mined first. Overburden from this pit will be placed in the WRD. Once this pit is mined out, mining will take place in the eastern section of the pit. • Simulations of the Pit are based on layout and contour information supplied by Jindal in the AMEC report. • No alternative sites have been proposed. • Site photos were taken at the beginning of winter and did not reflect the complete landscape character of the area as experienced through all seasons. However, due to the relative openness and nature of the study area, this is not a major concern in assessing potential visual impacts.

Study	Assumptions, Uncertainties and Gaps in Knowledge
Climate change	The following limitations and assumptions apply to this assessment (impact on climate change): • It was assumed that the following aspects of the Jindal MIOP would contribute immaterially towards the GHG footprint of the project during the operational phase: ○ Purchase of capital goods, such as vehicles; and ○ Business travel. • It was assumed that the decommissioning of the processing plant would contribute immaterially towards the GHG inventory when compared to the operational phase. • The above assumptions were determined by applying the significance criteria in the SANS14064 (2021) standard, namely the magnitude and level of influence criteria. The Project's vulnerability to climate change is assessed according to the following: • Climate projections at finer scales, such as at a municipal level, are much more challenging to project as opposed to a subcontinental or continental scale. As a result, there are levels of uncertainty at much finer scales. Therefore, while confidence is growing in global climate models, there is a much greater appreciation of uncertainties involved in downscaling global models to illustrate climate projections at a local scale. This is particularly relevant for rainfall projections where different climate change models are used. As such the latest climate change scenarios and projections were used in this climate change assessment. This uncertainty should be noted by the project developers, since the impacts of climate change may result in decreased investment value over time and possible increases in costs of maintenance. • The assessment of the vulnerability of the project to climate change is subject to further limitations, namely: ○ Only impacts on the direct value chain were assessed; ○ No modelling of climate change impacts was conducted; and ○ Only impacts occurring during the lifetime of the project were considered.
Blasting & vibration	The following limitations and assumptions apply to this assessment: • The project consists of new pit area where no mining is currently being conducted. • The anticipated levels of influence estimated in this report are calculated using standard accepted methodology according to international and local regulations. • The assumption is made that the predictions are a good estimate with significant safety factors to ensure that expected levels are based on worst case scenarios. These would have to be confirmed with actual measurements once the operation is active. • Drilling and blast designs was provided by Jindal. • The work done is based on the author's knowledge and information provided by the project applicant. Knowledge Gaps • The data provided by Jindal and information gathered was sufficient to conduct this study. Surface surroundings change continuously, and this should be considered prior to initial blasting operations. This report may need to be reviewed and updated if necessary. This report is based on data provided and internationally accepted methods and methodology used for calculations and predictions.

Study	Assumptions, Uncertainties and Gaps in Knowledge
Palaeontology	The following limitations and assumptions apply to this assessment: • Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the granites, gneisses and volcanic rocks are typical for the country. Since very important early evidence of life on earth (prokaryotes/microbes) has been found in the Barberton Greenstone Belt, there is a chance they might be found in the Nondweni Group rocks. These fossils are very small and not visible to the naked eye.
Community health	No limitations and assumptions apply to this assessment.
Cultural heritage	The following limitations and assumptions apply to this assessment: • A major gap in this study is that no ground surveys were undertaken due to restricted access to the Jindal MIOP site. • The description of the proposed project, provided, is assumed to be accurate. • The public consultation process to be undertaken as part of the EIA is sufficient and adequate and does not require repetition as part of the heritage impact assessment. • Heritage resources might be present below the surface. As such should any such resources be discovered during earthworks/ excavations the NHRA requires that a developer cease all work immediately and observe the protocol in Section 10. • No subsurface investigation (including excavations or sampling) were undertaken, since a permit from Amafa is required to disturb a heritage resource. • A key concept in the management of heritage resources is that of non-renewability: damage to or destruction of most resources, including that caused by bona fide research endeavours, cannot be reversed or undone. Accordingly, management recommendations for heritage resources in the context of development are as conservative as possible. • Human sciences are necessarily both subjective and objective in nature. eThembeni staff members strive to manage heritage resources to the highest standards in accordance with national and international best practice but recognise that their opinions might differ from those of other heritage practitioners. • Staff members involved in this project have no vested interest in it; are qualified to undertake the tasks as described in the appointment terms of reference; and comply at all times with the Codes of Ethics and Conduct of the Association of Southern African Professional Archaeologists.
Traffic	For the purpose of the traffic impact assessment, it was assumed that: • The vehicle traffic absorption rate (the rate at which existing developments attract vehicular traffic) by all other types of completed developments will maintain the same status for the next ten years. • That the average rate of growth of vehicle traffic in the area under investigation that is not relevant to the Jindal MIOP (background traffic) between the 2023 and 2033 scenarios was anticipated at 3% per annum.
Socio-economic	The following limitations and assumptions apply to this assessment: • Project-related information supplied by the broader specialist team involved in the project for the purpose of the analysis is assumed to be reasonably accurate. Thus, all impacts are analysed based on this information. Any changes therein cannot be accounted for in the analysis. • Secondary data used was sourced from Stats SA and Quantec, which may include data from the 2011 Census that may not have been updated since. • The secondary data sources used to compile the economic baseline (dynamics of the economy and labour force), although not exhaustive, can be viewed as being indicative of broad trends within the study area.

Study	Assumptions, Uncertainties and Gaps in Knowledge
	• The identification of possible impacts was based on the project team's experience with similar studies in the past and the existing desktop-level knowledge of the socio-economic environment. • Possible impacts, as well as stakeholder responses to these impacts, cannot be predicted with complete accuracy, even when circumstances are similar, and these predictions are based on research and years of experience, taking the specific set of circumstances into account. • It is believed that the data gathered from various I&APs (through interviews and documented responses of I&APs) is sufficient to confidently predict the potential impacts of the proposed project and objectively evaluate their significance. This is assuming that: ○ Questions asked during the interviews were answered accurately and truthfully by respondents and to the best of their abilities and knowledge. ○ That the attitudes of the respondents towards the project remain reasonably stable over the short to medium term. • The focus on the primary data collection was on those parties that were perceived to be most sensitive to the proposed project. As such, it is believed that the study was able to identify the most significant impacts and assess the most pertinent issues. • All engineering and technical work related to the construction and operations of the proposed MIOP will comply fully with statutory obligations required to ensure the health and safety of people and the environment. • The following considerations related to the community household survey must be noted: ○ The potential for selection bias in community surveying due to being facilitated by a local community liaison with familial links to the Nkosi of the Zulu-Ntembeni Traditional Authority. ○ The data obtained during community surveying was done by local unemployed youth who were provided with training on the survey and the tools and platforms to conduct the survey. This could have created challenges in data quality, although no red flags were discovered in the quality assurance process. ○
Closure	The following general and site-specific cost assumptions and qualifications are described in this section: General Costing Assumptions • The closure costs were determined and presented in terms of E-TEK's understanding of the currently applicable requirements of GNR 1147. • Currency of estimate: South African Rands (ZAR). • Based on the output required a 1–10-year closure forecast cost was calculated based on the following timelines: ○ Year 1 – 10 Closure Forecast (FY2023 – FY2032). • Quantities and volumes calculated as part of the closure forecast were obtained from the Mine Works Program, pit design, WRD design and associated drawings. • Costing was based on current value and no allowance was made for future value escalation as per the legislative requirements. • As per GNR 1147 no allowance was made to offset the value of scrap steel and or salvageable equipment to the liability.

Study	Assumptions, Uncertainties and Gaps in Knowledge
	• It was accepted that all information used to support the costing supplied by Jindal Iron Ore was accurate and true; this report only addresses the decommissioning and reclamation costs, equating to an outside (third party) contractor establishing on-site and conducting reclamation-related work. • Other components such as staffing of the site after decommissioning, the infrastructure and support services (e.g. power supply, etc.) for this staff as well as workforce matters such as separation packages, re- training /re-skilling, etc. are outside the scope of this report. • Based on the above, dedicated contractors would be commissioned to conduct the demolition and reclamation work on the site. This would inter alia require establishment and overhead costs for the contractors and hence, the allowance for P&Gs in the cost estimate. • Allowance has also been made for third party contractors and consultants to conduct Post Closure care and maintenance work as well as compliance monitoring. • The financial provision calculated represents the financial requirements to implement the closure criteria identified and agreed upon as part of the closure plan. • Weighted percentages for P&Gs and Contingencies have been applied VAT is also included: ○ P&G's – 6% Overall Allowance. ○ Contingencies – 10% Overall Allowance; and ○ VAT – 15% Overall Allowance. Site Specific Costing Assumptions Infrastructural Aspects • Structural assumptions were made for infrastructure with no supporting drawings, documents or information, for example single storey buildings, medium or heavy plant structures, etc. • Main access road and perimeter fence to remain post closure. • The construction of the infrastructural aspects was scheduled according to the Project Schedule in the Mine Works Program. Mining Aspects • Waste Rock Dump (WRD): ○ The WRD is designed and constructed at an 18° angle and will be reshaped during the deposition phase. ○ The increase in volumes in the WRD will be 5% per year. General Aspect • General surface rehabilitation: ○ Amelioration specifications were adapted to analysis conducted on growth medium soils. Unit rates were adapted to reflect the application requirements. • Monitoring and Maintenance: ○ Post closure monitoring requirements were updated as per specified closure criteria. ○ Unit rates for post closure care and maintenance of rehabilitated areas were updated based on updated criteria.

Study	Assumptions, Uncertainties and Gaps in Knowledge
	Financial Provision Exclusions: Infrastructural Aspects: • No allowance was made for the Eskom yard. This will be Eskom's responsibility as confirmed by Wood PLC. • No allowance was made for the Contractor yard. This will be the applicable contractor's responsibility. • No allowance for radioactive material and equipment to be removed, transported and disposed of at a registered radioactive waste disposal facility. • No allowance was made for the removal of waste tyres as it is assumed that the contractor in charge of the mining operations will be responsible for the removal of the waste tyres. Mining Aspects • No allowance has been made for concurrent rehabilitation activities. Biophysical Aspects (Water Resources) • No allowance was made for any post closure water treatment due to limited information available at this stage. This should be investigated and included in future liability updates. General Aspects • No general surface reclamation for topsoil stockpiles was allowed due to limited information available at this stage. • No P&G's allowance for post closure monitoring and maintenance as allowance is already made within the unit rate.

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

16.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT

During the construction phase (Table 11-1) there are a number of both biophysical and socio-economic impacts that could potentially occur once development of the project site is initiated. As per Section 9 and 11 most of the potential impacts can be reduced to medium to insignificant, however, there are a number of impacts that even with mitigation implemented would still remain of a high significance. These high significance impacts are largely related to the impacts to sensitive biodiversity in the footprint and surrounding areas of the Jindal MIOP. The most significant impacts are associated with the initial direct loss of habitat, loss of species of conservation concern and impacts on ecological processes. Based on best-practice guidelines, a biodiversity offset would therefore be required to compensate for these impacts should the application be approved. Protected plant permits would also need to be obtained from the relevant competent authorities. The impact on the visual environment is also very hard to mitigate with a project of this size and also remains of high significance.

An additional potentially high impact is associated with the relocation of communities in order for the mine development to proceed. This would include the requirement for the relocation of graves which could significantly impact the families and descendants. The relocation of people would be undertaken in accordance with best practice guidelines as part of the RAP (a separate process to the EIA process). This process could result in distress amongst the affected communities and is potentially a high risk to the project. The RAP and the associated resettlement would have to be completed prior to any pre-construction work taking place. In addition, the social impacts associated with the Jindal MIOP need to be understood within the socio-political context of the receiving environment and the directly impacted communities. The risk of social and political interference in the construction and operation of the Jindal MIOP remains high within the AoI given the social unrest and ‘localised’ political instability.

Potential significant impacts post mitigation associated with the operational phase include reduced groundwater levels due to dewatering of the open pit, additional loss or modification of freshwater habitat as the open pit and the WRD footprints expand and ongoing visual impacts. There is, however, the possibility of significant positive impacts in terms of job creation, economic stimulation and potential positive impacts due to road improvements. One of the major positive impacts during the operational phase is the positive impact due to the use of iron, and subsequent steel, as an enabler for moving the global economy to a 2-degree scenario . The global economy would not be able to move to a lower GHG emissions scenario without a substantial increase in renewable energy infrastructure development, which requires steel.

During operations (Table 11-2) there are two potential impacts that have been the subject of a lot of stakeholders concerns, air quality (dust) and water supply. Air quality modelling has been undertaken for the Jindal MIOP operational phase, the results of the model indicate that levels of dust to surrounding farming areas are likely to be within manageable levels. It is going to be important, however, should the Jindal MIOP be approved that ongoing monitoring be undertaken to understand whether the model outcomes are correct as well as to ensure that additional mitigation measures are implemented should levels be higher than assessed.

In terms of water supply, as has been discussed in Section 3.1.2.5, the potential abstraction of water from the Mhlathuze catchment has been explored. The Mhlathuze catchment (to which the Goedertrouw Dam contributes a significant portion) is currently overallocated and as such the DWS may only consider new allocations if the applicants contribute to the interventions, which would generate additional water in the catchment.

It is possible that the water required for the proposed mining development could be provide through one or more of the following interventions, as provided by Ward, 2022.

The Tugela Transfer Phase 2 was initiated because of the 2014 drought. The latest information is that completion of the scheme is scheduled for 2023, however this is likely to be reviewed due to the slow progress on site. After allowing for the current deficit, the requirement for the proposed mining development would take up over one third of this new supply.

The Mhlathuze weir ultimately provides water to Lake Nsezi. Spills from the Mhlathuze weir, during local rainstorms, have been in excess of what is required by Lake/Estuary. These spills may therefore be captured for use by Jindal.

Mhlathuze Water has already looked at duplicating the pipeline from the weir to the water treatment plant, which could provide an additional 24 Mm^3 per annum. This project was subsequently put on hold but could be revived through an agreement between Jindal and Mhlathuze Water.

In addition, Jindal could appoint a professional service provider with relevant experience and with agreement with the Infrastructure Branch of DWS to provide release instructions directly to the operator of Goedertrouw Dam. The intention would be for the appointed professional service provider to develop operating rules to maximize the yield of the dam and minimize losses/spills during the wet seasons, and to convey these directly to the Dam operator. This could provide an additional 18 Mm^3 per annum.

Jindal is also exploring other options to secure a water allocation within the Mhlathuze catchment, which would need to follow the process of redistribution of water in the catchment. Details of these options are not currently available.

At decommissioning and closure (Table 11-3) of the Jindal MIOP the bulk of the impacts would cease, and the levels of impact would largely rate as low to insignificant (with a few of medium significance) provided that the infrastructure is decommissioned and rehabilitated according to the approved Closure Plan and associated Rehabilitation Plan. The visual impact related to the Jindal MIOP would remain in the landscape permanently but can be minimised to some extent with rehabilitation. An important impact at decommissioning would be the potential negative impact on the local area as a result of the loss of employment and the associated benefits linked to the spend of the Jindal MIOP in the local economy. However, if properly managed and planned for well in advance, through a well-structured and implemented mine Closure Plan, the negative impacts on the local communities and surrounding towns can be significantly reduced. Careful consideration needs to be given to creating alternative economic activities through the life of mine and upskilling of staff to allow them to source alternative work when the mine closes. Closure planning must adopt an approach to reviewing the mine closure plan on a regular basis in consultation with local communities, local authorities and relevant government departments.

The findings of the impact assessment undertaken show that there is the potential for significant impacts throughout all phases of the project, however, with the effective implementation of the EMPr, careful planning and ongoing engagement with all stakeholders and potentially affected parties there is no biophysical, social or economic reason why the project should not proceed.

16.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

16.2.1 Specific Conditions to be Included into the Compilation and Approval of EMPr

Refer to Section 14.

16.2.2 Rehabilitation Requirements

A Concurrent Rehabilitation Plan must be compiled along with the refining of the Closure schedule and mine plan when the Closure Plan (Appendix U) is updated.

17.PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

The EA that is required for Phase 1 is for a period of 30 years based on the current anticipated LOM.

18.FINANCIAL PROVISION

18.1 EXPLAIN HOW THE AFORESAID AMOUNT WAS DERIVED.

The financial provision has been prepared in accordance with GNR 1147 of NEMA: Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations, published 20 November 2015 (Financial Provisioning Regulations, 2015), as amended. In terms of these regulations, an applicant must determine the financial provision through a detailed itemisation of all activities and costs, calculated on the actual costs of implementation of the measures required for:

- Annual rehabilitation, as per Appendix 3 of the regulations;
- Final rehabilitation, decommissioning and closure of the mining or production operations at the end of life of the operations, as per Appendix 4 of the regulations; and
- Remediation of latent or residual environmental impacts which may become known in the future, as per Appendix 5 of the regulations.

The amount determined for financial provision for the Project is provided in Section 29.

18.2 CONFIRM THAT THIS AMOUNT CAN BE PROVIDED FOR FROM OPERATING EXPENDITURE.

The amount required in order to manage and rehabilitate the environment can be provided from operating expenditure and is provided for as such in the Mining Work Programme.

19.DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

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

The assessment methodology used in the assessment of potential impacts (Section 7.9) is as per the approved Plan of Study for the EIA presented in the Scoping Report (DMRE Acceptance dated 14 July 2022).

19.2 MOTIVATION FOR THE DEVIATION.

With reference to Section 19.1 above, this section is not applicable.

20.OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

20.1 IMPACT ON THE SOCIO-ECONOMIC CONDITIONS OF ANY DIRECTLY AFFECTED PERSON.

No additional information has been requested by the Competent Authority at this stage.

20.2 IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT.

Due to access not being granted to the area by certain communities a detailed survey of the proposed Jindal MIOP footprint was not able to be conducted. It is therefore not understood at this stage what may fall within this ambit. Before any development could progress on site a detailed cultural heritage survey and grave assessment must be undertaken to identify potential 'national estate' and relevant permits would then need to be put in place.

According to Section 3(2) of the NHRA the following is considered as 'national estate':

a) places, buildings, structures and equipment of cultural significance;
b) places to which oral traditions are attached or which are associated with living heritage;
c) historical settlements and townscapes;
d) landscapes and natural features of cultural significance;
e) geological sites of scientific or cultural importance;
f) archaeological and palaeontological sites;
g) graves and burial grounds, including -
  - ancestral graves;
  - royal graves and graves of traditional leaders;
  - graves of victims of conflict;
  - graves of individuals designated by the Minister by notice in the Gazette;
  - historical graves and cemeteries; and
  - other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);

h) sites of significance relating to the history of slavery in South Africa;
i) movable objects, including -
  - objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
  - objects to which oral traditions are attached or which are associated with living heritage;
  - ethnographic art and objects;
  - military objects;
  - objects of decorative or fine art;
  - objects of scientific or technological interest; and
  - books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section I (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

21.OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT

No other matters are required in terms of Section 24(4)(A) and (B) of the Act.

PART B – ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

22.DETAILS OF THE EAP

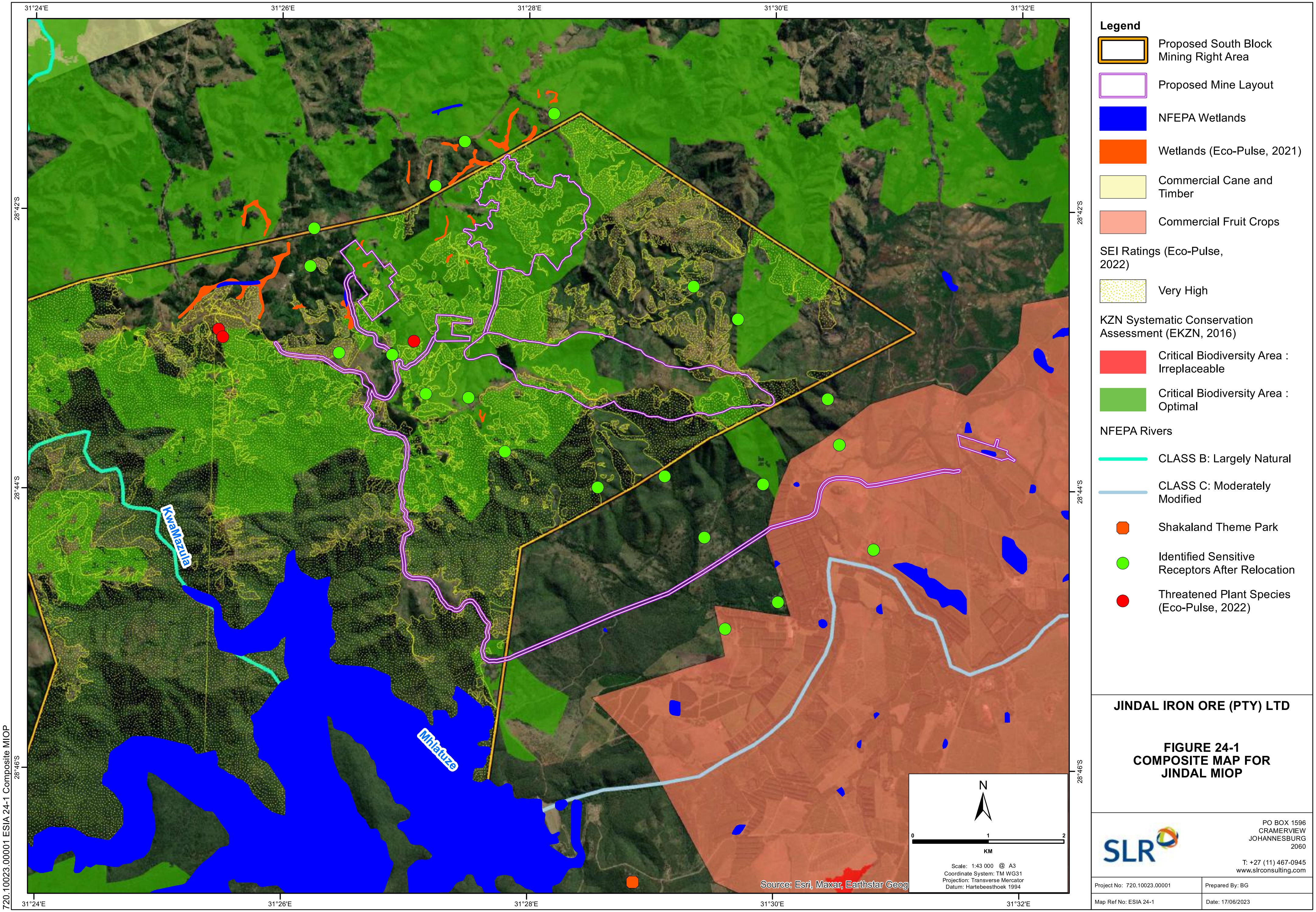
The details of the EAPs who undertook the EIA process and prepared this EMPr are provided in Part A, Section 1.1 and 1.2.

23. DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

The activities covered by this EMPr are fully described in Part A, Section 3.1.2.

24. COMPOSITE MAP

The proposed activity, its associated structures, and infrastructure with the identified environmental sensitivities is shown in Figure 24-1.



JINDAL IRON ORE (PTY) LTD

FIGURE 24-1
COMPOSITE MAP FOR JINDAL MIOP

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Project No: 720.10023.00001
Prepared By: BG
Map Ref No: ESIA 24-1
Date: 17/06/2023

25. DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

25.1 DETERMINATION OF CLOSURE OBJECTIVES.

25.1.1 Closure Vision

Through closure workshops held with Jindal Iron Ore (Pty) Ltd, consultations and applicable guidelines and policies as well as considering the specific commitments and targets of Jindal Iron Ore (Pty) Ltd, the Closure Vision will be formulated and updated with the next update of the Rehabilitation, Decommissioning and Closure Plan (Appendix T). The vision as it currently stands is:

> *"Jindal Africa is committed to incorporating good environmental management and practices into everyday activities and liaising with regulatory bodies to achieve set goals."*
> *(Jindal Africa, 2022)*

> *"Jindal Iron Ore is committed to implementing standards and statutory requirements pertaining to Mine Closure Planning and the associated Financial Provision. "*
> *(Jindal Africa, 2022)*

25.1.2 Closure Objectives and Targets

The Closure Plan (Appendix T) is prepared in terms of GNR 1147 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and includes the principles and objectives as laid out in Sections 25.1.2.1 and 25.1.2.2.

25.1.2.1 Principles for Sustainability

The following principles for sustainability as set out in this Act were considered and can be used as a guideline with mine closure in mind:

- (4)(a)(i) "That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- (4)(a)(ii) That pollution and degradation of the environment are avoided or, where these cannot be altogether avoided are minimised and remedied;
- (4)(a)(iii) That the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or when it cannot be altogether avoided; is minimised and remedied;
- (4)(a)(iv) That waste is avoided; or, where it cannot be altogether avoided; minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- (4)(a)(v) That the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
- (4)(a)(vi) That the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their Integrity is jeopardised;
- (4)(a)(vii) That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions;
- (4)(a)(viii) That negative impact on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied;

- (4)(b) Environmental management is integrated acknowledging that all elements of the environment are linked and interrelated, and it takes into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option;
- (4)(c) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person particularly vulnerable and disadvantaged persons;
- (4)(d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination;
- (4)(e) Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle;
- (4)(f) The participation of all interested and affected parties in environmental governance must be promoted and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured;
- (4)(g) Decisions must take into account the Interests, needs and values of all interested and affected parties, and this includes all forms of knowledge, including traditional and ordinary knowledge;
- (4)(h) Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means;
- (4)(i) The social, economic and environmental impacts of activities, including costs and benefits are considered, assessed and evaluated, and decisions are appropriate in the light of such consideration and assessment;
- (4)(j) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected;
- (4)(k) Decisions are taken in an open and transparent manner, and access is provided to information in accordance with the law;
- (4)(l) There is intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment;
- (4)(m) Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures;
- (4)(n) Global and international responsibilities relating to the environment must be discharged in the national interest;
- (4)(o) The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as people’s common heritage;
- (4)(p) The costs of remedying pollution, environmental degradation and consequent adverse, health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects are paid for by those responsible for harming the environment;
- (4)(q) The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted; and

- (4)(r) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure".

25.1.2.2 Mineral and Petroleum Resources Development Act (MPRDA 28 of 2002)

It is also important to take section 43(3) (d) of the MPRDA into account as it includes the following objectives for closure:

- "Rehabilitate disturbed areas, excluding the tailings dam and return water dam, to their pre-mining land capability and use potentials. The rehabilitation of disturbed land will be to the extent that it is within compliance of current national environmental quality objectives;
- Limit the short- and longer-term impacts of pollution on surface and ground water and related biodiversity;
- Control the further generation of dust;
- Minimize the visual impact of the permanent features at the mine e.g. tailings dam;
- Ensure that people and animals are not harmed by falling off or into hazardous excavations or steep slopes. The management objectives for these are to minimize safety risks to the public and livestock;
- Limit the impact on staff whose positions become redundant on closure of the mine;
- Keep relevant authorities informed of the progress of the decommissioning phase;
- Submit monitoring data to the relevant authorities; and
- Build and maintain meaningful relations with all stakeholders (I&AP's)".

25.2 THE PROCESS FOR MANAGING ANY ENVIRONMENTAL DAMAGE, POLLUTION, PUMPING AND TREATMENT OF EXTRANEOUS WATER OR ECOLOGICAL DEGRADATION AS A RESULT OF UNDERTAKING A LISTED ACTIVITY

The management actions outlined in Section 28 have been identified in order to manage and reduce impacts associated with the proposed Jindal MIOP in order to prevent unnecessary damage to the environment. In the event that unplanned incidents occur that may result in environmental or socio-economic impacts, the proposed Emergency Response Procedure (ERP) as outlined in Table 32-1 would be implemented to avoid pollution or degradation.

25.3 POTENTIAL RISK OF ACID MINE DRAINAGE

According to the Waste Classification undertaken (Appendix U) Acid Base Accounting (ABA) and Net Acid Generation (NAG) tests assessed the Jindal MIOP waste rock materials to all be Non-Potentially Acid Generating (non-PAG). The Synthetic Precipitation Leaching Procedure (SPLP) results returned minor Aluminium, Iron and Manganese exceedances of SANS 241: Operations and Aesthetic guidelines. The modelled source terms for the individual waste rock lithologies and WRD predicts no leachate Constituents of Concern (CoC) that could negatively influence the local water resources.

<u>Therefore, it was concluded that the Jindal MIOP waste rock materials present a low risk for Acid Rock Drainage (ARD) and Metal Leaching Potential (MLP) to the surrounding environment and downstream receptors.</u>

25.4 STEPS TAKEN TO INVESTIGATE, ASSESS, AND EVALUATE THE IMPACT OF ACID MINE DRAINAGE

Exploration cores samples (32 samples) were collected and made up into six composite samples that represent the main Jindal MIOP waste rock lithologies. The waste rock composites are dominated by Quartz, Biotite and Plagioclase, with major to minor Actinolite, Grunerite, Microcline and various clay minerals.

A summary of the waste type classification and liner requirements is presented in Table 25-1. Based on the Waste Assessment and Geochemical Characterisation (Appendix Q) results, all six waste rock samples were assessed to be a Type 3 waste in terms of the total concentration and leachable concentrations. In accordance with GNR. 635 of 2013, for a waste to be Type 3 results should meet the following criteria:

- Leachable concentrations of ALL elements are below or equal to the Leachable Concentrations Threshold (LCT0), and
- Total concentrations of ALL elements are below or equal to Total Concentrations Threshold (TCT1).

For waste to be a Type 3, in addition to the total concentrations being below TCT1, the leachable concentrations of elements need to be "below or equal to LCT0". Therefore, according to the NEMWA GNR. 635 and 636 of 2013, all the waste rock lithologies are assessed to be **Type 3** waste that require incorporation into a waste facility that has a **Class C** liner or similar constructed barrier.

Table 25-1 Waste Type Determination for Jindal MIOP Waste Rock

Sample Name	Waste Type	Reason for Classification	Landfill Class
AMP	Type 3	As, Ba, Cu, Mn >TCT0, All LC < LCT0	Class C
AQMcS	Type 3	As, Ba, Cu, Mn, Pb > TCT0; All LC < LCT0	Class C
MDOL	Type 3	As, Ba, Co, Cu, Mn, Ni, V > TCT0; All LC < LCT0	Class C
QTVN	Type 3	As, Ba > TCT0; All LC < LCT0	Class C
QMS	Type 3	As, B, Ba, Mn, Pb > TCT0; As = LCT0	Class C
QTZT	Type 3	Ba, Pb > TCT0; All LC < LCT0	Class C

25.5 ENGINEERING OR MINE DESIGN SOLUTIONS TO BE IMPLEMENTED TO AVOID OR REMEDY ACID MINE DRAINAGE

The Melmoth waste rock materials have all been classified as a **Type 3** waste (Table 25-1) and therefore disposal or incorporation into a storage facility (the WRD) would require a **Class C** landfill liner or similar constructed barrier. Figure 25-1 depicts an example of a Class C liner requirement.

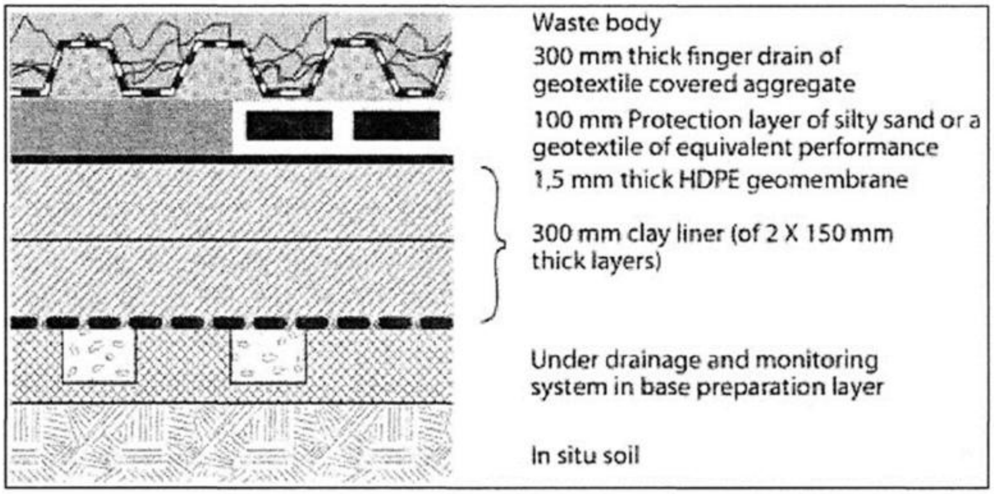


Figure 25-1: Class C Landfill Prescribed Liner

25.6 MEASURES THAT WILL BE PUT IN PLACE TO REMEDY ANY RESIDUAL OR CUMULATIVE IMPACT THAT MAY RESULT FROM ACID MINE DRAINAGE

As per Section 25.5 a Class C liner would be designed and installed for the WRD to minimise any potential contamination. Groundwater monitoring would also be required as per Section 30. Cumulative impacts are not anticipated (SLR, 2022 – Appendix U).

25.7 VOLUMES AND RATE OF WATER USE REQUIRED FOR THE MINING, TRENCHING OR BULK SAMPLING OPERATION

Water required for the Jindal MIOP would include water for the process plant, mining and dust control activities, drinking, sanitation and other miscellaneous uses such as the canteen, safety showers, etc. Make-up water requirements are calculated to be 1 500 m^3/h, based on average annual processing plant operations. This equates to a consumption of 11.56 Gl/a. This figure includes loss of water in final concentrate and evaporation estimated at 1% of the total water feed in the TSF, but excludes rainfall, and pit de-watering and can thus be taken as the maximum rate required by the processing plant. The Average annual water balance is included in Figure 25-2 and is discussed in detail in Appendix F – Section 8.

The TSF is included in these calculations as the water balance is inclusive of all operational aspects of the Jindal MIOP.

25.8 HAS A WATER USE LICENCE HAS BEEN APPLIED FOR?

A water use license application (WULA) is required for the proposed Jindal MIOP as discussed in Table 3-6. A pre-application submission was uploaded to the Electronic Water Use Licence Application and Authorisation System (e-WULAAS) on 17 November 2021 and a pre-application meeting was held with the DWS on 11 February 2022 (eWULAAS Reference: Jindal Melmoth Iron Ore IWULA- WU20014).

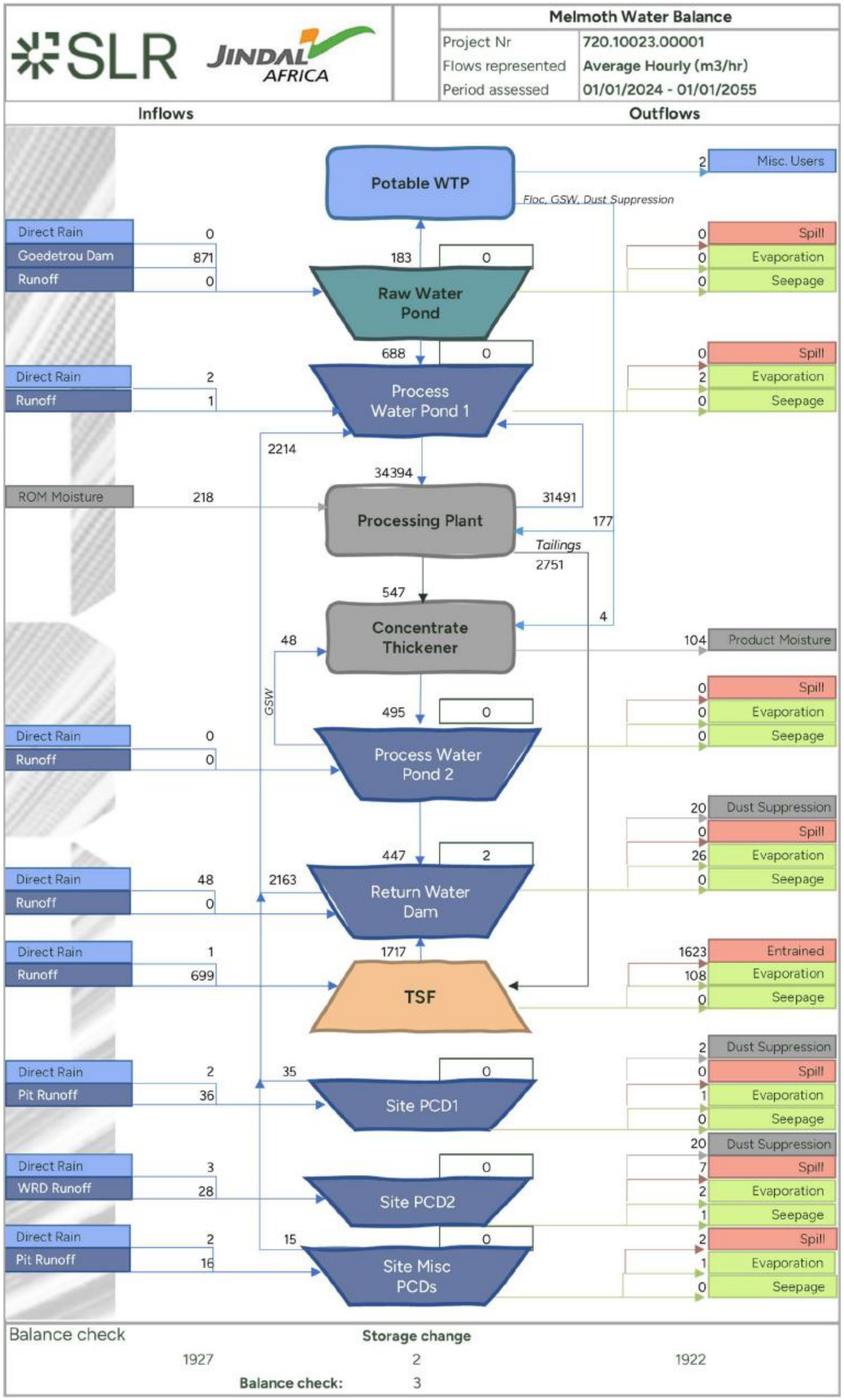


Figure 25-2 Average Annual Water Balance (m^3/hr)

26. IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

The assessment of potential impacts is included in Section 9 and Appendix D. Management actions which would be implemented to avoid and minimise potential impacts are detailed in Section 28.

Table 26-1 Impacts to be Mitigated In Their Respective Phases

Activities	Phase.	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Mitigation/ management measures for all listed activities that have been proposed as part of the Jindal MIOP are included in Table 27-1, Table 28-1, Table 28-2, Table 28-3 and Table 28-4.					

27. IMPACT MANAGEMENT OUTCOMES

Table 27-1 provides a description of the outcomes and objective of management actions in order to manage, remedy, control or modify potential impacts. The management actions identified to achieve these outcomes and objectives are described in Section 28.

Table 27-1 Description of Impact Management Outcomes

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
1	• Construction related clearing. • Development of surface infrastructure. • Changes to surface runoff. • Open pit mining and dewatering	Change in groundwater levels and gradient	Groundwater	Operational Decommissioning Closure	• Implementation of storm water controls. • Installation of Class C liner for the WRD. • Groundwater monitoring plan.	• To prevent changes in groundwater availability affecting third party water users.
2	• Potential spills from on-site activities.	Deterioration of groundwater quality	Groundwater	Construction Operational Decommissioning Closure	• Construction of the secured landfill facility with a Class C liner. • Implement a hazardous reagents and materials procedure to prevent spillage. • Implement mine incident management operating procedure to reduce impact of potential spills. • Remediation and rehabilitation of the footprint areas. • Groundwater monitoring plan. • Update the numerical groundwater model and use as a predictive tool. • Good housekeeping practices on-site.	• To prevent pollution of groundwater resources and related harm to groundwater users.
3	• Potential spills. • Contaminated discharges from the dirty water systems.	Contamination of surface water resources	Surface Water	Construction Operational Decommissioning Closure	• Implement hazardous reagents and materials procedure to prevent spillage. • Clean and dirty water separation.	• To prevent surface water contamination and related impacts on downstream users.

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
	• Residue from the dirty water circuit, chemicals, non-mineralised waste (hazardous, general, radioactive) and concrete wash water. • Contaminated runoff and seepage. • Erosion from compacted surfaces.				• Emergency Response Plan • Implement incident management operating procedure to reduce impact of potential spills. • Implement erosion prevention plan. • Implement ERP in case of a serious incident. • Ongoing water quality monitoring.	
4	• Clearance of surface areas for the Jindal MIOP development. • Construction of infrastructure within 1:100 year flood lines.	Flooding	Surface Water	Construction Operational Decommissioning	• Installation of flood protection berms. • Maintenance of stormwater infrastructure	• To prevent flooding of Jindal MIOP infrastructure.
5	• Clearance of surface areas and terrace construction for Jindal MIOP development. • Road crossings. • Diversion of runoff by stormwater controls.	Alteration of natural drainage patterns	Surface Water	Construction Operational Decommissioning	• Berm designed to have the minimum impact on the natural drainage patterns. • Storm water management plan for separation of clean and dirty water.	• To prevent unacceptable alteration of drainage patterns and the reduction in the volume of runoff into the downstream catchment.

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
6	• Clearance of surface areas for Jindal MIOP development. • Earthworks on-site. • Movement of vehicles.	Impacts to vegetation communities and implications for threatened ecosystems and biodiversity conservation	Terrestrial Biodiversity	Construction Operational Decommissioning	• Minimise the development footprint. • Demarcate sensitive areas. • Search and rescue requirements. • Obtain relevant permits for vegetation clearing and the translocation of protected species. • Awareness training. • Possible offset agreement.	• To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical and/ or general disturbance.
7	• Clearance of surface areas for Jindal MIOP development. • Earthworks on-site. • Movement of vehicles.	Impacts to species and threatened species conservation	Terrestrial Biodiversity	Construction Operational Decommissioning	• Minimise the development footprint. • Demarcate sensitive areas. • Search and rescue requirements. • Obtain relevant permits for vegetation clearing and the translocation of protected species. • Awareness training. • Possible offset agreement.	• To prevent the loss of species of conservation concern.
8	• Clearance of surface areas for Jindal MIOP development. • Earthworks on-site. • Movement of vehicles.	Impacts to local and regional ecological processes	Terrestrial Biodiversity	Construction Operational Decommissioning	• Minimise the development footprint. • Demarcate sensitive areas. • Search and rescue requirements. • Obtain relevant permits for vegetation clearing and the translocation of protected species. • Awareness training. • Possible offset agreement.	• To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical and/ or general disturbance.
9	• Clearance of surface areas for Jindal MIOP development. • Earthworks on-site.	Physical loss or modification of freshwater habitat	Wetland & Aquatic Biodiversity	Construction Operational Decommissioning	• Minimise the development footprint. • Demarcate sensitive areas. • Search and rescue requirements.	• To prevent the unacceptable disturbance and loss of aquatic biodiversity and related

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
	• Movement of vehicles.				• Obtain relevant permits for vegetation clearing and the translocation of protected species. • Awareness training. • Possible offset agreement.	ecosystem functionality through physical and/ or general disturbance.
10	• Clearance of surface areas and terrace construction for Jindal MIOP development. • Road crossings. • Diversion of runoff by stormwater controls. • Construction of terraces • WRD and open pit	Alteration of hydrological and geomorphological processes	Wetland & Aquatic Biodiversity	Construction Operational Decommissioning	• Minimise the development footprint. • Demarcate sensitive areas. • Berm designed to have the minimum impact on the natural drainage patterns. • Storm water management plan for separation of clean and dirty water.	• To prevent unacceptable alteration of drainage patterns.
11	• Potential spills. • Contaminated discharges from the dirty water systems.	Impacts to wetlands and aquatic ecosystems due to reduced water quality	Wetland & Aquatic Biodiversity	Construction Operational Decommissioning	• Implement hazardous reagents and materials procedure to prevent spillage. • Clean and dirty water separation. • Emergency Response Plan.	• To prevent the unacceptable disturbance and loss of aquatic biodiversity and related ecosystem functionality through physical and/ or general disturbance.
12	• Clearance of surface areas for Jindal MIOP development. • Earthworks on-site.	Impacts to ecological connectivity and/or ecological	Wetland & Aquatic Biodiversity	Construction Operational Decommissioning	• Minimise the development footprint. • Demarcate sensitive areas. • Search and rescue requirements.	• To prevent the unacceptable disturbance and loss of aquatic biodiversity and related ecosystem functionality

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
	• Movement of vehicles. • Mining operations.	disturbance impacts			• Obtain relevant permits for vegetation clearing and the translocation of protected species. • Awareness training. • Possible offset agreement.	through physical and/ or general disturbance.
13	• Clearance of surface areas for Jindal MIOP development. • Earthworks on-site. • Movement of vehicles. • Mining operations.	Potential human health impacts due to mining related activities. Potential impacts of dust on nearby commercial farms.	Air Quality	Construction Operational Decommissioning	• Limit vehicle speeds. • Concurrent rehabilitation and re-vegetation. • Best available technology where possible. • Implementation of a grievance procedure. • Occupational health monitoring programme for employees. • Air quality monitoring.	• To prevent human health impacts due to reduced ambient air quality (remain within NAAQS and NDCR).
14	• Noise generated due to construction and decommissioning activities i.e. vehicle and machinery noise. • Noise generated due to operational activities i.e. dumping of waste rock, processing plant, blasting and vehicle movement.	Nuisance impact on surrounding landowners.	Noise	Construction Operational Decommissioning	• Limit construction to recognised daytime periods as defined by DMRE. • Implementation of a grievance procedure.	• To prevent noise related impacts (remain within IFC guidelines and SANS 10103).
15	• Resettlement of local communities.	Change of land use from	Soils and Land Capability	Construction	• Limit the land use change to the infrastructure footprint.	• To minimise the impacts of land use change from

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
		subsistence farming to mining.			• Minimise the infrastructure footprint as far as possible. • RAP considers the resettlement of livestock to the areas where the current homestead owners will be resettled. • RAP must ensure that the areas where homestead owners will be resettled, have soil that is suitable for subsistence-level crop production near the houses.	subsistence agriculture to mining during.
16	• Soil erosion resulting from cleared and disturbed areas. • Soil compaction. • Loss of soil depth and volume due to excavation.	Loss of and/ or reduction of current land capability	Soils and Land Capability	Construction	• Limit the land use change to the infrastructure footprint. • Rehabilitate by replacing topsoil at depths similar to the pre-mining topsoil depths.	• To minimise the loss of soil resources to be used as part of rehabilitation and to support post closure land capability.
17	• Soil erosion resulting from cleared and disturbed areas. • Soil compaction. • Loss of soil depth and volume due to excavation.	Loss of soil resources due to erosion	Soils and Land Capability	Construction Operational Decommissioning	• Phased land clearance. • Minimise the infrastructure footprint as far as possible. • Concurrent rehabilitation. • Erosion controls if required.	• To minimise the loss of soil resources and related land capability through soil erosion.
18	• Earth-moving operations. • Construction and delivery vehicles.	Loss of soil resources due to compaction	Soils and Land Capability	Construction Operational Decommissioning	• Demarcate ‘no-go’ areas. • Materials must be off-loaded and stored in designated laydown areas.	• To minimise the loss of soil resources and related land capability through soil compaction.

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
	• Haul vehicle movement. • Processing plant and primary crusher. • Dumping of waste rock. • Demolition activities.				• Rip all compacted areas such as roads and stockpiles areas, during the last phases of site rehabilitation.	
19	• Land clearance and earthworks. • Building of access and haul roads. • Construction of the processing plant, crusher and power yard and associated infrastructure. • Blasting. • Mining activities and pit creation. • Waste Rock Dump. • Movement of vehicles. • Night lighting. • Demolition and dismantling activities. • Rehabilitation activities.	Change in landscape and related visual impacts due to the Jindal MIOP	Visual	Construction Operational Decommissioning Closure	• Ongoing rehabilitation of affected areas. • Good housekeeping practices. • Limit vehicle speed and dust suppression. • Paint all structures with colours that reflect and compliment the colours of the surrounding landscape. • Lights used for illumination should be faced inwards and shielded and high pole top security lighting avoided to minimise light spillage. • Removal of all structures at decommissioning.	• To limit negative visual impacts.

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)

20	• Use of construction equipment and other machinery during construction activities.
	• Offset due to renewable energy support.
		Impact of the project on climate change	Climate Change	Construction
				Operational
					• Consider the use of fuel additives in diesel vehicles.
					• Regular servicing of vehicles and machinery through implementation of a maintenance schedule.
					• Consider:
					  • Decarbonisation of the electricity supply.
					  • Electrification of the fleet.
						• To minimise the emissions of GHGs into the atmosphere.

21	• Effect of changing local climate on operational activities.	Impact of climate change on the project	Climate Change	Construction Operational	• Closure and Rehabilitation Plan must consider climate change and climate modelling and the potential impacts thereof.	• To minimise the risk of climate change on project activities.
22	• Blasting activities	Impact of ground vibration, air blast an/ or fly rock	Blasting & Vibration	Operational	• Consider relocation of households closest to the pit areas. • Good housekeeping practices should be implemented and maintained with monitoring of each blast. • Evacuation of people and animals out of the danger zone. • Undertake independent structural surveys on a regular basis.	• To minimise the impact of blasting during the operational phase.
23	• Clearance of surface areas for Jindal MIOP. • Blasting for the open pit. • Earthworks on-site.	Damage to or disturbance of palaeontological resources	Palaeontology	Construction Operational	• Awareness training programme. • Implement a fossil chance find procedure.	• Minimise impacts to local palaeontology.

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
24	• Employment at/ for the mine	Impact of changing farming practices, market options and sources of nutrition	Community Health	Construction Operational Decommissioning	• Compensation for loss of agricultural land. • Liaison with local supermarkets to curb food inflation. • Training and awareness. • Possible school feeding programmes and education nutrition, and good nutritional habits.	• Minimise impacts on health implications due to changing farming practices, market options and sources of nutrition.
25	• Poor site management	Exposure to vector-borne and zoonotic disease	Community Health	Construction Operational Decommissioning	• Control of vector breeding sites. • Vector control in the local communities. • Effective domestic waste management. • Establish vector awareness programs. • Education on household and food hygiene and waste management.	• Minimise exposure to vector-borne and zoonotic diseases.
26	• Mine clinic/ investment in local emergency services	Changes in access to healthcare	Community Health	Construction Operational Decommissioning	• Provision/ support of private ambulance services. • Support of local hospitals, particularly for emergency/casualty care. • Health and healthy and vaccination information campaigns to raise the baseline health level of the local community and limit the need for urgent healthcare.	• Maximise access to healthcare facilities for local communities.
27	• Clearance of surface areas for Jindal MIOP. • Earthworks on-site.	Damage to or disturbance of heritage	Archaeology and Cultural Heritage	Construction	• Undertake surveys of the entire footprint area prior to construction.	• Minimise impacts to local archaeology and cultural heritage.

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
		(including cultural)			• Implement cultural heritage procedure and awareness programme. • Minimise the development footprint. • Demarcation of construction areas. • Implement a chance find procedure.	
28	• Resettlement of local households. • Clearance of surface areas for Jindal MIOP. •	Relocation of graves	Archaeology and Cultural Heritage	Construction	• Undertake surveys of the entire footprint area prior to construction. • Contact and consult communities and individuals who by tradition have an interest in the grave or burial ground • Reach agreements with these communities and individuals regarding the future of the grave or burial ground.	• Minimise impacts to local archaeology and cultural heritage.
29	• Increased vehicular movement during construction and decommissioning phases. • Transport of staff. • Transport of concentrate. • Maintenance related traffic.	Road disturbance and traffic safety	Traffic	Construction Operational Decommissioning	• Implement recommended road upgrades and mitigations. • Implementation of a grievance procedure.	• Minimise impacts on the safety of other road users.
30	• Jindal MIOP employment opportunities.	Labour influx / in-migration of jobseekers	Socio-economic	Construction Operational Decommissioning	• Manage through implementing approved SLP. • Maximise local employment opportunities.	• To minimise the impacts on local communities of labour influx/ in-migration of jobseekers.

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
					• Implementation of the SLP Skills Development Plan (SDP) • Continuous engagement with local community and labour representatives, including traditional leadership and ward committees.	
31	• Development of the Jindal MIOP.	Resettlement and relocation	Socio-economic	Construction	• Resettlement mitigation measures should be developed by qualified resettlement specialists and should be included as part of the Resettlement Action Plan (RAP).	• To minimise the impacts of resettlement and relocation during the construction phase.
32	• Investment into the local municipality by Jindal Iron Ore (Pty) Ltd.	Community development and lifestyle	Socio-economic	Construction Operational Decommissioning	• Effective implementation of the SLP, especially in relation to the skills development plan. • Engage in early and ongoing open and transparent discussions with community members to effectively manage community expectations. • Undertake a skills audit in the labour-sending communities. • Establishment and implementation of effective governance controls to reduce or avoid opportunities for political influence.	• To maximise the community development and lifestyle impacts for local communities.
33	• Jindal MIOP employment opportunities. • Impacts on ground or surface water and	Business and enterprise - impacts on the agricultural sector	Socio-economic	Construction Operational Decommissioning	• Ongoing implementation of mitigation measures and monitoring of compliance. • Improved planning, dialogue and social compacts are required to	• To minimise impacts to the viability of the agricultural sector due to the Jindal MIOP.

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
	other biophysical aspects.				optimise the relationship and ensure a balanced coexistence that would produce social and economic development without disrupting the livelihoods of those whose lives are tied to farming.	
34	• Vehicle movements. • Earthworks and site clearance. • Construction of the processing plant and primary crusher. • Blasting and mining activities. • Demolition and earthworks.	Business and enterprise - impacts on tourism	Socio-economic	Construction Operational Decommissioning	•	• To minimise impacts to the viability of the tourism sector due to the Jindal MIOP.
35	• Employment creation • Community investment	Impact on the local and regional economy	Socio-economic	Construction Operational Decommissioning	• Effective implementation of the SLP. • Provision of relevant and effective training and skills development initiatives to residents of the local community. • Develop a Closure Plan (which includes socio-economic measures.	• To maximise benefits to the local and regional economy.

28.IMPACT MANAGEMENT ACTIONS

Management actions identified to prevent, reduce, control or remedy the assessed impacts for the planning and design, construction, operational and decommissioning phases are presented in Table 27 1, Table 27 2, Table 27 3 and Table 27 4.

The action plans include the timeframes for implementing the management actions together with a description of how management actions comply with relevant standards. Management actions and recommendations identified by specialists have been summarised in the tables.

28.1 ADMINISTRATION AND REGULATION OF ENVIRONMENTAL OBLIGATIONS

28.1.1 Management Structure

Details of the management structure for the construction phase are presented below. All official communication and reporting lines, including instructions, directives and information shall be channelled according to the organisational structure presented in Figure 28-1.

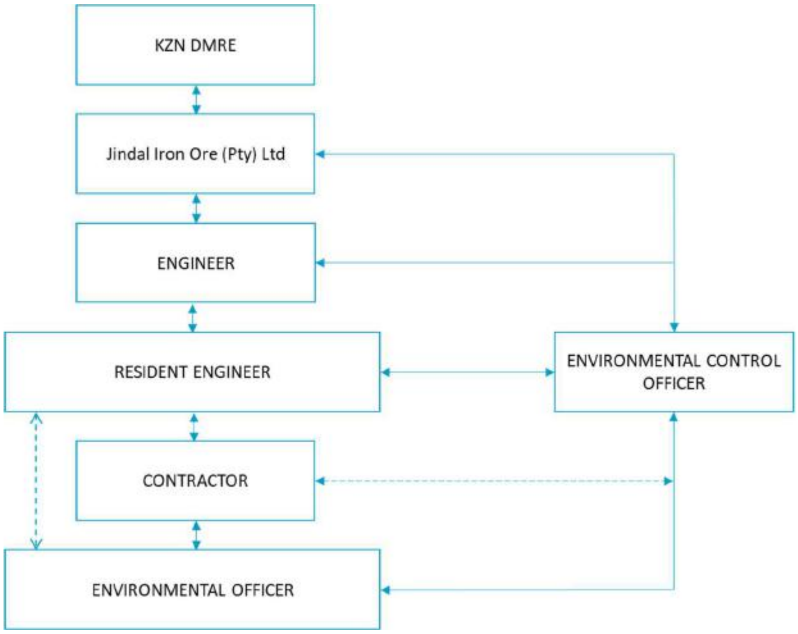


Figure 28-1 Construction Phase Organisational Structure

28.1.2 Roles and Responsibilities

The implementation of this EMPr requires the involvement of several stakeholders, each fulfilling a different but vital role to ensure sound environmental management during the planning and design, construction and operational phases.

28.1.2.1 KZN Department of Mineral Resources and Energy (DMRE)

The DMRE is the designated Competent Authority responsible for authorising this EMPr. The DMRE has the authority to enforce legal action if Jindal Iron Ore (Pty) Ltd does not comply with the relevant legislation and conditions of the EA and this EMPr.

The DMRE will need to approve any amendments to the Environmental Outcomes set out in Section 26 of this EMPr, and may also perform inspections to assess compliance with the relevant legislation, the EA and the EMPr.

DMRE would also need to undertake a close out audit at the completion of the construction phase to ensure adherence to the EA and EMPr.

28.1.2.2 Developer

The Developer for the Jindal MIOP is Jindal Iron Ore (Pty) Ltd who would ultimately be responsible for compliance with all conditions of the EA and EMPr.

Jindal Iron Ore (Pty) Ltd would be responsible for the construction, operational and decommissioning phases of the Jindal MIOP .

With respect to the pre-construction phase, the Developer is to:

- Implement the planning and design Recommendations outlined in the EMPr (Table 27 1);
- Implement all recommendations included in the EMPr that would lessen the total environmental impact of the proposed Jindal MIOP from the design stage (Section 27.2), through to construction (Section 27.3) and ultimately the operational (Section 27.4) and decommissioning (Section 27.5) phases; and
- Appoint required specialists (where relevant) to provide input into the pre-construction/ design phase.
- With respect to the construction phase, the Developer is to:
- Ensure that all relevant approvals and permits have been obtained prior to the start of construction activities on-site;
- Ensure that the EMPr has been approved by the DMRE prior to the start of construction activities on-site;
- Ensure that the DMRE has been notified of the date on which construction activities would be starting, prior to commencement of the activity;
- Ensure that all conditions of approval have been complied with;
- Appoint a suitably qualified or experienced Environmental Control Officer (ECO) prior to the start of construction activities on-site, and for the duration of the construction phase; and
- Appoint the Engineer, Resident Engineer, Construction Contractor and Environmental Control Officer (ECO) during the construction phase.
- With respect to the operational phase, Jindal Iron Ore (Pty) Ltd is to:
- Ensure that operation of the Jindal MIOP is undertaken in line with the requirements of the operational phase EMPr (Table 27 3) and the EA; and
- Continuously seek to improve performance to minimise any negative environmental and social impacts and enhance the benefits which result from the operational phase.

28.1.2.3 Engineer

The Engineer shall oversee the planning, design and construction phases of the project. The Engineer shall appoint a Resident Engineer or Engineer’s Representative (referred to as the RE) to act as the on-site implementing agent. The Engineer shall address any site issues pertaining to the environment at the request of the RE and/ or the ECO.

The responsibilities of the Engineer are to:

- Ensure that the Construction Contractor’s contract contains relevant clauses requiring their compliance with this EMPr and all applicable environmental permits/ licences.

- Ensure that the requirements as set out in this EMPr and by the relevant Authorities are adhered to and implemented.
- Assist the ECO in ensuring that the conditions of the Construction EMPr are being adhered to and promptly issuing instructions requested by the ECO, to the Construction Contractor. All site instructions relating to environmental matters issued by the Engineer are to be copied to the ECO.
- Assist the ECO in making decisions and finding solutions to environmental issues that may arise during the construction phase.
- Review and approve construction Method Statements (Section 28.1.4.1) with input from the ECO.
- Recommend to the Developer the removal of person(s) and / or equipment not complying with the EMPr specifications.
- Provide input into the ECO's ongoing internal review of the EMPr.

28.1.2.4 Engineer (RE)

The RE would act as Jindal Iron Ore (Pty) Ltd's on-site implementing agent and carries the responsibility to ensure that the Construction Contractor undertakes their construction activities in such a way that Jindal Iron Ore (Pty) Ltd's environmental responsibilities are not compromised and ensure that the Construction Contractor's activities are executed in compliance with the EMPr.

Any on-site decisions regarding environmental management are the responsibility of the Engineer and/ or RE in accordance with their delegated authorities. The RE shall assist the ECO where necessary, and shall have the following responsibilities in terms of the implementation of this EMPr:

- Conducting regular site inspections;
- Reviewing and approving the Construction Contractor's Method Statements (with input from the ECO where necessary);
- Monitoring and verifying that the EMPr and Method Statements are adhered to at all times and taking action if specifications are not followed;
- Keeping a daily photographic record of construction activities on-site;
- Assisting the Construction Contractor in finding environmentally responsible solutions to issues with input from the ECO where necessary;
- Recommending to the Engineer the removal of person(s) and / or equipment not complying with the EMPr specifications;
- Recommending to the Engineer the issuing of fines for transgressions of the EMPr;
- Recommending to the Engineer delaying any construction activity if he/ she believes the integrity of the environment has been or is likely to be seriously jeopardised;
- Providing input into the ECO's ongoing internal review of the EMPr;
- Communicating environmental issues to the ECO; and
- Reporting non-compliances to Jindal Iron Ore (Pty) Ltd and the DMRE (where required).

28.1.2.5 Environmental Control Officer (ECO)

The ECO will be a qualified and suitably experienced environmental specialist appointed by the Engineer for the construction phase (after construction the Jindal Iron Ore (Pty) Ltd environmental team takes responsibility) to objectively and regularly monitor the Construction Contractor's compliance with the conditions of the EAs issued for the Jindal MIOP and the approved EMPr. The ECO shall undertake site inspections, as agreed by the Employer, for the duration of the construction contract.

The ECO's duties shall include, inter alia, the following:

- Implementing the ECO responsibilities as outlined in the EA;
- Implementing specific actions assigned to the ECO in this EMPr;
- Ensuring the necessary EAs and permits, if any, have been obtained;
- Advising the Construction Contractor and/ or the RE on environmental issues within defined construction areas;
- Reviewing Method Statements;
- Undertaking site visits to assess compliance with the EMPr and EA;
- Keeping a photographic record of progress on-site from an environmental perspective;
- Developing and maintaining a database of environmental incidents and non-compliances with the EMPr and to ensure that these are investigated and remediated within reasonable timeframes;
- Report any significant environmental incidents to the DMRE;
- Assisting the Construction Contractor and/ or the RE in finding environmentally acceptable solutions to construction issues;
- Recommending additional environmental protection measures should this be necessary; and
- Providing a report back on the environmental issues at site meetings.

The ECO shall communicate directly with the RE. Should issues arise on-site that cannot be resolved between the ECO and the RE, the ECO shall take the matter up with the Engineer and/ or Jindal Iron Ore (Pty) Ltd. If Jindal Iron Ore (Pty) Ltd does not respond the ECO shall take the matter up with DMRE.

28.1.2.6 Construction Contractor

The Construction Contractor shall have the following responsibilities:

- To implement all provisions of the EMPr (if the Construction Contractor encounters difficulties with specifications, they must discuss alternative approaches with the RE and the ECO prior to proceeding);
- To ensure that all staff are familiar with the EMPr;
- To monitor and verify that the environmental impacts are kept to a minimum;
- To make personnel aware of environmental issues and ensure they show adequate consideration of the environmental aspects of the project;
- To prepare the required Method Statements;
- To report any incidences of non-compliance with the EMPr to the RE and the ECO; and
- To rehabilitate any sensitive environments damaged due to the Construction Contractor's negligence (this shall be done in accordance with the Engineer's and ECO's specifications).

Failure to comply with the EMPr may result in fines and reported non-compliance may result in the Engineer suspending the operation causing the non-compliance.

28.1.2.7 Environmental Officer (EO)

Each Construction Contractor (where more than one Construction Contractor is appointed for components of the construction activities) shall appoint a competent individual as its on-site EO to ensure that the EMPr is implemented and that all environmental specifications and EMPr requirements are met at all times. The EO shall be responsible for monitoring, reviewing and verifying the Construction Contractor's compliance with the EMPr.

The EO's duties in this regard shall include, inter alia, the following:

- Daily site inspections;
- Monitoring and verifying that the EA, EMPr and Method Statements are adhered to at all times and reporting to the ECO if specifications are not followed;
- Monitoring and verifying that environmental impacts are kept to a minimum;
- Submission of regular written reports to the Engineer and ECO (at least once a month);
- Assisting the RE and ECO in finding environmentally responsible solutions to issues;
- Keeping accurate and detailed records of these inspections;
- Reporting any incidents of non-compliance with the EMPr to the RE and/ or the ECO; and
- Keeping a register of complaints on-site and recording community comments and issues, and the actions taken in response to these complaints.

Before the Construction Contractor begins each construction activity, the EO shall give to the RE a written Method Statement setting out the following:

- The type of construction activity about to be started;
- Locality where the activity will take place;
- Identification of the environmental aspects and impacts that might result from the activity;
- The methodology of impact prevention for each activity or aspect;
- The methodology of impact containment for each activity or aspect;
- Identification of the emergency/disaster potential for each activity (if any) and the reaction procedures necessary to mitigate impact severity; and
- Treatment and continued maintenance of impacted environment (where applicable).

28.1.3 EMPr Administration

The EA and EMPr shall be issued to all Construction Contractor/s prior to finalisation of any tender process in order to ensure that the appointed Construction Contractors make appropriate financial provision in their budgets to ensure compliance with the EA and this EMPr.

Copies of the EA and this EMPr shall be kept at the construction site office and shall be distributed to the EO and all other senior contract personnel. All senior personnel shall be required to familiarise themselves with the contents of this document.

The RE may order the Construction Contractor to suspend part or all of the works if the Construction Contractor fails to comply with the specifications set out in the EA, EMPr and Method Statements. Such suspension would be enforced until compliance is achieved. The construction contract shall make provision for such suspension and penalties.

During the operational phase copies of the EA and this EMPr will be kept at the main offices and the environmental section and shall be implemented by the Jindal Iron Ore (Pty) Ltd environmental team.

28.1.4 Communication Structures

28.1.4.1 Method Statements

The Construction Contractor (through the EO) shall submit written Method Statements to the RE and ECO for all environmentally sensitive aspects of the work. Method Statements shall cover applicable details with regard to the following, as appropriate:

- Type of construction activity and construction procedures;

- Timing and location of the activity;
- Identification of the environmental aspects and impact that might result from the activity;
- The methodology for impact avoidance or minimisation for each activity or aspect;
- Materials and equipment to be used;
- Getting equipment to and from site;
- How the equipment/ material would be moved while on-site;
- How and where material would be stored;
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- Treatment and continued maintenance of impacted environment (where applicable);
- Compliance/non-compliance with the EA and EMPr; and
- Any other information deemed necessary by the RE or ECO.

The Method Statements required are defined in Section 28.3.3. The RE and/ or the ECO may specify any additional Method Statements that may be required.

A Method Statement Control Sheet, signed by the Construction Contractor, must accompany each Method Statement. Method Statements shall be submitted to the RE and ECO at least ten (10) days prior to the commencement of construction. It should be noted that Method Statements must contain sufficient information and detail to enable the RE and ECO to apply their minds to the potential impacts of the works on the environment. The Construction Contractor would also need to thoroughly understand what is required of him/her in order to undertake the works.

Work shall not commence until the RE and ECO have approved the Method Statements. Failure to submit Method Statements may cause the RE to order the Construction Contractor to suspend part or all of the works concerned until a MS has been submitted and approved. Any damage caused to the surrounding environment shall be rehabilitated at the Construction Contractor's cost.

28.1.4.2 Information Boards

The Construction Contractor shall be responsible for erecting general information boards at appropriate locations on-site. The general information board (in English and Zulu) shall provide the name and contact number of the EO, to ensure that the public has access to the RE to request information and/or to lodge any complaints. The EO shall report complaints to the Engineer, RE and ECO. One of these information boards shall be erected at the main site office.

28.1.4.3 Community Relations

Jindal Iron Ore (Pty) Ltd should continue to engage with stakeholders throughout the project construction and operational phases. Communication with local communities and other local stakeholders would be a key part of this engagement process. Development of a Community Engagement Plan (CEP) is important to facilitate this communication.

The objectives of the CEP are the following:

- To provide residents in the vicinity of the proposed infrastructure and other interested stakeholders with regular information on the progress of work and its implications;
- To monitor the implementation of the EMPr and the impact on communities, in order to ensure that mitigation measures are implemented and the mitigation objectives achieved; and

- To manage any disputes between Jindal Iron Ore (Pty) Ltd, the Construction Contractor's and local communities.

28.1.4.4 Grievance Procedure

The grievance procedure should be based on the following principles and commitments:

- It should be transparent;
- It should seek to resolve all grievances timeously; and
- Full written records of each grievance case and the associated process of resolution, including the final outcome, should be maintained and used to facilitate transparent, external reporting.
- The grievance procedure should also:
- Require the development and maintenance of an up to date and comprehensive complaints register which would include the following information:
    - The date on which the complaint was raised or received;
    - The name and contact details of the stakeholder/group who raised the complaint (if by group, then the names of all the group members should be included);
    - A brief description of the complaint;
    - The manager responsible for the resolution of the complaint (dependent on the nature of the complaint); and
    - Due date for completion of the appropriate action, based on the time period specified in the procedure.
- The complaints register should also be updated with the following;
    - The date on which the action or decision was taken;
    - All and any communication with the stakeholder (date, method, and purpose);
    - The person/s responsible for the action or decision;
    - Nature of the action or decision; and
    - Date on which the complaint was escalated or finalised.
- All complainants should be offered an option of requesting confidentiality. The personal details of complainants would only be made available to those involved in the resolution of the grievance in question, and Jindal Iron Ore (Pty) Ltd employees and other groups must follow policies related to protecting personal data when handling grievances; and
- Jindal Iron Ore (Pty) Ltd would accept, record and seek to address grievances that are contained in anonymous complaint forms, however, due to the anonymous source of the grievance, Jindal Iron Ore (Pty) Ltd would not be able to respond directly to the complainant.

Jindal Iron Ore (Pty) Ltd should prepare responses to grievances in a timeous manner; an initial acknowledgement must be made within five working days and a timeframe provided for resolution, not exceeding two weeks, unless the grievance warrants additional time for investigation. The response should consider the complainants' views about the process, as well as provide specific remedies. Where needed, a relevant manager would communicate with the stakeholder to better understand the nature of the complaint before formulating a response. If the case is complex and the stated resolution timeframe cannot be met, an interim response would be provided (oral or written) that informs the stakeholder of the delay, explains the reasons, and offers a revised date for next steps. In the case of a particularly sensitive complaint, Jindal Iron Ore (Pty) Ltd would engage an external organisation/third party in a joint investigation, in order to demonstrate transparency in the process.

28.1.4.5 Environmental Awareness Training

Before the commencement of any work on-site, the Construction Contractor's site management staff shall attend an environmental awareness training course, presented by the ECO. The Construction Contractor shall liaise with the ECO prior to the commencement date to arrange a date and venue for the course. The Construction Contractor shall provide a suitable venue with facilities and ensure that the specified employees attend the course. No induction or course should be given until the Engineer has been afforded the opportunity to appraise it and provide comment.

The information presented at the course shall be communicated by the Construction Contractor site management staff to the rest of the employees on the site, to any new employees coming onto site after the initial training course and to their suppliers. The presentation shall be conducted, as far as is possible, in the employees' language of choice. As a minimum, training shall include:

- Explanation of the importance of complying with the EA and EMPr;
- Discussion of the potential environmental impacts of construction activities;
- Explanation of the management structure of individuals responsible for matters pertaining to the EMPr;
- Employees' roles and responsibilities, including emergency preparedness;
- Explanation of the mitigation measures that must be implemented when carrying out their activities; and
- Explanation of the requirements of the EA and EMPr.

The Construction Contractor shall keep records of all environmental training sessions, including names of attendees, dates of their attendance and the information presented to them. Records of environmental training sessions shall be submitted to the RE and ECO.

28.1.4.6 Meetings

The ECO shall meet (or otherwise connect) with the RE and EO on a monthly basis, or more frequently as may be required during the initial stages of the project. The ECO shall prepare a feedback report to be tabled at monthly site meetings and is not required to physically attend scheduled construction-site meetings (Construction Contractor/ Engineer /RE /EO) throughout the contract period.

28.1.5 Inspection Procedures

The day-to-day monitoring and verification that the EMPr is being adhered to shall be undertaken by the RE and the EO.

The ECO shall inspect the site on a monthly basis to ensure that correct procedures are being implemented and that the Construction Contractor is complying with the EA and requirements of the EMPr. Additional site inspections by the ECO may be needed during the initial stages of the project. The ECO shall address any queries to the Construction Contractor / RE/ EO. If the queries cannot be resolved at this level, they would be referred to the Engineer.

28.1.6 Record of Activities

The EO shall keep a record of activities on-site, including but not limited to:

- Meetings attended;
- Site inspections;
- Internal audits;
- Monitoring results;

- Method Statements;
- Issues arising on-site, cases of non-compliance with the EA and EMPr;
- Penalties issued;
- Complaints received and corrective action taken; and
- Environmental incidents and corrective actions taken.

The EO and RE shall undertake daily photographic monitoring of the site. This shall include a photographic record of all areas that would be impacted by the construction activities prior to construction activities commencing. The ECO shall monitor all sensitive work environments (e.g. watercourse crossings, site clearance activities in the vicinity of identified sensitive biodiversity areas), which may also include photographic monitoring.

28.1.7 Fines

A system of fines/ contractual penalties shall be implemented to ensure compliance with the EMPr. Where the Construction Contractor or their sub-Construction Contractors inflict damage on the environment or fail to comply with any of the environmental specifications of the EA or EMPr, the Construction Contractor may be liable to pay a fine / incur penalties in terms of the contract. The Construction Contractor is deemed to not have complied with the EMPr if:

- There is evidence of contravention of the EMPr specifications, including any non-compliance with an approved Method Statement;
- Construction activities take place outside the defined boundaries of the site;
- Environmental damage ensues due to negligence;
- The Construction Contractor fails to comply with corrective or other instructions issued by the RE/ECO within a specific time period; and/or
- The Construction Contractor fails to respond adequately to complaints.

Failure by any employee of the Construction Contractor or their sub-Construction Contractors to show adequate consideration to the environmental aspects of the contract shall be considered sufficient cause for the ECO to recommend to the RE to have that employee removed from the site. The ECO may, through the Engineer, also order the removal of any equipment that is causing environmental damage.

28.1.8 Internal Auditing and Review

The Construction Contractor shall establish an internal inspection and review procedure to monitor the day-to-day implementation of the EA and EMPr requirements. Internal inspections shall be conducted by the EO on a weekly basis. The EO audit reports shall be submitted to the RE and ECO. Internal audits and inspections shall include an assessment of performance against the requirements of other environmental licences or permits (e.g. water use authorisation, flammable substance certificates, integrated flora permits, protected tree permits, etc.).

The following shall be implemented to address non-compliances with the EMPr or other environmental issues related to construction activities. Timeous planning, intervention and corrective action to deal with EMPr non-compliance and key environmental issues is essential. All instructions and records of measures implemented to address the issues shall be kept on file.

- Where necessary, the ECO should issue EMPr instructions to Construction Contractors on-site to address and correct non-compliances with the EMPr and specific environmental issues pertaining to the project footprint and surroundings.

- The ECO should report environmental incidents and EMPr non-compliances (that could result in significant environmental damage or pollution) to the RE who would then be responsible for reporting to the Engineer and competent authorities.
- The EO is to report environmental incidents, complaints, and EMPr non-compliances (that could result in notable environmental damage or pollution) to the ECO.

The ECO shall undertake a monthly audit of compliance with the relevant environmental requirements and identify the need for any amendments to the EMPr in order to improve its effectiveness in avoiding or minimising any negative environmental impacts. Any recommended amendments to the EMPr outcomes must be approved by the DMRE and communicated to the relevant stakeholders, as per the requirements of the EIA Regulations, before the amendments to the EMPr are implemented. Any such amendments to the EMPr shall be registered in the daily records of the EO.

At the conclusion of the construction phase a final environmental audit report shall be compiled and submitted to DMRE. This report shall be compiled by the ECO in collaboration with the RE, EO and the Construction Contractor. It would outline the implementation of the EMPr and highlight any issues that arose during the construction period to report, on a formal basis, the lessons learned on the project.

28.2 PLANNING AND DESIGN PHASE ENVIRONMENTAL MANAGEMENT PROGRAMME

28.2.1 Introduction

The Planning and Design EMPr covers the phase prior to the start of construction and the various actions and activities that are required to be undertaken to minimise environmental damage and enhance social benefits once construction begins. The following sections highlight the various areas of focus.

28.2.2 Application

The roles and responsibilities in terms of the application and implementation of this EMPr have been outlined in Section 27.1.2.

28.2.3 1.2.3 Permit Requirements

Activities undertaken during site preparation, construction and operation may require additional permits, over and above the Environmental Authorisation. Jindal Iron Ore (Pty) Ltd is responsible for ensuring that they hold the necessary permits in order to comply with national and local regulations.

28.2.4 Tender Documentation

Jindal Iron Ore (Pty) Ltd shall ensure that this EMPr is included within the tender documents for all Construction Contractors tendering to undertake any aspects of the construction phase of the Jindal MIOP.

In the adjudication of any tenders to undertake any aspect of the construction or operation of the proposed project, Jindal Iron Ore (Pty) Ltd must ensure that the costs of compliance with the EMPr have been adequately allowed for within the winning tender.

28.2.5 Additional Pre – Construction Requirements

The following requirements also need to be taken into consideration by Jindal Iron Ore (Pty) Ltd:

- Notify DMRE prior to commencement of construction;

- A Health and Safety Plan must be developed prior to the commencement of construction, to identify and avoid work-related accidents;
- Establish a recruitment and procurement policy which sets reasonable targets for the employment of local residents /suppliers;
- A Code of Conduct must be developed for all workers directly related to the project, the objective of which is to limit, where possible, social ills brought about by the construction of the facility;
- Develop and implement a grievance procedure as defined previously (as per Section 27.1.4); and
- Screen for threatened or protected plant species as well as protected trees and if recorded, submission of permit application to KZN EDTEA and DFFE according to the relevant legislation.

28.2.6 Planning and Design Phase Actions and Outcomes

Key activities during the planning and design phase will include:

- Pre-construction monitoring;
- Notification of DMRE and other relevant authorities of final layout (if required) and additional mitigation/ management measures, where needed;
- Drafting of subsidiary plans, policies and procedures;
- Developing, with the Construction Contractor, the following:
  - A Site Layout Plan; and
  - Method Statements.

These activities are described in more detail in Table 28-1.

Table 28-1 Description of Impact Management Actions – Planning and Design Phase

Aspect		Objective/ Outcome	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
#	Description of Aspect		#	Management Actions			
1	Stakeholder engagement	Notify all registered Interested and Affected Parties of Environmental Authorisation.	1.1	Notify all registered I&APs and key stakeholders of the opportunity for appeal of the Environmental Authorisation.	EAP	Notices sent to relevant parties on the stakeholder database. List of those to whom it was sent on file.	Within 12 days from the issuing of the Environmental Authorisation by the DMRE.
2	Permit requirements	Ensure that all relevant permits/ licences have been issued.	2.1	Meet all relevant legal requirements.	Jindal Iron Ore (Pty) Ltd (Jindal MIOP Project Manager)	Permits	Prior to construction
3	Finalisation of EMPr and Construction Contractor Compliance Standards	Update EMPr with EA conditions and other mitigation measures from monitoring.	3.1	Incorporate additional mitigation measures specified by DMRE in the EA into the EMPr and Construction Contractor Compliance Standards.	Jindal Iron Ore (Pty) Ltd (EO & Environmental Manager)	EMPr and Construction Contractor Compliance Standards	Prior to construction
4	Authority notification	Notify DMRE of commencement date.	4.1	Notify DMRE prior to commencement of construction.	Jindal Iron Ore (Pty) Ltd (Environmental Manager)	Proof of communication	At least 14-days in advance of commencement of construction.
		Keep DMRE (Compliance Department) informed of any aspects of non-compliance with EMPr or EA.	4.2	Notify DMRE with reasons if any provisions of the EMPr or EA cannot be implemented, and provide alternative/s	Jindal Iron Ore (Pty) Ltd (Environmental Manager)	DMRE notification	Prior to construction
		Keep DMRE informed of current contact details of applicant.	4.3	Notify DMRE of any change of contact details of the applicant	Jindal Iron Ore (Pty) Ltd (Environmental Manager)	DMRE notification	Prior to construction
		Keep DMRE informed of contact details of ECO.	4.4	Submit the name and contact details of the appointed ECO prior to construction	Jindal Iron Ore (Pty) Ltd (Environmental Manager/ EO)	DMRE notification	Prior to construction
5	Adherence to EMPr	EMPr included in Construction Contractor Contracts	5.1	Include approved EMPr in all tenders for Construction Contractors and the adherence thereto must be written into the Contract.	Jindal Iron Ore (Pty) Ltd (EO & Environmental Manager)	Proof of EMPr in Contract with Construction Contractor	Prior to construction
6	Resettlement of Project Affected People	Resettlement and relocation	6.1	A Resettlement Action Plan would be required as a separate process to be undertaken in terms of the following: - Jindal must engage in open and transparent discussions with community members, through the mandated channels, to effectively manage community expectations. - Fair and just compensation must be provided to any relocated community members and all lost infrastructure must be replaced to a similar or better standard. - Continual engagement with local community and labour representatives, including traditional leadership and ward committees.	Jindal Iron Ore (Pty) Ltd (Project Manager), Resettlement Specialist	Resettlement Action Plan approved and signed off by all relevant parties	Prior to construction.
		Impacts to community health via changed farming practices	6.2	Compensation for loss of agricultural land that is within the Jindal MIOP footprint or in immediately surrounding areas that are required to be cleared, through provision of alternative fields or financial compensation if required.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Stakeholder engagement meeting minutes Signed agreements	Prior to construction
7	Subsidiary Plans	Develop Subsidiary Plans to minimise environmental and social risks	7.1	The following subsidiary plans should be developed (if required) as part of the Jindal MIOP Environmental and Social Management System (ESMS) prior to construction:	Jindal Iron Ore (Pty) Ltd (EO & Environmental Manager)	Relevant Plans	Prior to construction

Aspect		Objective/ Outcome	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
#	Description of Aspect		#	Management Actions			
				- Biodiversity Management Plan (qualified botanist required); - Traffic Management Plan; - HIV Policy and Awareness Plan; - Rehabilitation Plan; - Policy for assessing damages and losses to resources; - Recruitment Policy; - Procurement Policy; - Code of Conduct; - Community Engagement Plan; - Waste Management Plan (Waste management specialist required); - Emergency Response and Preparedness Plan; - Storm Water Management Plan; - Grievance Procedure; - Comprehensive Water Balance Plan; - Soil Erosion and Sediment Control Management Procedure; - Air Quality Monitoring Plan, including dust suppression (air quality specialist required); - Chance Finds Procedure; - Soil Contamination and Management Plan; - Health and Safety Plan (include requirements in terms of the Operational, Health and Safety Act); and - Groundwater Monitoring Plan, for implementation prior to construction.			
8	Employment and procurement of services and tender procedures	Ensure that employment and procurement of local, regional and national services are maximised.	8.1	Agree local employment requirements with the local authority and Construction Contractor upon advertising for jobs. Before any project commencement in the Mthonjaneni LM all Construction Contractors must meet with the local authority to discuss employment and local business opportunities.	Jindal Iron Ore (Pty) Ltd (Stakeholder Relations Manager & HR Manager)	Meeting minutes / advertisements	Prior to construction
			8.2	Appointed project Construction Contractors and suppliers must have access to Health, Safety, Environmental and Quality training as required by the project.	Jindal Iron Ore (Pty) Ltd (Safety Manager)	Procurement contract and Recruitment policy	Prior to construction
			8.3	Implement Procurement Policy and ensure it includes reasonable targets for the procurement of goods and services from South African residents /suppliers, particularly local residents as far as possible; and identifies and invites bids from local suppliers.	Jindal Iron Ore (Pty) Ltd (Commercial Manager)	Procurement policy	Prior to construction
			8.4	Adopt transparent adjudication process for tender awards.	Jindal Iron Ore (Pty) Ltd (Commercial Manager)	Demonstrate transparent process of adjudicating tenders	Prior to construction
			8.5	Identify local suppliers (as a first preference) with the appropriate level of capacity to supply goods and services over the operational lifetime of the project (specifically BBBEE companies).	Jindal Iron Ore (Pty) Ltd (Stakeholder Relations Manager)	Proof of suppliers	Prior to construction
9	Social ills and disruption	To limit, where possible, social ills brought about by the construction phase	9.1	Develop an induction programme, including a Code of Conduct, for all workers.	Jindal Iron Ore (Pty) Ltd (HR Manager & Training Manager)	Code of Conduct	Prior to construction
			9.2	All workers will agree to the Code of Conduct and be aware that contravention of the Code could lead to dismissal.	Jindal Iron Ore (Pty) Ltd (HR Manager)	Code of Conduct	Prior to construction

Aspect		Objective/ Outcome	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
#	Description of Aspect		#	Management Actions			
			9.3	A Grievance Procedure will be established whereby complaints are recorded and responded to.	Jindal Iron Ore (Pty) Ltd (Stakeholder Relations Manager & HR Manager)	Grievance Procedure	Prior to construction
			9.4	Implement an HIV Policy and Awareness Plan.	Jindal Iron Ore (Pty) Ltd (HR Manager)	HIV Policy	Prior to construction
10	Groundwater Impacts	To minimize impacts on the groundwater	10.1	Design and install a Class C Liner for the WRD and TSF.	Jindal Iron Ore (Pty) Ltd (Project Manager & Engineer)	Proof of liner design and installation	Prior to construction
			10.2	Liner for onsite dams as determined through the detailed design.	Jindal Iron Ore (Pty) Ltd (Project Manager & Engineer)	Proof of liner design and installation	Prior to construction
			10.3	Drill specific monitoring boreholes as per the monitoring plan in the vicinity of the South East Pit, WRD and the TSF to detect any potential groundwater contamination from Jindal MIOP activities (Figure 30-1 and Figure 30-2).	Jindal Iron Ore (Pty) Ltd (Environmental Manager)	Proof of additional monitoring boreholes	Prior to construction
		Impacted ground water levels	10.4	An aquifer testing program to include the open pit and WRD area must be undertaken within the pit area. Suitable boreholes must be drilled, and aquifer testing must be completed prior to construction starting.	Jindal Iron Ore (Pty) Ltd (Project manager/ geologist)	Groundwater drilling programme and updated/ recalibrated groundwater model	Prior to construction
			10.5	Packer testing should be completed in existing boreholes within the pit area to characterise the hydraulic conductivity at various depths throughout the formations.	Jindal Iron Ore (Pty) Ltd (Project manager/ geologist)	Groundwater drilling programme and updated/ recalibrated groundwater model	Prior to construction
			10.6	Additional boreholes must be sited on the periphery of the pit to serve as long term monitoring boreholes.	Jindal Iron Ore (Pty) Ltd (Project manager/ geologist)	Groundwater drilling programme results	Prior to construction
			10.7	The boreholes drilled at the TSF must be tested to confirm the hydraulic conductivity values assumed within the modelling.	Jindal Iron Ore (Pty) Ltd (Project manager/ geologist)	Groundwater drilling programme results and updated groundwater model	Prior to construction
			10.8	Prior to groundwater abstraction for water supply, supply boreholes should be aquifer tested and licenced to ensure that nearby water users are not impacted by drawdown due to pumping.	Jindal Iron Ore (Pty) Ltd (Project manager/ geologist)	Groundwater drilling programme and updated/ recalibrated groundwater model	Prior to construction
11	Surface water impacts	Minimise alteration of natural drainage patterns	11.1	Design and construct a berm around the WRD to divert clean water around the facility.	Engineer/ RE/ EO/ Environmental Manager	Signed engineering designs Approved Integrated Water Use Licence (IWUL)	Prior to construction and active mining and waste rock dumping taking place
		Minimise flooding of infrastructure	11.2	Design and construct a berm to divert clean water around the mine infrastructure and back into natural flowpaths in the environment.	Engineer/ RE/ EO/ Environmental Manager	Signed engineering designs Approved Integrated Water Use Licence (IWUL)	Prior to construction of the processing plant and other infrastructure
12	Traffic impact	Minimise negative effects associated with the increase in traffic.	12.1	Access to and from the development area should be either via existing roads or within the construction servitude.	Construction Contractor/ EO	Road design plan	Daily inspections throughout construction
			12.2	Develop and implement a Traffic Management Plan (TMP) including strict controls over driver training and qualifications, vehicle maintenance, vehicle certifications, speed restrictions, appropriate road safety signage, and vehicle loading and maintenance measures. Ensure that this TMP includes measures to	Jindal Iron Ore (Pty) Ltd (Safety Manager)	TMP	Prior to construction

Aspect		Objective/ Outcome	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
#	Description of Aspect		#	Management Actions			
				reduce the need to drive at night and during peak traffic times, as well as to ensure vehicular activities are staggered as much as possible.			
			12.3	Apply for and obtain all necessary transportation permits from the relevant authorities, including permits for abnormal loads if required. Oversee acquisition of permits required by Construction Contractors.	Jindal Iron Ore (Pty) Ltd (Project Manager)	Permits	Prior to construction
13	Waste management	Prevent soil and/or groundwater contamination from waste.	13.1	Implement a Waste Management Plan (WMP) to include the Jindal MIOP . This will follow the principles of waste minimisation at source, segregation for reuse, recycling, treatment or disposal. The WMP should include the following: • Waste quantities and types; • Waste recycling; • Temporary waste storage; and • Waste treatment and disposal.	Engineer/ EO	WMP	Prior to construction
14	Impacts on vegetation	Biodiversity Offset	14.1	Biodiversity Offset, if required, must be in place and be signed off by the relevant authorities before any clearing of vegetation may take place.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Biodiversity Specialist)	Signed Biodiversity Offset Agreement	Prior to construction
		Screening and translocation of threatened or protected species and protected trees	14.2	Undertake pre-construction surveys of the approved footprints (by a qualified botanist and specific faunal ecologist that are familiar with the area) to identify Red Listed and protected plant species and confirm search and rescue requirements, or other avoidance measures, where possible. Search and rescue of species of conservation concern should be conducted prior to clearing activities.	Engineer /EO	Search and Rescue Protocol Relevant permits obtained	Prior to and throughout construction
			14.3	Obtain permits for vegetation clearing and the translocation of protected species from EDTEA prior to initiating site clearance. Removal of any protected trees within the footprint requires an additional permit from the Department of Environment, Forestry and Fisheries (DEFF) for which the lead time is about three months.	Engineer / EO/ Biodiversity Manager	Relevant permits obtained	Prior to and throughout construction
			14.4	Locate any lay-down or other temporary infrastructure sites within low biodiversity sensitivity areas.	Engineer / EO / Biodiversity Manager	Search and Rescue Protocol Relevant permits obtained	Prior to and throughout construction
			14.5	Minimise the development footprint as far as possible and rehabilitate construction-affected areas that are no longer required before the operational phase of the development.	Engineer / EO/ Environmental Manager/ Biodiversity Manager	Visual inspection	Prior to and throughout construction
			14.6	Demarcate 'no-go' areas before any construction activities are undertaken.	Engineer / EO/ Environmental Manager/ Biodiversity Manager	Visual inspection	Prior to and throughout construction
			14.7	Demarcate sensitive areas or individual trees in close proximity to the development footprint as 'no-go' areas with construction tape, temporary fencing or signage and mark these on site development plans for construction staff.	Engineer / EO/ Biodiversity Manager	Visual inspection Relevant permits obtained	Prior to and throughout construction
			14.8	Fence/ demarcate the development area to avoid movement of construction vehicles into 'no-go' areas.	Engineer / EO/ Biodiversity Manager	Visual inspection	Prior to and throughout construction
			14.9	Clearly mark vehicle routes and turning points and ensure all vehicle operators are made aware of restrictions on off-road driving in undesignated areas.	Engineer / EO	Visual inspection	Prior to and throughout construction

Aspect		Objective/ Outcome	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
#	Description of Aspect		#	Management Actions			
			14.9	Undertake awareness training for construction workers on the prohibition on collecting firewood or any plants from the project area (e.g. through induction and toolbox talks).	Engineer / EO/ Biodiversity Manager	Proof of Awareness Training	Prior to and throughout construction
			14.10	The following supplementary actions will need to be completed, in addition to the EMPr, if the development is approved to inform the monitoring and mitigation of biodiversity impacts related to the project: • Protected flora rescue and translocation plan to be prepared by a terrestrial ecologist or botanist, which will need to include a monitoring programme and follow-up action plan to ensure successful rescue/translocation is achieved. • Permits for the destruction or relocation of protected plants will need to be acquired subject to the submission of the relevant applications to EKZNW. This will be required prior to the implementation of the flora rescue and relocation plan. • Undertake flora rescue and relocation in line with the approved rescue and relocation plans. The flora rescue and relocation should be undertaken by a qualified botanist in consultation with EKZNW.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of all approved plans on site	Prior to and throughout construction
			14.11	A management plan for areas within the mining right area and managed by the applicant. Such a plan should be informed by: • A comprehensive invasive alien plant eradication programme compiled by an appropriately qualified person which accounts for alien plant clearing during the construction, operational and de-commissioning phase of the mine and covers the entire mining right area. • An alien plant monitoring programme or schedule must also be included and incorporated into the mines standard operating procedure from inception. • A comprehensive grassland management programme, which accounts for an appropriate fire management regime.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of all approved plans on site	Prior to and throughout construction
			14.12	Produce an overarching rehabilitation strategy for terrestrial ecosystems that will be affected by mining and a detailed rehabilitation plan for each phase of mine development (i.e. the construction, operational, de-commissioning and closure phases) once detailed information on site infrastructure and mining footprints is available.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of all approved plans on site	Prior to and throughout construction
			14.14	Produce a rehabilitation audit programme which reviews rehabilitation success periodically and allows for amelioration and follow-up to be accounted for.	Independent auditor	Rehabilitation Audits	Throughout all phases of the Jindal MIOP
			14.15	A handover document and programme if the mine intends to pass the land holdings onto a successor in title/new land owner.	Jindal Iron Ore (Pty) Ltd (General Manager/ Environmental Manager/ Commercial Manager)	Handover document	Should handover be required
15	Impacts on wetlands	Minimise impacts to wetland areas	15.1	Avoid delineated wetlands and riparian areas during layout planning for mine infrastructure and stockpile areas. Where possible a wetland and aquatic ecologist should do more detailed watercourse delineation sampling at locations of proposed encroachment to increase delineation accuracy at those locations.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Updated Wetland delineation	Prior to and throughout construction

Aspect		Objective/ Outcome	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
#	Description of Aspect		#	Management Actions			
16	Heritage resources and local graves	Loss of cultural heritage	16.1	Complete survey of the proposed Jindal MIOP footprint for possible site identification, mapping and description to identify all heritage resources and graves as identified in the NHRA.	Jindal Iron Ore (Pty) Ltd (Project manager/ EO Palaeontological specialist	Results of survey Record of findings	At the start of the planning and design process
			16.2	A complete survey of the Jindal MIOP footprint must be taken to locate possible graves identification, auditing, and engagement with affected families.	Jindal Iron Ore (Pty) Ltd (Project manager/ EO Palaeontological specialist	Results of survey Record of findings	At the start of the planning and design process
			16.3	Low significance sites can be recorded for addition to the provincial archaeological data base. Medium and high significance sites will require further recording and excavation to retrieve data for future research and addition to the data base.	Jindal Iron Ore (Pty) Ltd (Project manager/ EO Palaeontological specialist	Results of survey Record of findings	At the start of the planning and design process
17	Local employment	Skills audit	17.1	At the pre-construction phase, Jindal should undertake a skills audit in the labour-sending communities with the objective of identifying skills development interventions necessary for community members to take up the employment opportunities on offer.	Jindal Iron Ore (Pty) Ltd (Stakeholder Relations Manager & HR Manager)	Local Employment Policy on file Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout construction
18	Rehabilitation Plan	Successful site rehabilitation	18.1	A Rehabilitation Plan must be compiled and implemented from the onset of the activities. in consultation with a Biodiversity Specialist. The Rehabilitation Plan must include the following: • Take detailed electronic colour photographs of the proposed site before any clearing may commence. • These records of the site should be kept by the EO, ECO, RE and Engineer for consultation during rehabilitation of the site in order to ensure that rehabilitation is, as a minimum, done to a standard similar to pre-construction (as far as is practically possible). • Provide guidelines on how to restore the disturbed area to (as close as possible to) its natural state. The plan must also include the incorporation of natural vegetation, sloping plans as well as storm water management; and • Rehabilitation of the disturbed areas within the project area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type.	Construction Contractor/ RE/ EO/ Biodiversity Specialist	Photographs and Rehabilitation Report	Prior to construction

28.3 CONSTRUCTION PHASE IMPACT MANAGEMENT ACTIONS

28.3.1 Introduction

The Construction EMPr (CEMPr) covers the construction phase and the various actions and activities that are required to be undertaken in this phase to minimise environmental damage and enhance social benefits. All construction activities shall observe the requirements of this CEMPr as well as any relevant environmental legislation. The CEMPr matrix is included in Table 28-2.

28.3.2 Application

The roles and responsibilities in terms of the application and implementation of this CEMPr have been outlined in Section 27.1.2.

28.3.3 Method Statements and Site Management

Any Method Statements (as defined in Section 27.1.4) required shall be produced by the applicable Construction Contractor prior to the start of construction. The Construction Contractors shall not commence any activity until the relevant Method Statements have been approved and shall, except in the case of emergency activities, allow a period of two weeks for approval of the Method Statements by the Engineer. Such approval shall not be unreasonably withheld.

The Engineer or ECO may request any additional Method Statements for any activity they believe may impact on the environment.

The Construction Contractors shall ensure that copies of all approved Method Statements are readily available on the site and shall be communicated to all relevant personnel. The Construction Contractors shall carry out the Works in accordance with the approved Method Statements . Approval of the Method Statements shall not absolve the Construction Contractors from any of their obligations or responsibilities in terms of their Contracts.

The following Method Statements (amongst others if required) shall be provided by the Construction Contractor and submitted to the Engineer, RE and ECO before site establishment:

- Temporary Laydown Areas;
- Protection of Flora and Fauna;
- Erosion and Sedimentation Control;
- Dust Control;
- Materials Handling, Use and Storage;
- Fuel (Petrol and Diesel) and Oil Use and Storage;
- Solid Waste Management (General and Hazardous);
- Ablution Facilities;
- Eating Areas;
- Drinking Water;
- Contaminated Water;
- Hazardous Substances;
- Site Structures;
- Workshop, Equipment Maintenance and Storage;
- Noise Control;

- Environmental Awareness Training;
- Fire Control and Management Plan;
- Concrete and Cement Work;
- Emergency Procedures;
- Safety;
- Security;
- Community Relations;
- Protection of Natural Features;
- Working Hours;
- Excavation and Trenching; and
- Temporary Site Closure.

28.3.4 Construction Phase Impact Management Actions

The impact management actions that have been identified for the construction phase of the Jindal MIOP are summarised in Table 28-2.

Table 28-2 Description of Impact Management Actions – Construction Phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
1	• Compliance with EMPr and EA	Confirm commitment to adherence to EMPr and Construction Contractor Compliance Standards	1.1	The EMPr, Construction Contractor Compliance Standards and EA must be available on-site throughout construction and must be implemented by the Construction Contractors.	Project Manager	Copy of signed EMPr and EA with Construction Contractor	Prior to construction and ongoing throughout construction
		Auditing of compliance with EMPr and EA	1.2	An audit shall be undertaken by an independent auditor at the end of the construction phase, and a report shall be submitted to DMRE. The audit report shall indicate the date of the audit, name of auditor, and outcome of the audit in terms of compliance with the environmental authorisation and conditions of the EMPr.	Project Manager/ RE/ EO	Audit report and proof of submission to DMRE	Upon completion of construction
2	• Health and Safety of employees during construction related activities	Ensure the health and safety of Construction Contractors and site users	2.1	Adhere to the Health and Safety Plan to avoid work related accidents.	Construction Contractor/ Safety Officer	Signed Health and Safety Plan All incidents recorded in an Incident Report.	Throughout construction
			2.2	Appropriate Personal Protective Equipment (PPE) must be worn by all construction personnel. This shall include the use of ear protection in areas where the 8-hour ambient noise levels exceed 75dBA.	Construction Contractor/ Safety Officer	Signed Health and Safety Plan,	Throughout construction
			2.3	Audit the implementation of measures outlined in all health and safety related management plans.	Construction Contractor/ Safety Officer	Health and Safety Audit reports	Bi-annual audits
3	• All construction related activities resulting in environmental impacts	General site requirements	3.1	Good housekeeping, and adherence to good health and safety practices on site during construction.	Construction Contractor/ ECO/EO/ Safety Officer	All incidents recorded in an Incident Report.	Weekly inspections throughout construction
			3.2	Establish good waste management practices on site, to include recycling, separation and storage of hazardous waste at suitable lined/bunded areas. All wastes that cannot be reused or recycled shall be collected by approved waste Construction Contractors and disposed of in a registered landfill or licensed hazardous waste site.	Construction Contractor/ ECO/EO	Waste Management Plan compliance report	Weekly inspections throughout construction
4	• Minimise potential environmental impacts throughout the construction phase.	Progressive/ concurrent rehabilitation	4.1	Implement the Rehabilitation Plan to progressively/ concurrently rehabilitate areas as soon as construction is complete in those areas.	Construction Contractor/ EO	Compliance with Rehabilitation Plan Visual inspection	Weekly inspections throughout construction
5	• Groundwater abstraction	Lowering of the groundwater level	5.1	Ongoing monitoring of groundwater levels.	EO/ ECO	Proof of groundwater monitoring	Monthly inspections throughout construction
6	• Potential spills/ contamination from construction activities.	Deterioration of groundwater/ surface water quality	6.1	Supply chemical toilets, which should be regularly, maintained at sites where worker/ contractor numbers are high.	Construction Contractor	Proof of maintenance and cleaning schedules	Weekly inspections throughout construction
			6.2	Make oil spill kits available on site in case of spills of hydrocarbon chemicals and the relevant training on the use of spill kits must be provided.	Construction Contractor/ EO	Proof of spill kits on site Signed awareness training register	Weekly inspections throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			6.3	Phasing / scheduling of earthworks should be implemented in order to minimise the footprint that is at risk of erosion at any given time, or schedule works according to the season, where possible. Clear areas as and when needed for construction related purposes.	Construction Contractor/ EO	Photographic evidence of cleared areas	Daily inspections throughout construction
			6.4	Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff.	Construction Contractor/ EO	Photographic evidence of rehabilitated areas	Daily inspections throughout construction
			6.5	Traffic and movement over stabilised areas should be controlled (minimised and kept to certain paths), and damage to stabilised areas should be repaired timeously and maintained.	Construction Contractor/ EO	Compliance with TMP	Daily inspections throughout construction
			6.6	In case of an occurrence of a discharge incident that could result in the contamination of surface water resources, the ERP should be implemented.	Construction Contractor/ EO	Record of incidents	Daily inspections throughout construction
			6.7	Any on-site maintenance of vehicles must be undertaken within a lined bunded area or off-site.	Construction Contractor/ EO	Record of incidents	Daily inspections throughout construction
			6.8	Undertake water quality monitoring as per Section 30.	EO	Compliance with quality standard for surface and ground water as per the WUL and parameters as per Section Table 30-1.	Quarterly throughout construction
7	• Clearance of surface areas for the processing plant, WRD and open pit. • Diversion of runoff by stormwater controls. • Construction and operation of the processing plant, WRD and open pit	Alteration of natural drainage patterns	7.1	Develop and implement a Stormwater Management Plan according to the NWA to ensure the separation of clean and dirty water around the processing plant, WRD and open pit. The flow must be diverted around the infrastructure then allowed to enter preferential flow areas into the environment.	Engineer/ RE/ EO	Signed engineering designs Approved IWUL	Weekly inspections throughout construction to ensure integrity
		Flooding of infrastructure	7.2	Suitable flood protection measures must be designed to ensure the safety of the infrastructure and surrounding environment during flood events.	Engineer/ RE/ EO	Signed engineering designs Approved IWUL	Weekly inspections throughout construction to ensure integrity
			7.3	Suitable remedial measures should be investigated for the rivers passing through the South East Pit area. Maximum flood depths specified throughout the various streams must be considered during the development of flood protection berms including relevant engineering freeboard. The flood protection berms need to be sufficiently high along their full alignment in order to withstand the flood level and flood velocities.	Engineer/ RE/ EO	Signed engineering designs Approved IWUL	Weekly inspections throughout construction to ensure integrity
			7.4	Undertake water monitoring as per Table 30-1.	EO	Compliance with quality standard for surface and ground water as per the WUL and parameters as per Section 30.	Quarterly throughout construction
8	• Clearance of surface areas for processing plant, WRD and open pit. • Earthworks on-site. • Movement of vehicles.	Impact on vegetation and flora due to construction-related activities	8.1	Protected flora rescue and translocation plan to be implemented throughout construction (as per Section 14 of Table 28-1) by a terrestrial ecologist or botanist with associated monitoring (Table 30-1).	Construction Contractor/ EO	Search and Rescue Protocol implemented and signed off Relevant permits in place	Weekly inspections throughout construction
9	• Clearance of surface areas for processing	Impact on terrestrial vegetation and flora	9.1	All staff involved in work within the mining area must receive basic environmental awareness training.	Construction Contractor/ EO	Proof of training undertaken	Throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
	plant, WRD and open pit. - Earthworks on-site. - Movement of vehicles.	due to access control and site camps	9.2	All relevant staff on the property are to be informed of the sensitivity of the natural ecosystems and the need to avoid damaging/polluting these sensitive natural environments.	Construction Contractor/ EO	Proof of training undertaken	Throughout construction
			9.3	All areas outside of the formal demarcated working area must be considered 'no-go' areas for all phases (construction, operation, decommissioning, and closure). All 'no-go' areas in the vicinity of any mining operations should be clearly demarcated. These demarcated areas should be considered as "out of bounds" for all vehicles and personnel.	Construction Contractor/ EO	Record of incidents	Daily inspections throughout construction
			9.4	As far as possible, all mining-related activities and infrastructure should remain outside of the recommended 'no-go' areas.	Construction Contractor/ EO	Record of incidents	Daily inspections throughout construction
			9.5	When locating temporary construction camps and equipment yards, areas susceptible to soil erosion and/or water contamination must be avoided.	Construction Contractor/ EO	Record of incidents	Daily inspections throughout construction
			9.6	Attempts must be made to situate the camp on flat ground that is at least 50m away from the edge of the nearest 'no-go' area.	Construction Contractor/ EO/ ECO	Record of incidents	Daily inspections throughout construction
			9.7	Any contractors found working inside the 'no-go' areas (areas outside the construction/ working servitude) should be fined as per a fining schedule/system setup for the project.	Construction Contractor/ EO	Record of incidents	Daily inspections throughout construction
10	- Clearance of surface areas for processing plant, WRD and open pit. - Earthworks on-site. - Movement of vehicles.	Impact on terrestrial vegetation and flora due to storm water management and erosion/sediment control:	10.1	Wherever possible, existing vegetation cover at the site should be maintained during the construction phase. The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes.	Construction Contractor/ EO	Record of incidents	Daily inspections throughout construction
			10.2	Where possible construction roads should be aligned along contours rather than downslopes to avoid these features generating excessive sediment laden runoff.	Construction Contractor/ EO	Road desiGNReport Visual inspection	Daily inspections throughout construction
			10.3	All bare slopes and surfaces to be exposed during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals to break the energy of surface flows. The use of hay-bale berms, sandbags and/or silt fences is particularly important in areas where surface runoff is concentrated (e.g.: rills, road stormwater discharge points etc.).	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections throughout construction
			10.4	Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately.	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections throughout construction
			10.5	If re-vegetation of exposed surfaces cannot be established immediately due to construction phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence.	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections throughout construction
			10.6	All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas.	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections throughout construction
			10.7	After heavy rainfall events, site checks must be conducted for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and / or silt fences until vegetation has re-colonised the rehabilitated area.	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			10.8	Undertake any crossing construction or maintenance during low flows (winter season).	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections throughout construction
			10.9	On-going maintenance stormwater infrastructure to ensure optimal functioning. At a minimum this should include silt and debris/litter removal from catch pits, filtration devices and attenuation ponds, and maintenance and repair of stormwater outlets to ensure the optimal functioning of such systems.	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections throughout construction
			10.10	All new planned dirty water containment facilities must remain outside of 'no-go' areas.	Construction Contractor/ EO	Visual inspection Record of erosion instances	Weekly inspections throughout construction
			10.11	Stormwater that may be contaminated with industrial-type wastes should drain to sump collection points where this water will need to be filtered and/or treated for fuel/oil/chemical contaminants before being released into the environment. Any release must then comply with the relevant standards stipulated by the DWS.	Construction Contractor/ EO	Visual inspection Water monitoring records	Daily inspections throughout construction
			10.12	During the construction and operational phases of the proposed mining project, erosion berms should be installed on all unpaved surfaces and roadways and around stockpile areas to prevent gully formation and siltation of adjacent or downstream areas as follows: • Where the track has a slope <2%, berms every 50m should be installed. • Where the track slopes between 2% - 10%, berms should be installed every 25m. • Where the track slopes between 10% - 15%, berms should be installed every 20m. • Where the track has a slope > 15%, berms should be installed every 10m.	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections throughout construction
			10.13	Undertake the construction of any road or pipeline crossings of watercourses during low flows (winter season	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections during construction of crossings
			10.14	Rehabilitate any erosion or vegetation clearing impacts as soon as practically possible and in accordance with the Rehabilitation Plan.	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections throughout construction
			10.15	Dewatering of any areas within the mining site needs to be done in a manner that does not cause erosion and does not result in heavily silt-laden water flowing downslope of the mining footprint. Water must be pumped out into a well vegetated and already disturbed area 100 m from any watercourse to facilitate sediment trapping and reduce the chance of sediment entering rivers/streams.	Construction Contractor/ EO	Visual inspection Record of erosion instances	Daily inspections throughout construction
			10.16	After every major rainfall event, all erosion and sediment control structures or interventions will need to be inspected for damage immediately after the rains and repaired accordingly.	Construction Contractor/ EO	Visual inspection Record of erosion instances	After rainfall events
			10.17	Excavated or imported material/sediments/spoil should not be placed or stockpiled within any 'no-go' areas.	Construction Contractor/ EO	Visual inspection	Daily inspections throughout construction
			10.18	Soil/sand required for construction purposes must not be derived from nearby rivers/streams or other 'no-go' areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			10.19	Any concentrated flow path within and around mine areas must be backfilled/shaped and ideally revegetated to promote more diffuse flows/sheet-wash runoff rather than concentrated flows.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			10.20	Any breached stormwater structures (e.g. eroded berms, collapsed stormwater channels, etc.) must be repaired timeously.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			10.21	Sediment barriers such as silt fences, berms, cut-off drains and sand bags must be implemented at sources of sediment. Berms, sandbags and/or silt fences employed must be maintained and monitored throughout the construction phase of mining areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			10.22	After every significant rainfall event, staff must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be stabilised and where possible with appropriate material with appropriate sediment barriers for additional protection until grass has re-colonised the rehabilitated area.	Construction Contractor/ EO	Visual inspection Record of incidents	After rainfall events
			10.23	Stockpiles must not be placed in areas vulnerable to excessive erosion.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			10.24	Any and all soil stockpile areas are to be located outside of 'no-go' areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			10.25	Erosion/sediment control measures such as silt fences; bricks or low soil berms must be placed around soil stockpiles to limit sediment runoff from stockpiles.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			10.26	Subsoil and topsoil must be stockpiled separately.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			10.27	Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			10.28	The stockpiles may only be placed within demarcated stockpile areas, which must be established on flat ground and away from slopes.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			10.29	Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			10.30	The slope and height of stockpiles must be limited to 2m to avoid collapse and compaction.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
11	• Clearance of surface areas for processing	Impact on terrestrial vegetation and flora	11.1	No dirty water runoff from mining or processing areas must be discharged into the environment during the entire life-span of mining operations.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
	plant, WRD and open pit. - Earthworks on-site. - Movement of vehicles.	due to poor pollution control	11.2	Clean and dirty water management systems must be put in place to prevent contaminated runoff (containing sediments, salts, pollutants/toxicants such as hydrocarbons/oils and water with low pH) from entering the receiving natural environment outside of the mine footprint.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.3	All dirty water containment facilities must remain outside of the 'no-go' areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.4	No dumping of waste (liquid & solid waste) is permitted to take place within 'no-go' areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.5	The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be administered for all mining activities.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.6	Drip trays should be utilised at all fuel dispensing areas and whenever refuelling is carried out, including when portable re-fuelling systems are used.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.7	Potentially hazardous materials (chemicals, fuel, oils) liable to spillage need to be stored in appropriate containment structures (e.g using suitable industry-standard drip-trays or within concrete bunded areas).	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.8	Washing and cleaning of any construction and/or mining equipment should be undertaken only in clearly designated areas which are located far from 'no-go' areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.9	Drip-trays should be used beneath any standing machinery/plant if such equipment is to be left standing for an extended period.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.10	Vehicles are not to be refuelled or serviced within 'no-go' areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.11	Spillages of fuels, oils and other potentially harmful chemicals should be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the site must be removed and rehabilitated timeously and appropriately.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.12	Clear and completely remove from the site, all general waste, construction related plant, equipment, surplus rock and other foreign materials.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.13	All solid waste recorded within 'no-go' areas must be collected and placed in bins prior to being disposed of appropriately.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.14	Adequate scavenger-proof rubbish bins and waste disposal facilities are to be provided on-site at strategic points at work areas and educate/encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal. The bins must be emptied on a regular basis and taken to a registered landfill for disposal only.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			11.15	A culture of "conserve, reduce, reuse & recycle" should be promoted with regards to the use and disposal of products to minimise resource consumption and reduce the amount of potential waste.	Construction Contractor/ EO	Regular tool box talks Records of incidents	
			11.16	Sanitation – portable toilets (1 toilet per 30 users is the norm) must be provided where mining is occurring. Workers need to be encouraged to use these facilities and not the natural environment. Toilets should be located outside of the 1:100 year flood line of all watercourses and outside of the recommended 'no-go' areas. Waste from chemical toilets should be disposed of regularly and in a responsible manner by a registered waste contractor.	Construction Contractor/ EO	Visual inspection Record of incidents Record of collection	Daily inspections throughout construction
			11.17	Noise pollution should be minimized where possible by ensuring the proper maintenance of equipment and vehicles, including the tuning of engines and mufflers as well as employing low noise equipment where possible.	Construction Contractor/ EO	Visual inspection Record of incidents Maintenance records	Daily inspections throughout construction
			11.18	Haul trucks must operate within the recommended 20 km/h speed limit when driving on all dirt roads (low speeds generally generate less dust when compared to high speeds).	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			11.19	Adequate water carts and or adequate spray frequencies must be implemented particularly on dry and hot days to suppress dust pollution. Water retained in PCDs, provided the water quality is acceptable should be used for this purpose for example.	Construction Contractor/ EO	Visual inspection Record of incidents Water quality records	Daily inspections throughout construction
			11.20	PCDs must be designed to capture all dirty water runoff from the mine, including the discard dumps and stockpile areas and must be designed to contain at least a 1: 100-year rainfall event.	Construction Contractor/ EO	Visual inspection Record of incidents Water quality records	Daily inspections throughout construction
			11.21	Monthly inspections and maintenance of PCDs, stockpiles and mine discard dumps will be required to reduce the risk of failure and contamination.	Construction Contractor/ EO	Visual inspection Record of incidents Water quality records	Daily inspections throughout construction
12	• Clearance of surface areas for processing plant, WRD and open pit. • Earthworks on-site. • Movement of vehicles.	Impact on terrestrial vegetation and flora due to poor topsoil management:	12.1	Subsoil and topsoil must be stockpiled separately.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			12.2	Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			12.3	The stockpiles may only be placed within demarcated stockpile areas, which must be established on flat ground and away from slopes.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			12.4	Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			12.5	Topsoil from different vegetation communities should be stripped and stockpiled separately.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			12.6	Handling of the stripped topsoil should be minimized. If possible, topsoil should not be stockpiled but used directly.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			12.7	Stockpiling should be minimized to periods of 6-12 months to limit deterioration of seed, nutrients and soil biota.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			12.8	Stockpiles should be seeded with grass or legume mixtures to minimize erosion and loss of beneficial micro-organisms.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
13	• Clearance of surface areas for processing plant, WRD and open pit. • Earthworks on-site. • Movement of vehicles.	Impact on terrestrial vegetation and flora – general management	13.1	Construction should take place in the winter months where possible in order to minimise the impacts on the breeding activities of the terrestrial faunal species.	Construction Contractor/ EO	Visual inspection	Daily inspections throughout construction
			13.2	Vegetation removal/stripping must be limited to the approved mining footprint.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			13.3	No clearing of indigenous vegetation outside of the defined working servitudes is permitted for any reason (i.e. for firewood or medicinal use).	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			13.4	Grubbing is not permitted as a method of clearing vegetation. Any trees needing clearing must be cut down using chain saws and hauled from the site using appropriate machinery where practically possible.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			13.5	If any Red Data plant species are identified that may be disturbed, effective relocation of such species to suitable natural habitat outside of the mining impact zone must be arranged in consultation with Ezemvelo KZN Wildlife (EKZNW).	Construction Contractor/ EO	Visual inspection Record of incidents and consultation with EKZNW	Daily inspections throughout construction
			13.5	Prior to mining activities taking place in natural areas, it is advised that the 'flushing out' of local wildlife be undertaken to allow species to relocate naturally before mining commences.	Construction Contractor/ EO	Visual inspection Record of 'flushing'	Daily inspections throughout construction
			13.6	No animals are to be killed on the site or surrounding areas, including species considered as dangerous/ vermin such as snakes and rats. Where these are encountered on the site, they should be removed and transferred to the nearest suitable natural habitat by a qualified handler.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			13.7	Any fauna that are found within the mining area should be moved to the closest point of natural or semi-natural vegetation outside the construction servitude. Where these are encountered on the site, they should be removed and transferred to the nearest suitable natural habitat by a qualified handler.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			13.8	Plants that are removed during construction should be maintained on site and used to re-vegetate the disturbed soil.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			13.9	Only indigenous plant species naturally occurring in the area should be used during the rehabilitation of the affected areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			13.10	All vehicles accessing the site should adhere to a low speed limit (typical speed limits are 40km/hr on paved site roads and 20 km/hr on unpaved haul routes.) to avoid collisions with susceptible species such as reptiles (snakes and lizards).	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			13.11	No trapping of any animal must be allowed on the site and nearby/adjacent areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			13.12	No fishing is to take place.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			13.13	No firewood or medicinal plants may be harvested from natural areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
14	• Clearance of surface areas for processing plant, WRD and open pit. • Earthworks on-site. • Movement of vehicles.	Impact on terrestrial vegetation and flora - Fire management:	14.1	Adequate firebreaks around the mining areas must be maintained at all times.	Construction Contractor/ EO	Visual inspection	Daily inspections throughout construction
			14.2	Illicit or informal fires must be prohibited on site and within natural areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			14.3	No open fires to be permitted on the site.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			14.4	Smoking must not be permitted in areas considered to be a fire hazard (i.e. in close proximity to grasslands, etc.).	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			14.5	Ensure adequate fire-fighting equipment is available at the site and train workers on how to use equipment.	Construction Contractor/ EO	Record of training	Throughout construction
			14.6	Ensure that all workers on site know the proper procedure in case of a fire occurring.	Construction Contractor/ EO	Record of training and fire drills	Throughout construction
			14.7	Ensure that no refuse wastes are burnt on the site or surrounding areas.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
15	• Clearance of surface areas for processing plant, WRD and open pit. • Earthworks on-site. • Movement of vehicles.	Impact on fauna due to construction phase site clearance and disturbances	15.1.	Conduct search and rescue for any reptiles prior to site clearance. Particular attention should be paid to tortoises and clearing of bush clumps, stone/rubble piles and any other areas where reptiles are likely to be sheltering. Snakes to be removed by trained snake handlers and records maintained of snakes removed.	Construction Contractor/ Biodiversity Manager	Record of any fauna relocated	Duration of construction
			15.2.	Remove any fauna directly threatened by the construction activities to a safe location.	Construction Contractor/ Biodiversity Manager	Record of any fauna relocated	Duration of construction
			15.3.	All construction vehicles using internal roads should adhere to a low speed limit (typical speed limits are 40km/hr on paved site roads and 20 km/hr on unpaved haul routes.) to avoid collisions with susceptible species such as snakes, tortoises, rabbits or hares. Speed monitoring of construction vehicles and regular awareness raising of staff on this issue should be implemented.	Construction Contractor/ EO	Speed limit testing Record of incidents	Duration of construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			15.4	Where fences are installed, no electrified strands should be placed within 30 cm of the ground as some species such as tortoises are susceptible to electrocution as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of such fenced areas and not the outside.	Construction Contractor/ EO	Visual inspection	Weekly inspections throughout construction
			15.5	Implement awareness training for construction workers on prohibitions on collecting fauna such as lizards, tortoises or snakes, and are restricted from free movement outside of the construction sites.	Construction Contractor/ EO	Record of training Signed Code of Conduct	Duration of construction
			15.6	Lighting should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which should be directed downwards.	Construction Contractor/Engineer/ EO	Proof of lighting installed	Weekly inspections throughout construction
			15.7	• A qualified ecologist should be on site when species that will be directly disturbed and which need to be relocated i.e. fauna (including nests of SCCs) are found during the project activities. • Daily inspection of trenches needs to be conducted and any faunal species trapped in trenches shall be relocated by a qualified ecologist. In the case of snakes, a trained snake handler needs to appointed onsite. • Training of employees onsite by registered snake handler companies can also be considered. Records of faunal species translocation and/or faunal mortalities must be kept on a daily basis and weekly translocating and mortalities shall be reported to the ECO for record keeping.	Construction Contractor/ EO/ Biodiversity Manager	Proof of EO on site Daily EO records Proof of reports of the ECO	Throughout construction
16	• Earthworks for processing plant and WRD • Construction of roads and road crossings	Impacts to wetlands and aquatic environments	16.1	Limit the number of required road crossings as far as practically possible. All road crossings need to be licenced under the NWA S21 (c) and (i) water uses.	Construction Contractor/ EO	Proof of IWULA for all road crossings	
			16.2	Best practice design principles must be utilised for all road crossing locations where crossings of watercourses are unavoidable.	Construction Contractor/ Engineer/ EO	Approved engineering designs	Throughout construction
			16.3	Undertake the construction of any road or pipeline crossings of perennial rivers/wetland during low flows (winter season).	Construction Contractor/ EO	Visual inspection	Weekly inspections throughout construction
			16.4	Implement post-construction wetland and river rehabilitation strategy as and where necessary.	Construction Contractor/ EO	Visual inspection Proof of successful rehabilitation	Weekly inspections throughout construction
			16.5	Rehabilitate any erosion or vegetation clearing impacts as soon as practically possible.	Construction Contractor/ EO	Visual inspection Proof of successful rehabilitation	Weekly inspections throughout construction
		Impacts to wetlands and aquatic environments - 'No-Go' Areas During Construction.	16.6	All watercourses must be considered 'no-go' areas for the duration of the construction process.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			16.7	Construction staff and machine operators must be informed of the location of all watercourses in the vicinity of the construction site.	Construction Contractor/ EO	Visual inspection Record of incidents Record of discussions	Daily inspections throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			16.8	No areas outside the construction footprint may be cleared and stripped of vegetation. The outer edges of construction sites must be demarcated using a high visibility barrier / fencing.	Construction Contractor/ EO	The demarcation must be signed off by the project Environmental Control Officer (ECO). Visual inspection Record of incidents	Daily inspections throughout construction
			16.9	Access to and from construction areas should, as far as practically possible, be via existing roads.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			16.10	All disturbed areas beyond the demarcated construction area that are intentionally or accidentally disturbed must be immediately rehabilitated to the satisfaction of the ECO.	Construction Contractor/ EO	Visual inspection Record of incidents Proof of successful rehabilitation	Daily inspections throughout construction
		Impacts to wetlands and aquatic environments - Hazardous Substances / Materials Management	16.12	The proper storage and handling of hazardous substances (e.g., fuel, oil, cement, etc.) needs to be administered.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			16.13	Mixing and / or decanting of all chemicals and hazardous substances must take place on an impermeable surface and must be protected from the ingress and egress of stormwater.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			16.14	Drip trays should be utilised at all fuel dispensing areas and whenever refuelling is carried out, including when portable re-fuelling systems are used.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			16.15	No refuelling, servicing or chemical storage should occur near any watercourse. In this regard watercourse buffer zones should be adhered to.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			16.16	Hazardous substance storage and refuelling areas must be bunded prior to their use on site during the construction period. Bund walls should be high enough to contain at least 110% of any stored volume. The surface of the bunded area should be graded downwards to the centre so that spillage may be collected and satisfactorily disposed of.	Construction Contractor/ EO	Visual inspection Record of soills Engineering designs of storage areas	Daily inspections throughout construction
			16.17	An emergency spill response procedure must be formulated for the site, and staff are to be trained in spill response.	Construction Contractor/ EO	Proof of training Proof of procedure on site	Daily inspections throughout construction
			16.18	All necessary equipment for dealing with spills of fuels / chemicals must be available at the site.	Construction Contractor/ EO	Visual inspection of availability of spill kit	Daily inspections throughout construction
			16.19	Spills must be cleaned up immediately and contaminated soil / material disposed of appropriately at a registered site.	Construction Contractor/ EO	Visual inspection Record of incidents Proof of safe clean up and disposal	Daily inspections throughout construction
			16.20	Drums must be kept on site to collect contaminated soil. These should be disposed of at a registered waste site.	Construction Contractor/ EO	Visual inspection Record of safe disposal	Daily inspections throughout construction
			16.21	Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at an appropriately registered site.	Construction Contractor/ EO	Visual inspection Record of safe disposal	Daily inspections throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			16.22	Vehicle maintenance should not take place on site unless a specific bunded area with a roof covering is constructed for such a purpose.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
		Impacts to wetlands and aquatic environments - Landscaping Recommendations	16.23	It is recommended that landscaping promote the use of indigenous species common to the region and that as much natural ground cover as possible is established on the site to help with binding soils and encouraging rainfall and stormwater runoff infiltration.	Construction Contractor/ EO	Visual inspection Proof of rehabilitation	Daily inspections throughout construction
		Impacts to wetlands and aquatic environments - Alien Plant Monitoring and Control	16.24	It is recommended that bi-annual alien plant clearing be undertaken by the mine operator throughout construction. Thereafter, alien plant clearing should be undertaken annually. The following must be noted: - Any action taken to control a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. - The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material, and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.	Construction Contractor/ EO/ Environmental Manager/ ECO	Visual inspection for alien invasive species Proof of alien plant clearing programmes	Daily inspections throughout construction Bi-annual alien plant clearing
17	- Movement of construction equipment and other vehicle during construction activities. - Clearance of vegetation during the construction phase.	Potential human health impacts due to dust and emissions	17.1	Focused staff training on air quality management to include need for limited idling of vehicles and adhere to specified speed limit (typical speed limits are 40km/hr on paved site roads and 20 km/hr on unpaved haul routes).	Construction Contractor/ EO	Proof of training	Daily inspections throughout construction
			17.2	Wet suppression of stockpiles when necessary (including wind shielding, storage away from site boundaries, and restricted height of stockpiles).	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			17.3	Water and chemical sprays will be used for dust suppression on haul roads.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			17.4	Ensuring that vehicles carrying dry soil and other materials are covered during travel.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			17.5	Best practices must be implemented to control emissions from loading and dumping material include water application, minimisation of drop heights and suspension or modification of activities during adverse weather conditions.	Construction Contractor/ EO	Visual inspection Record of incidents	Daily inspections throughout construction
			17.6	Increase frequency of site inspections by the responsible person for air quality and dust issues on site when activities with a high potential to produce dust are being carried out.	Construction Contractor/ EO	Visual inspection Record of incidents	Inspections as required throughout construction
			17.7	Operation and maintenance of any generators and vehicles/equipment according to supplier specification at maintenance workshops.	Construction Contractor/ EO	Visual inspection Record of incidents	Minimum of annual servicing throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			17.8	Implement methods of reducing wind speed around potentially dusty activities / areas. Early planting of site perimeter areas with native tree species, and / or the strategic use of 'snow fencing' will potentially reduce wind speed across the site.	Construction Contractor/ EO/ Environmental Manager	Visual inspection Record of incidents Within NDCR standards	To be implemented pre-construction Monthly monitoring at SRs to assess compliance
			17.9	Display details of responsible person for air quality and dust issues at the site boundary.	Construction Contractor/ EO	Visual inspection Grievance mechanism	Monthly inspections throughout construction
			17.10	Implement a grievance procedure whereby air quality issues can be raised/ reported and transparently and timeously addressed.	Construction Contractor/ EO	Grievance mechanism Proof of close out of grievance	As required
			17.11	Undertake air quality monitoring as per Table 30-1.	EO	Compliance with quality standard for air quality as per Table 30-1	Monthly throughout construction
18	- Noise generated due to construction activities i.e. vehicle and machinery noise.	Nuisance impact on surrounding landowners	18.1	Limit construction activities to day-time hours as defined by DMRE as far as possible.	Construction Contractor/ EO	Construction activities between the hours of 06h00 and 19h00 or as specified in the EA Grievance mechanism	Daily inspections throughout construction
			18.2	Site inductions must be undertaken to cover the importance of noise control and available noise reduction measures.	Construction Contractor/ EO	Proof of induction/ training	Daily inspections throughout construction
			18.3	Construction contractors should be required to use equipment that is in good working order, is properly maintained according to the equipment's manufacturer requirements and that meets current best practice noise emission levels.	Construction Contractor/Engineer /EO	Proof of equipment specifications Maintenance records	Daily inspections throughout construction
			18.4	Review equipment to ensure the quietest available technology is used. Equipment with lower sound power levels should be selected in such instances and vendors/ contractors should be required to guarantee optimised equipment design noise levels.	Construction Contractor/Engineer/ EO	Proof of equipment specifications	Throughout construction
			18.5	As far as reasonably practicable, sources of significant noise should be enclosed. The extent to which this can be done depends on the nature of the machines to be enclosed and their ventilation requirements.	Construction Contractor/Engineer /EO	Proof of equipment specifications Maintenance records Visual inspection	Daily inspections throughout construction
			18.6	A gradual start to noisy activities and as far as it is feasible, establish a schedule for noisy activities to reduce overlapping of works.	Construction Contractor/ EO	Visual inspection	Daily inspections throughout construction
			18.7	Implement a grievance procedure whereby issues associated with noise can be raised/ reported and transparently and timeously addressed.	Construction Contractor/ EO	Grievance mechanism Proof of close out of grievance	As required
19	- Soil erosion resulting from cleared and disturbed areas. - Soil compaction from construction vehicles.	Loss of soil resources and land capability	19.1	Ensure that the RAP considers the resettlement of livestock to the areas where the current homestead owners will be resettled. The RAP must ensure that the areas where homestead owners will be resettled, have soil that is suitable for subsistence-level crop production near the houses.	Construction Contractor/ EO	Resettlement Action Plan	Daily inspections throughout construction
			19.2	Develop and implement a Topsoil Management Plan.	Construction Contractor/ EO	Topsoil Management Plan	Prior to construction commencing

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
	- Loss of soil depth and volume due to excavation.		19.3	Protect exposed soils to suppress dust during the construction phase. Plans for soil stripping should be compiled on the basis that certain soils are inherently suitable for rehabilitation purposes, whilst others are not.	Construction Contractor/ EO	Visual inspection of dust suppression effectiveness Soil stripping plan	Daily inspections throughout construction
			19.4	Re-vegetate all disturbed areas adjacent to the infrastructure complexes with an indigenous grass mix, if necessary, to re-establish a protective cover, in order to minimise soil erosion and dust emission.	Construction Contractor/ Environmental Manager	Concurrent rehabilitation plan	Completion of construction
			19.5	Limit excavation and long-term stockpiling of soil as far as practically possible. Stockpiled soils should be stored and used for rehabilitation and landscaping around the site once construction activities have been completed. Concurrent rehabilitation should be conducted where practically possible to reduce the duration of stockpile storage in order to ensure that the quality of stored soil material does not deteriorate excessively.	Construction Contractor/ EO	Concurrent rehabilitation plan Top soil plan Soil stripping plan	Monthly inspections throughout construction
			19.6	Identify areas for stockpiling in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas.	Construction Contractor/ EO	Top Soil Plan Soil stripping plan	Monthly inspections throughout construction
			19.7	Re-vegetate stockpiles to establish a vegetation cover as an erosion control measure, as far as possible. These stockpiles should also be kept free of alien vegetation at all times to prevent loss of soil quality.	Construction Contractor/ EO	Concurrent rehabilitation plan Top soil plan	Completion of construction
20	- Potential spills from construction activities.	Loss of soil resources due to contamination	20.1	Store all hazardous liquids within a bunded facility which will be designed to contain up to 110% of the volume of hazardous liquids stored within.	Construction Contractor/ EO	Visual inspection of bund wall or storage facility integrity	Weekly inspections throughout construction
			20.2	Maintain vehicles and equipment either on impermeable surfaces or drip trays should be used.	Construction Contractor/ EO	Visual inspection of vehicle maintenance sites Record of non-compliance	Daily inspections throughout construction
			20.3	Store all waste in specified areas according to the Waste Management Plan and should be on impermeable surfaces where specified.	Construction Contractor/ EO	Visual inspection of integrity of storage facilities and capacity of containers Compliance with Waste Management Plan	Daily inspections throughout construction
			20.4	Spill kits must be available on site to ensure that any fuel or oil spills are cleaned up immediately and disposed of correctly.	Construction Contractor/ EO	Visual inspection of spill kit availability and contents	Daily inspections throughout construction
			20.5	Provide awareness training to all workers (temporary and permanent) on the required steps to enable fast reaction to contain and remediate pollution incidents. In situ treatment is generally considered to be the preferred option because with successful in situ remediation the soil resource can be retained in the correct place. The in-situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bio remediation at a designated area after which the soils are returned	Construction Contractor/ EO	Training records	Duration of construction
			20.6	Undertake post rehabilitation audits to ascertain whether the remediation of any polluted soils and re-establishment of soil functionality has been successful and if not, to recommend and implement further measures.	Construction Contractor/	Audit findings	Duration of construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
					EO/Environmental Manager		
		Loss of soil resources due to compaction	20.7	Do not allow vehicle and equipment movement or parking outside of demarcated areas.	Construction Contractor/ EO	Visual inspection	Daily inspections throughout construction
			20.8	Materials must be off-loaded and stored in designated laydown areas.	Construction Contractor/ EO	Visual inspection	Daily inspections throughout construction
			20.9	Rip all compacted areas such as roads and stockpiles areas, during the last phases of site rehabilitation.	Construction Contractor/ EO	Visual inspection	Daily inspections throughout construction
21	- Land clearance; - Alteration of surface topography; - Vehicular movement; - Lighting; and - Construction activities.	Change in landscape and related visual impacts	21.1	Demarcate specific areas within which all construction activities must be undertaken.	Construction Contractor/ EO	Survey plan indicating construction area and regularly updating plans	Throughout construction
			21.2	Apply dust suppression methods to limit the dust generated on haul roads and at the primary crusher and processing plant areas.	Construction Contractor/ EO	Visual inspection	Daily inspections throughout construction
			21.3	Phasing / scheduling of earthworks should be implemented in order to minimise the footprint that is at risk of erosion at any given time, or schedule works according to the season, where possible. Clear areas as and when needed for construction related purposes.	Construction Contractor/ EO	Visual inspection	Throughout construction
			21.4	Rehabilitate all disturbed areas as soon as possible after construction is complete in an area.	Construction Contractor/ EO	Rehabilitation plan	Throughout construction
			21.5	All topsoil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use in accordance with a Topsoil Management Plan. The construction contract must include the stripping and stockpiling of topsoil. Topsoil would be used later during the rehabilitation phase and / or ongoing rehabilitation. The presence of degraded areas and disused construction roads, which are not rehabilitated, will increase the overall visual impact.	Construction Contractor/ EO	Topsoil Management Plan Visual Inspection	Throughout construction
			21.6	During construction, temporary fences surrounding the material storage yards and laydown areas should be draped with 'shack' cloth (khaki coloured).	Construction Contractor/ EO	Visual inspection	Throughout construction
			21.7	Building or waste material should be discarded at an authorised/ licensed location, which should not be within any sensitive areas.	Construction Contractor/ EO	Visual inspection	Throughout construction
			21.8	Earthworks should be executed so that only the footprint and a small 'construction buffer zone' around the proposed activities are exposed. In all other areas, the naturally occurring vegetation should be retained, especially along the periphery of the project sites.	Construction Contractor/ EO	Visual inspection	Throughout construction
			21.9	Paint all structures with colours that reflect and compliment the colours of the surrounding landscape. This can be achieved by painting rooftops and walls of buildings in the hues and tones of the surrounding grasslands. To further reduce glare potential, the external surfaces of structures should be painted with matt paints and pure whites and blacks should be avoided.	Construction Contractor/ EO	Visual inspection	Throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			21.10	Keep the construction sites neat and tidy at all times with litter and dust management measures in place.	Construction Contractor/ EO	Housekeeping reports	Daily inspections throughout construction
			21.11	All lights used for illumination, and within safety limitations, should be faced inwards and be shielded to avoid light spillage to the surrounding areas.	Construction Contractor/ EO	Visual inspection to ensure illumination installed correctly	Weekly inspections throughout construction
			21.12	Make use of motion detectors on security lighting, in office and maintenance areas, to reduce unnecessary illumination	Construction Contractor/ EO	Signed off design As built signoff	Throughout construction
22	• Use of construction equipment, vehicles, power generators and other machinery during construction activities.	Impact of the project on climate change	22.1	Investigate the use of fuel additives which improve fuel economy for vehicles and machinery.	Construction Contractor/ EO	GHG modelling Records of fuel additives purchase/ used	Ongoing throughout construction
			22.2	Regularly service vehicles and machinery to ensure optimal fuel efficiency.	Construction Contractor/ EO	Maintenance records	Weekly inspections throughout construction
			22.3	Adhere to speed limits of 40km/hr on paved site roads and 20 km/hr on unpaved haul routes.	Construction Contractor/ EO	TMP Incident report	Throughout construction
23	• Earthworks for processing plant and WRD • Construction of roads and road crossings • Excavation and trenching	Damage to or disturbance of palaeontological resources	23.1	Train personnel to ensure that employees are alert as to the potential occurrence of fossil bones, archaeological material and of unrecorded burials.	Construction Contractor/ EO	Record of training	Throughout construction

			23.2	Develop and implement a Fossil Finds Procedure to include:
				• If fossils occur on site they need to be photographed, removed and stored in a safe place for a palaeontologist to assess. Since the fossils are too small to see it is recommended that samples of the black, finely laminated rocks of the Nondweni Group that overlie the iron ore deposits are put aside for future research. Amafa/ the South African Heritage Resources Agency (SAHRA), must be informed and supplied with contextual information:
				  • A description of the nature of the find.
				  • Detailed images of the finds (with scale included).
				  • Position of the find (GPS) and depth.
				  • Digital images of the context. i.e. the excavation (with scales).
				  • Amafa/ SAHRA and an appropriate specialist palaeontologist should assess the information and liaise with Jindal Iron Ore (Pty) Ltd, the environmental consultants and the ECO and a suitable response should be established.
				  • In the event of a significant fossil find, a professional palaeontologist must be appointed to undertake the excavation of the fossils and to record their contexts. The palaeontologist must also undertake the recording of the stratigraphy and sedimentary geometry of the exposures, must attempt sampling of the ambient small fossil content and must undertake the compilation of the detailed report.
				  • A permit from Amafa/ SAHRA is required to excavate fossils. The applicant should be the qualified specialist responsible for assessment, collection and reporting (palaeontologist). Should fossils be found that require rapid collecting, application for a palaeontological permit will immediately be made to Amafa/ SAHRA. The application requires details of the registered owners of the sites, their permission and a site-plan map. All fossil finds must be recorded and the fossils and their contextual information (a report) must be deposited at a Amafa/ SAHRA-approved institution.
					RE/ EO
					Palaeontological specialist
						Visual inspection of excavations for fossils
						Record of findings
						Fossil Finds Procedure
						Permit for excavation
							Weekly inspections of newly opened trenches throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
24	• Earthworks for processing plant and WRD • Construction of roads and road crossings • Excavation and trenching	Damage to or disturbance of archaeology and/ or heritage resources	24.1	Train personnel to ensure that employees are alert as to the potential occurrence of fossil bones, archaeological material and of unrecorded burials.	Construction Contractor/ EO/ECO	Training material and schedule Record of training	Throughout construction

			24.2	Chance Finds Protocol must be in place for construction and operational phases.
				• Protocols for the identification, protection and recovery of heritage resources during construction and operation must include:
				  • It is possible that sub-surface heritage resources could be encountered during the construction phase of this project. The EO/ ECO and all other persons responsible for site management and excavation should be aware that indicators of sub-surface sites could include:
				    • Ash deposits (unnaturally grey appearance of soil compared to the surrounding substrate).
				    • Bone concentrations, either animal or human.
				    • Ceramic fragments, including potshards.
				    • Stone concentrations that appear to be formally arranged (may indicate the presence of an underlying burial, or represent building/structural remains); and
				    • Fossilised remains of fauna and flora, including trees.
				  • In the event that such indicator(s) of heritage resources are identified, the following actions should be taken immediately:
				    • All construction within a radius of at least 20m of the indicator should cease. This distance should be increased at the discretion of supervisory staff if heavy machinery or explosives could cause further disturbance to the suspected heritage resource.
				    • This area must be marked using clearly visible means, such as barrier tape, and all personnel should be informed that it is a ‘no-go’ area.
				    • A guard should be appointed to enforce this ‘no-go’ area if there is any possibility that it could be violated, whether intentionally or inadvertently, by construction staff or members of the public.
				    • No measures should be taken to cover up the suspected heritage resource with soil, or to collect any remains such as bone or stone.
				    • If a heritage practitioner has been appointed to monitor the project, s/he should be contacted, and a site inspection arranged as soon as possible.
				    • If no heritage practitioner has been appointed to monitor the project, the head of archaeology at Amafa’s Pietermaritzburg office should be contacted; telephone 033 3946 543).
				    • The South African Police Services should be notified by an Amafa Heritage staff member or an independent heritage practitioner if human remains are identified. No SAPS official may disturb or exhume such remains, whether of recent origin or not.
				    • All parties concerned should respect the potentially sensitive and confidential nature of the heritage resources, particularly human remains, and refrain from making public statements until a mutually agreed time.
				    • Any extension of the project beyond its current footprint involving vegetation and/or earth clearance should be subject to prior assessment by a qualified heritage practitioner, considering all information gathered during this initial heritage impact assessment.
					Construction Contractor/ EO Archaeological specialist	Visual inspection of open trenches to determine presence of artefacts
						Record of findings
						Chance Finds Procedure
							Weekly inspections of newly opened trenches throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
		Relocation of graves	24.3	Amafa will not issue a permit for any alteration to or disinterment or reburial of a grave unless it is satisfied that the developer has, in accordance with regulations made by the responsible heritage resources authority – • (a) made a concerted effort to contact and consult communities and individuals who by tradition have an interest in such grave or burial ground; and, • (b) reached agreements with such communities and individuals regarding the future of such grave or burial ground.	Construction Contractor/ EO Archaeological specialist	Visual inspection of open trenches to determine presence of artefacts Record of findings Chance Finds Procedure	Weekly inspections of newly opened trenches throughout construction

			24.4	The Chance Finds Protocol for unidentified graves must be in place for Construction and Operational Phases. This must include:
				• Any person who in the course of development or any other activity discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the responsible heritage resources authority which must, in co-operation with the South African Police Services and in accordance with regulations of the responsible heritage resources authority—
				  • (a) carry out an investigation for the purpose of obtaining information on whether or not such grave is protected in terms of the NHRA or is of significance to any community; and
				  • (b) if such grave is protected or is of significance, assist any person who or community which is a direct descendant to make arrangements for the exhumation and re-interment of the contents of such grave or, in the absence of such person or community, make any such arrangements as it deems fit.
					Construction Contractor/ EO
					Archaeological specialist
						Visual inspection of open trenches to determine presence of artefacts
						Record of findings
						Chance Finds Procedure
							Weekly inspections of newly opened trenches throughout construction

25	• Increased heavy traffic and vehicular movement	Road disturbance and traffic safety	25.1	Implement appropriate technical measures and road upgrades, where required, to provide continued access to facilities, and to minimise traffic disruptions.	Construction Contractor/ EO	Visual inspection DesiGNReports Grievance mechanism	Weekly inspections throughout construction
			25.2	Road safety mitigation measures at Point D (where the R66 joins the PTOW314) to include pedestrian crossings/ walkways must be implemented for pedestrian safety.	Construction Contractor/ EO	Visual inspection DesiGNReports Grievance mechanism	Weekly inspections throughout construction
			25.3	A dedicated right-turn lane on the northern approach of Road R66 should be implemented. Provision of a dedicated right-turn lane would require relocating the existing intersection to the south in order to accommodate the right-turn lane, due to an existing bridge to the north.	Construction Contractor/ EO	Visual inspection DesiGNReports Grievance mechanism	Weekly inspections throughout construction
			25.4	Provision of a dedicated left-turn lane on both the southern approach of Road R66 and the western approach of Road PROW15 where it joins the R66 (Point F).	Construction Contractor/ EO	Visual inspection DesiGNReports Grievance mechanism	Weekly inspections throughout construction
			25.5	Erect suitable traffic and construction signage to control traffic, raise awareness of potential risks/hazards and indicate alternative access routes, if needed.	Construction Contractor/ EO/Safety Officer	Visual inspection of signage presence Grievance mechanism Awareness training records	Weekly inspections throughout construction
			25.6	Implement suitable consultation procedures to ensure that potentially affected parties are informed about pending construction activities and potential disruptions.	Construction Contractor/ EO/Stakeholder Relations Manager	Record of consultation Grievance mechanism	Throughout construction
			25.7	All project related transport associated with the construction activities must adhere to stipulated national speed limits as displayed.	Construction Contractor/	Grievance mechanism	Throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
					ECO/Safety Officer		
			25.8	Peak traffic periods should be avoided as far as possible by heavy delivery vehicles.	Construction Contractor/ EO	Transport schedules and planning records Grievance mechanism	Monthly inspections throughout construction
			25.9	Implement a transport safety programme to achieve the mitigation objectives. Key components of the programme include: - Education and awareness training; - Speed limit enforcement; - Maintenance of the transport system where appropriate; and - Use of dedicated loading and off-loading areas on site.	Construction Contractor/ EO	Training records	Throughout construction
			25.10	Develop and implement a road safety awareness campaign and TMP .	Construction Contractor/ Safety Officer/Safety Manager	Awareness training schedule and material Training records	Throughout construction
			25.11	Implement a grievance procedure whereby traffic related issues can be raised/ reported and transparently and timeously addressed.	Construction Contractor/ ECO	Grievance mechanism	As required throughout construction
26	- Earthworks etc requiring resettlement of people from their land	Impacts to community health via changed farming practices	26.1	Liaison with local supermarkets to curb food inflation during the construction phase.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of discussions/ agreements Grievance mechanism	As required throughout construction
			26.2	Provision of sanitation awareness materials to local district environmental health officers for educational sessions with slaughterhouse, food handlers and vendors.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of liaison/ training Records of materials delivered	As required throughout construction
			26.3	Education on lifestyle behaviours including eating habits, exercise, etc. Supply of educational materials for use in local clinics, with cognizance of the generally low levels of education in the community.			
			26.4	Food security and childhood nutritional status can be improved through school feeding programmes, and education on food gardens, nutrition, and good nutritional habits.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of programmes implemented Proof of training provided	Throughout construction
			26.5	Engagement with charity organisations such as Gift of the Givers to establish a plan of action should there be critical food shortages in the region.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Records of engagement where required	As required

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
27	• Construction phase employment opportunities resulting in population influx • Potentially poorer living conditions • Increased investment in local communities	Increased exposure to disease Access to healthcare facilities	27.1	Efficient removal of organic/ domestic wastes by licensed contractors, draining of stagnant water (e.g. in ditches or hollows), and sealing off of building roofs and basements to control vector breeding sites.	Jindal Iron Ore (Pty) Ltd (Environmental Manager)	Collaboration with local community/ traditional Leaders	Throughout construction
			27.2	Replacement of pit latrines with flushable or dry diversion options in affected nearby communities.	Jindal Iron Ore (Pty) Ltd (Environmental Manager)	Collaboration with local community/ traditional Leaders	As required throughout construction
			27.3	Vector control in the local communities using indoor residual spraying is possible, however, sustainability is important and best practice guidelines should be implemented.	Jindal Iron Ore (Pty) Ltd (Environmental Manager)	Collaboration with local community/ traditional Leaders	As required
			27.4	Effective domestic waste management will be required with the influx of people to prevent disease-carrying vermin from being attracted to the region.	Jindal Iron Ore (Pty) Ltd (Environmental Manager)	Collaboration with local community/ traditional Leaders	
			27.5	Coordination with the relevant government departments (i.e. health and social development) to establish vector awareness programs.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Record of meetings Roll out of awareness programmes	Throughout construction
			27.6	Education on household and food hygiene and waste management for the control of vectors and vermin, keeping household surfaces clean, sealing off food storage must be undertaken.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of awareness programmes rolled out	Throughout construction
			27.7	Ongoing provision/support of basic clinic services. This could be through investment projects with existing clinics and/or the development of private clinics, for example onsite clinics for workers and their families, and potentially opening these up to the local community.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of investment or support of local clinic; or Design for an on-site clinic.	Throughout all phases
			27.8	Provision/support of private ambulance services.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of investment in or support of private ambulance service or similar as required through discussion with local emergency services.	Throughout construction
			27.9	Support of local hospitals, particularly for emergency/casualty care.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of investment in or support of local clinic/ emergency care or similar as required through discussion with local emergency services.	Throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			27.10	Health and healthy living (e.g. diet and exercise, dental care, clean water and food hygiene), and vaccination information campaigns to raise the baseline health level of the local community and limit the need for urgent healthcare.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of health awareness programmes undertaken	Throughout construction
			27.11	Engagement with the Department of Health to ensure that any investment in local healthcare projects is aligned with state healthcare plans for the region.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of engagement and outcomes	Throughout construction
			27.12	Engagement with flight emergency services to ensure availability for critical cases that local hospitals are not equipped to care for and identification of (and engagement with) nearest equipped hospitals to receive these cases	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager)	Proof of engagement and outcomes	
28	• Project-induced population influx • Negative impacts related to the presence of construction workers • Health, safety and security of communities	Measures to address population influx:	28.1	Effective implementation of the Social and Labour Plan (SLP), including the ring-fencing of a portion of procurement to locally empowered suppliers and a stipulation for them to employ local residents.	Jindal Iron Ore (Pty) Ltd (Project Manager)	Approved SLP Ongoing updates of SLP to include municipal input.	Throughout all phases
			28.2	Providing opportunities for local residents to take up construction jobs is likely to mitigate potential conflict arising from the influx of outsiders.	Construction Contractor/ EO	Proof of employment of local community members	Throughout construction
			28.3	Appropriate liaison structures should be established with local police services to monitor changes in crime patterns. Liaison should also be established with existing crime control organisations, such as community policing forums.	Security Manager/ Construction Contractor/ SAPS	Record of communication	As required throughout construction
			28.4	Communication of recruitment policies with local community and labour representatives, including traditional leadership and ward committees to discourage influx of jobseekers from other areas and to prevent potential community conflict.	Stakeholder Relations Manager/ Construction Contractor/ HR Manager	Record of communication	Throughout construction
			28.5	Involve the local municipality and community structures (e.g. ward councillors) to assist in communicating the intention to give preference to local labour, and to assist in identifying the recruitment stations and protocol.	Stakeholder Relations/ Construction Contractor/	Record of communication	Throughout construction
		Employee health & safety	28.6	Implement the existing HIV/AIDS awareness and prevention programme amongst all employees, and make this a condition of contract for any suppliers and sub-contractors.	HR Manager/ Construction Contractor/ Occupational Hygiene Manager	Record of awareness campaigns Supplier/ Construction Contractor contracts	Throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			28.7	Provide an adequate supply of free condoms (male and female) to workers.	Developer/ Construction Contractor/ ECO	Visual verification of availability	Weekly checks throughout construction
		Measures to address potential conflict between locals and non-locals	28.8	The Jindal MIOP 's recruitment and employment policies should be fair, transparent and readily available.	HR Manager/ Construction Contractor/	Recruitment Policy	Throughout construction
			28.9	Establish a grievance procedure and mechanism to lodge complaints at a location that is accessible to aggrieved members of the surrounding communities.	Stakeholder Relations Manager/ Construction Contractor/	Grievance mechanism	As required throughout construction
			28.10	Develop standby procedures with the local police and private security services to assist with any security incidents. These procedures should be aligned with the UN Voluntary Principles on Security and Human Rights.	Security Manager/ Construction Contractor/	Relevant Procedures on record	Quarterly checks throughout construction
			28.11	In the event of notable friction/ conflict between locals and non-locals, a conflict management plan may have to be developed and implemented in conjunction with other key stakeholders.	Security Manager/ Construction Contractor/ Stakeholder Relations Manager	Relevant Procedures on record	Quarterly checks throughout construction
		Health, safety & security of communities	28.12	Implement a Construction Contractor Management Plan which must include requirements with regard to health and safety, as well as conduct and controls for construction workers. This plan should be aligned with the UN Voluntary Principles on Security and Human Rights.	Safety Manager/ Construction Contractor/ Security Manager	Construction Contractor Management Plan on file	Annual audits
29	• Construction phase employment opportunities (direct and indirect). • Expenditure on construction activities.	Employment creation and economic stimulus Economic benefits Significance of project expenditure	29.1	Identify required core skills and extend employee skills audits to investigate the prevalence of required skills in the municipal towns/ communities, and structure skills development endeavours accordingly. Use of skills audit undertaken previously.	Construction Contractor/ /HR Manager	Local Employment Policy on file Recruitment records Construction Contractor Management Plans on file Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout construction
			29.2	Ongoing implementation of the skills development plan as identified in the SLP.	Jindal Iron Ore (Pty) Ltd (Project Manager/ Environmental Manager/ HR Manager	Proof of enrolment/ training of local community members Employment of these trainees	Throughout construction
			29.3	Review current targets for how much local labour should be used based on the needs of the Jindal MIOP and the availability of existing skills and people that are willing to undergo training.	Construction Contractor/ /HR Manager	Local Employment Policy on file Recruitment records Construction Contractor Management Plans on file	Throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
						Labour pool database developed and kept up-to-date Records of employee places of origin	
			29.4	Ensure, through a structured stakeholder engagement programme, that communities are aware of local employment requirements and opportunities that are available. Where required, the local resident status of applicants should be verified in consultation with community representatives and municipal structures.	Construction Contractor/ /Stakeholder Relations Manager	Local Employment Policy on file Recruitment records Construction Contractor Management Plans on file Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout construction
			29.5	Clearly advertise the nature and numbers of jobs available during the project phases in surrounding communities, and ensure that communities understand the local recruitment procedures. Eligibility criteria should be informed by local authorities, or similar, and clearly communicated to any potential beneficiaries.	Construction Contractor/ /HR Manager	Local Employment Policy on file Recruitment records Construction Contractor Management Plans on file Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout construction
			29.6	Co-ordinate recruitment through local offices set up for recruitment from local communities. A recruitment registry should be created for jobseekers to record relevant qualifications, work experience and contact details.	HR Manager/ Construction Contractor/ Stakeholder Relations Manager	Local Employment Policy on file Recruitment records Construction Contractor Management Plans on file Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout construction
			29.7	Formalise preferential employment of women and youth in the company recruitment policy. Performance indicators for promoting the employment of women and youth should be developed and implemented by the Jindal MIOP and its Construction Contractors. The positions reserved for these groups may only be filled with persons outside of these categories when it can be clearly demonstrated that no suitable persons are available.	HR Manager/ Construction Contractor/	Local Employment Policy on file Recruitment records Construction Contractor Management Plans on file Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout construction
			29.8	An up-to-date skills database would greatly facilitate local employment. It is suggested that the Jindal MIOP engage with the relevant municipal departments and/or active NGOs in developing this database. The database should be in place in advance of the Construction Contractors being appointed. The database should include documentation verifying the eligibility status of applicants.	HR Manager/ Construction Contractor/ Stakeholder Relations Manager	Local Employment Policy on file Recruitment records Construction Contractor Management Plans on file Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout construction
			29.9	Labour-based methods of construction (e.g. digging of trenches), should be used, where possible, to maximise the Jindal MIOP 's requirements for unskilled labour. If feasible, offer appropriate training and skills development to improve the ability of local community members to take advantage of employment opportunities arising.	Engineer/ Construction Contractor/ Stakeholder Relations	Local Employment Policy on file Recruitment records Construction Contractor Management Plans on file Labour pool database developed and kept up-to-date	Throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
					Manager/HR Manager	Records of employee places of origin	
			29.10	Provide employees with reference letters that they can submit to gain further employment. Also, provide certificates of completion for on-the-job training.	HR Manager/ Construction Contractor/	Reference letters/ certificates	Throughout construction
	• Local procurement		29.11	Review current targets for the use of local suppliers and sub-contractors where possible requiring that contractors from outside the local area that tender also meet targets for how many locals are given employment.	Commercial Manager/ Construction Contractor/ Stakeholder Relations Manager	Local Procurement Policy Record of local procurement	Throughout construction
			29.12	Assist smaller enterprises where possible in tendering for contracts and in accessing finance for their participation in projects. Tender forms need to be kept as simple as possible so as not to act as a barrier to entry and Jindal MIOP must be willing to provide assistance with tendering where required.	Stakeholder Relations Manager/ Construction Contractor/	Local Procurement Policy Record of local procurement	Throughout construction
			29.13	Tender criteria should require the relevant Construction Contractors to provide training and skills development to the locally recruited workforce. Where possible, training should be aimed at providing skills to employees that might enable them to apply for some permanent positions that become available once construction is complete, or at other construction companies active in the local and regional study area.	Commercial Manager/ Construction Contractor/ Stakeholder Relations Manager	Local Procurement Policy Record of local procurement	Throughout construction
			29.14	Identify procurement opportunities and goods/services that could be supplied by local contractors and service providers.	Commercial Manager/ Construction Contractor/	Local Procurement Policy Record of local procurement	Throughout construction
			29.15	Give preference to suitable sub-contractors or SMMEs located firstly in the surrounding towns/ settlements, then in surrounding municipalities.	Stakeholder Relations Manager/ Construction Contractor/	Local Procurement Policy Record of local procurement	Throughout construction
			29.16	Develop a register of SMMEs and the types of goods and services they provide. Work with local municipalities to develop SMMEs through relevant forums and committees. Where SMMEs do not exist locally, investigate the possibility of launching a training/ skills development initiative under the auspices of the skills development programme required for the SLP.	Commercial Manager/ Construction Contractor/ Stakeholder Relations Manager	Local Procurement Policy Record of local procurement	Throughout construction
			29.17	Include local procurement requirements/ targets in procurement policies and Construction Contractor agreements. Monitor the procurement practices of Construction Contractors and enforce requirements. If contracts are awarded to non-local service providers, Construction	Commercial Manager/ Construction Contractor/	Local Procurement Policy Record of local procurement	Throughout construction

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
				Contractors should demonstrate that reasonable action was taken to identify a local service provider.	Stakeholder Relations Manager		
			29.18	Clearly advertise the nature and extent of local procurement opportunities during all project phases.	Commercial Manager/ Construction Contractor/ Stakeholder Relations Manager	Local Procurement Policy Record of local procurement	Throughout construction

28.4 OPERATIONAL PHASE ENVIRONMENTAL MANAGEMENT PLAN

28.4.1 Introduction

This Operational EMPr (OEMPr) covers the requirements for controlling the impact on the environment of operational activities. This OEMPr aims to provide Jindal Iron Ore (Pty) Ltd with the necessary tools to ensure that the potential impacts on the environment during the operation and maintenance of the Jindal MIOP are minimised and the social benefits enhanced. It also aims to ensure that the infrastructure is operated and maintained according to Good Practice. The OEMPr matrix is included in Table 28-3.

This OEMPr is a working document that may be amended to enhance its effectiveness for environmental control.

28.4.2 Application

The application and implementation of the OEMPr shall be the responsibility of Jindal Iron Ore (Pty) Ltd. Jindal Iron Ore (Pty) Ltd is to designate an EO to ensure that relevant requirements of the OEMPr are implemented, and that the site is suitably managed. Jindal Iron Ore (Pty) Ltd may appoint a suitably qualified and experienced person from within the existing staff to fulfil the role of EO.

Should Jindal Iron Ore (Pty) Ltd sub-contract any portion of the operational activities to a third party, the OEMPr must be part of the contract and must be binding.

The roles and responsibilities of each of the above-mentioned environmental management bodies have been detailed in Figure 28-2.

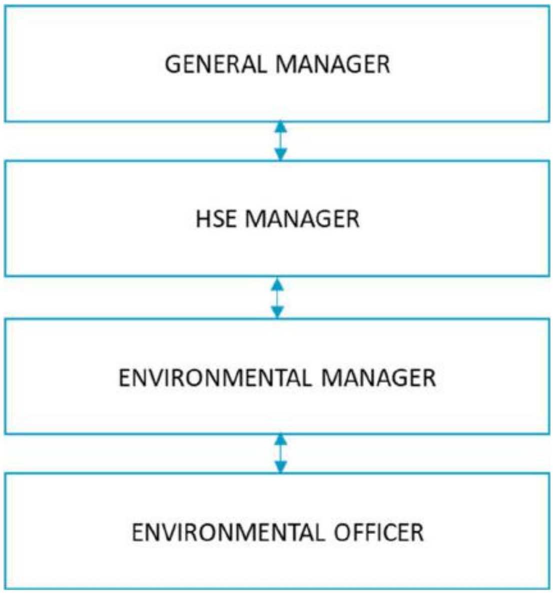


Figure 28-2 Operational Phase Roles and Responsibilities

28.4.2.1 Environmental Manager

The Environmental Manager would act as Jindal Iron Ore (Pty) Ltd.'s on-site implementing agent and carries the responsibility to ensure that operational activities are executed in compliance with the EMPr.

Any on-site decisions regarding environmental management are the responsibility of the Environmental Manager in accordance with their delegated authorities. The Environmental Manager shall oversee the EO and ensure their responsibilities are fulfilled.

28.4.2.2 Environmental Officer

A suitably qualified and trained individual appointed by Jindal Iron Ore (Pty) Ltd prior to the operational phase of the project, would fulfil the role of the EO. The primary roles and responsibilities of the EO will be:

- To oversee the implementation of the OEMPr on site in accordance with the OEMPr and Jindal Iron Ore (Pty) Ltd' internal environmental management systems;
- To visit the site on a monthly basis (or as required) and advise on areas of environmental management, or compliance with the OEMPr requiring attention;
- To visit the site more regularly during the first three months of operation, during which more frequent monitoring may be required for the establishment of certain programmes or aspects of environmental management;
- To be called to site in the case of any emergency situation which may impact on the local environment;
- To liaise with various specialists and the local authorities if required, regarding issues relating to environmental management;
- To report on compliance with the OEMPr specifications to Jindal Iron Ore (Pty) Ltd;
- To facilitate environmental audits and ensure that they are undertaken, as required;
- To keep a comprehensive record of environmental management, issues of non-compliance and minutes of meetings for audit purposes;
- To ensure monitoring programmes are implemented during the operational phase; and
- To undertake any other tasks outlined in this document, on the behalf of Jindal Iron Ore (Pty) Ltd.

28.4.2.3Independent Environmental Auditor

Since provision has been made for the EO to be an internal Jindal Iron Ore (Pty) Ltd appointment, Jindal Iron Ore (Pty) Ltd shall employ an independent Environmental Professional with a post graduate degree in environmental studies and a minimum of five years relevant experience to act as the independent environmental auditor (IEA) for the site. The IEA is to be employed upon completion of the first year of operation, and is to perform an annual formal audit on the OEMPr, and its implementation by the relevant parties at intervals as indicated in the environmental authorisation . Specific audit requirements are contained within Section 27.4.4.

28.4.3 Financing for Environmental Management

The budget for the implementation of the OEMPr shall come out of Jindal Iron Ore (Pty) Ltd.'s Jindal MIOP operational budget. Jindal Iron Ore (Pty) Ltd must review the OEMPr and allocate the requisite funds to facilitate compliance. The majority of the items addressed in the OEMPr relate to required preventative maintenance, operator legal compliance, and responsible environmental management. Monitoring costs are also to be included. These budgets are to be reviewed annually and adjusted based on operational requirements and the results of compliance audits.

28.4.4 OEMPr Review and Audit

28.4.4.1OEMPr Audit

Audits of the OEMPr implementation should be undertaken on an annual basis. Internal audits (by the EO) should be done on a quarterly basis with an external audit conducted by the IEA as specified below.

Each audit is to be based on site visits by the auditor as well as a review of any records of environmental management and monitoring to be kept by the EO. The audit must also determine whether the OEMPr is adequately dealing with the range of environmental impacts on the site, i.e. whether the plan is still appropriate, or whether it needs to be extended.

The audit report is to include recommendations of changes required to the OEMPr document, management practices, etc., to improve environmental management of the site. The results of this audit are to be submitted to the KZN DMRE.

28.4.4.2OEMPr Review

A schedule for the review of the OEMPr should be established by Jindal Iron Ore (Pty) Ltd. It is recommended that the effectiveness of the OEMPr be reviewed on an annual basis, and possibly bi-annually in the first year of operation. The need for review would be identified during the annual audits. The review process should be aligned with the scheduling of the Management Review process defined in the mine’s ISO 14001 environmental management system.

Any proposed changes are to be submitted by the EO to KZN DMRE for approval prior to implementation. Amendments or additions made to the document (with the approval of the relevant authorities) are to be included as annexures, distributed to all relevant parties, and should be considered as OEMPr specifications to which all relevant parties are bound.

Results of internal environmental audits are to inform Jindal Iron Ore (Pty) Ltd of changes required to the OEMPr documentation.

28.4.5 Operational Phase Impact Management Actions

The impact management actions that have been identified for the operational phase of the Jindal MIOP are summarised in Table 28-3.

Table 28-3 Description of Impact Management Actions – Operational Phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
1	• Compliance with EMPr and EA	Confirm commitment to adherence to EMPr and Construction Contractor Compliance Standards	1.1	Ensure that the EMPr, Construction Contractor Compliance Standards and EA are available on- site throughout the operational phase.	EO/ Environmental Manager	Copy of signed EMPr and EA on-site	Throughout operational phase
			1.2	Ongoing awareness training of all employees on environmental concerns.	Environmental Manager/ EO	Proof of training Daily toolbox talks	Annually throughout operational phase
		Auditing of compliance with EMPr and EA	1.3	An annual audit shall be undertaken by an independent auditor, and a report shall be submitted to DMRE. The audit report shall indicate the date of the audit, name of auditor, and outcome of audit in terms of compliance with the environmental authorisation and conditions of the EMPr.	Environmental Manager/ EO	Audit report and proof of submission to DMRE	Annually throughout operational phase
2	• Health and Safety of employees during operational activities	Ensure the health and safety of all employees and site users	2.1	Health and safety in accordance with the Mine Health and Safety Act requirements must be in place.	HSE Manager/ EO	Updated Health & Safety Plan	Throughout operational phase
			2.2	Install firefighting equipment (e.g. fire hydrants, fire hose reels and an automatic sprinkler system) in buildings and maintain to meet the minimum requirements of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHS Act, 1993).	HSE Manager/ EO	Visual Inspection of equipment availability and condition Weekly Safety Reports Maintenance records	Throughout operational phase
			2.3	Appropriate PPE must be worn by all personnel (e.g. footwear, earplugs, masks, protective clothing and goggles) in areas where these are deemed applicable and as defined in the safety management system.	HSE Manager/ EO	Occupational safety inspection reports	Throughout operational phase
			2.4	Implement Health and Safety communication and training programmes to prepare workers to recognise and respond to workplace hazards. Programmes will include, as a minimum, aspects of hazard identification, safe operating and materials handling procedures, safe work practices, basic emergency procedures and special hazards unique to their jobs.	HSE Manager/ Training Manager	Signed training registers	Throughout operational phase
			2.6	Undertake a job safety analysis (Risk Assessment) to identify specific potential occupational hazards and industrial hygiene surveys, as appropriate, to monitor and verify chemical exposure levels, and compare with applicable occupational exposure standards.	Occupational Hygiene Manager	Records of safety analysis	Throughout operational phase
			2.7	Display safety signage in prominent areas at the entrance to designated high-risk zones. All employees' working conditions shall comply with the requirements of the Mine Health and Safety Act.	Plant Manager/HSE Manager	Safety Officer inspection reports Incident Reports	Throughout operational phase
			2.8	Conduct regular medical surveillance (which includes employee hearing tests and monitoring) for all employees working in designated noise zones.	Occupational Hygiene Manager/ HSE Manager	Medical Reports	Throughout operational phase
			2.9	Develop and implement an ERP that is commensurate with the risks of the facility.	Safety Manger/ Occupational Hygiene Manager	ERP on site Proof of training	Throughout operational phase
3	• All operational related activities resulting in environmental impacts	General site requirements	3.1	Adhere to good health and safety and good housekeeping practices on site.	EO	Site inspection reports Incident report	Throughout operational phase
			3.2	Establish good waste management practices on site, to include recycling, separation and storage of hazardous waste at suitable lined/bunded areas. No dumping of waste (liquid & solid waste) is permitted to take place within 'no-go' areas.	EO	Waste volume records Site inspection reports Waste management procedure	Throughout operational phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			3.3	Implement a grievance procedure whereby any issues can be raised / reported and transparently and timeously addressed.	EO	Grievance mechanism Proof of close out of grievance Grievance register	Throughout operational phase
4	• Mining of the South East Pit and dewatering activities– cone of depression • Deposition of waste rock onto the WRD • Deposition of tailings onto the TSF • General mining activities	Impacts to groundwater levels or quality	4.1	The water level data should be evaluated against the model predictions annually and if significant variation is observed, the model should be re-calibrated. Once operational the model should be re-looked at on a 3 year basis.	EO	Recalibration of groundwater model when required.	Every 3 years throughout operational phase
			4.2	The boreholes on neighbouring farms may potentially become impacted by mine dewatering. The depths of the boreholes and the required yields should be evaluated as part of the hydrocensus study. Alternative water supply sources may be required for water users identified to be affected by mine dewatering.	EO	Monitoring data Proof of supply of water to affected groundwater users if required	Ongoing throughout operational phase
			4.3	Monitoring of boreholes at the TSF, near to the pit and on surrounding farms should be monitored monthly for a water level.	EO	Monitoring data	Monthly throughout operational phase
			4.4	The monitoring data for groundwater depth should be collated quarterly and analysed in detail annually to validate the findings of the modelling.	EO	Monitoring data	Quarterly throughout operational phase
			4.5	Update the water balance for Jindal MIOP, this data will benefit future groundwater modelling updates and predictions.	Environmental Manager/ EO	Updated water balance	Throughout operational phase
			4.6	Undertake water quality monitoring as per Table 30-1.	EO	Groundwater monitoring report	Monthly throughout operational phase
5	• Potential spills/ contamination from operational activities. • Clean and dirty water separation	Deterioration of surface water quality	5.1	Store all chemicals and toxins in bunded areas with sufficient capacity to retain 110% of the volume of material stored in the bund.	EO	Environmental Monitoring Report Record of spills and proof of safe disposal	Throughout operational phase
			5.2	Material Safety Data Sheets for all applicable materials stored on site must be readily available to on site personnel.	EO	MSDS on site	Throughout operational phase
			5.3	Maintenance of vehicles to be done within a lined bunded workshop area or off-site.	EO	Records of maintenance Visual inspections	Throughout operational phase
			5.4	Maintain stormwater systems on a monthly basis to prevent contaminated runoff (containing sediments, salts, pollutants/toxicants such as hydrocarbons/oils and water with low pH) from entering the receiving natural environment outside of the mine footprint. .	Plant Manager/ EO	Storm water maintenance schedule Environmental inspection reports	Monthly checks and after storm events throughout operational phase
			5.5	All contaminated stormwater must be conveyed to PCDs and not discharged into the natural environment.	Plant Manager/ EO	Storm water maintenance schedule Environmental inspection reports	Monthly checks and after storm events throughout operational phase
			5.6	All run-off from stockpiles should be captured in a suitable PCD. The base of the stockpile should be sealed to prevent infiltration of polluted water into the ground.	Plant Manager/ EO	Storm water maintenance schedule Environmental inspection reports	Monthly checks and after storm events throughout operational phase
			5.7	Oil spill kits should be available on site in case of spills of hydrocarbon chemicals and the relevant training on the use of spill kits must be provided.	Engineer/ EO	Report on spill kit availability and conditions	Weekly inspections throughout operational phase
			5.8	Implement the ERP in case of a discharge incident that could result in the pollution of surface water resources.	EO/Environmental Manager	Close out report Record of incident investigation	Throughout operational phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
						Proof of submission to DWS	
			5.9	Spillages of fuels, oils and other potentially harmful chemicals should be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the site must be removed and rehabilitated timeously and appropriately.	Engineer/ EO	Proof of safe disposal/ treatment	Weekly inspections throughout operational phase
			5.10	Monitor and maintain flood protection berms as required.	EO	Visual inspections of status and condition of berm	Monthly checks and after storm events throughout operational phase
			5.11	Signage should be provided at a visible location at the WWTW to inform workers and locals in the area of the purpose of the treatment works. Emergency telephone contact details should also be provided on the signs so that pump station failure, leakage or electrical power outages affecting the system can be easily reported.	EO	Visual inspections of status and condition of berm	Monthly checks and after storm events throughout operational phase
			5.12	A monitoring and maintenance programme should be prepared for the WWTW to ensure the on-going performance of infrastructure and prevention of foreseeable faults/problems that could result in leakage/failure. An annual report should be compiled, highlighting monitoring undertaken and main findings in terms of faults, problems, breakdowns, etc. Monitoring should consider the use of telemetry systems at pump stations and include regular inspections of the WWTW operation.	EO	Visual inspections on a monthly basis	Annual Report throughout operational phase
			5.13	Undertake water quality monitoring as per Table 30-1.	EO	Surface water monitoring report	Monthly throughout operational phase
6	• Mining of the South East Pit • Deposition of waste rock onto the WRD • Deposition of tailings onto the TSF • General mining activities	General terrestrial ecology management	6.1	No animals are to be killed on the site or surrounding areas, including species considered as dangerous/ vermin such as snakes and rats. Where these are encountered on the site, they should be removed and transferred to the nearest suitable natural habitat by a qualified handler.	EO	Visual inspection Proof of safe relocation	Throughout operational phase
			6.2	Any fauna that are found within the mining area should be moved to the closest point of natural or semi-natural vegetation outside the construction servitude. Where these are encountered on the site, they should be removed and transferred to the nearest suitable natural habitat by a qualified handler.	EO	Visual inspection Proof of safe relocation	Throughout operational phase
			6.3	All vehicles accessing the site should adhere to a low speed limit (typical speed limits are 40km/hr on paved site roads and 20 km/hr on unpaved haul routes) to avoid collisions with susceptible species such as reptiles (snakes and lizards).	EO	Visual inspection TMP	Throughout operational phase
			6.4	No trapping of any animal must be allowed on the site and nearby/adjacent areas.	EO	Visual inspection Grievance mechanism Toolbox talks	Throughout operational phase
			6.5	No fishing is to take place.	EO	Visual inspection Grievance mechanism Toolbox talks	Throughout operational phase
			6.6	No firewood or medicinal plants may be harvested from natural areas.	EO	Visual inspection Grievance mechanism Toolbox talks	Throughout operational phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			6.7	It is recommended that landscaping during the operational phase promote the use of indigenous species common to the region and that as much natural ground cover is established (naturally) on the site to help with binding soils and encouraging water infiltration, thus reducing overland flows and the pressure on stormwater management infrastructure.	EO	Visual inspection Records of ongoing rehabilitation and success thereof	Throughout operational phase
			6.8	Any damage to the terrestrial ecosystems that takes place during the life of the mine outside of the designated mining footprint must be rehabilitated immediately. A site-specific rehabilitation plan would need to be developed by a qualified botanist.	EO/ Botanist	Visual inspection Records of rehabilitation and success thereof	As required throughout operational phase
			6.9	It is recommended that the developer compile and implement a long-term plan to promote the conservation of remaining primary grassland vegetation communities and habitat on the property and surrounds, in consultation with local stakeholders and local and provincial conservation authorities EKZNW in this instance and a terrestrial ecologist consulted in this regard should such disturbance occur.	EO/ Ecology specialist, EKZNW	Offset agreement	Prior to Construction and ongoing maintenance throughout operational phase
		Fire management:	6.10	Adequate firebreaks around the mining areas must be maintained at all times.	EO	Visual inspection Proof of maintenance	Bi-annually or as needed throughout operational phase
			6.11	Illicit or informal fires must be prohibited on site and within natural areas.	EO	Visual inspection Possible fines administered for offenders	As required throughout operational phase
			6.12	No open fires to be permitted on the site.	EO	Visual inspection Possible fines administered for offenders	As required throughout operational phase
			6.13	Smoking must not be permitted in areas considered to be a fire hazard (i.e. in close proximity to grasslands, etc.).	EO	Visual inspection Possible fines administered for offenders	As required throughout operational phase
			6.14	Ensure adequate fire-fighting equipment is available at the site and train workers on how to use equipment.	EO	Visual inspection Maintenance records	Bi-annually or as needed throughout operational phase
			6.15	Ensure that all workers on site know the proper procedure in case of a fire occurring.	EO	Proof of training	Bi-annually or as needed throughout operational phase
			6.16	Ensure that no refuse wastes are burnt on the site or surrounding areas.	EO	Visual inspection Possible fines administered for offenders	As required throughout operational phase
7	• Presence of workers; and • Movement of vehicles.	Impact on fauna due to operational phase disturbances	7.1.	Catch and remove any fauna such as snakes, lizards or small mammals that are trapped or otherwise threatened by operational activities to a safe location by trained snake handlers who should be available on site at all times.	Biodiversity Manager	Record of any fauna relocated	Throughout operational phase
			7.2.	Maintain night lighting using low-UV type lights (such as most LEDs) to minimise attracting insects, bats and nocturnal birds.	EO/Engineer	Visual inspection	Throughout operational phase
			7.3.	All construction vehicles using internal roads should adhere to a low speed limit 20 km/h) to avoid collisions with susceptible species such as snakes, tortoises, rabbits or hares. Speed monitoring of construction vehicles and regular awareness raising of staff on this issue should be implemented.	EO/Engineer	Speed monitoring report Record of incidents Record of training attended	Throughout operational phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
		Impact on wetland and freshwater ecosystems	7.4	The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.	EO/ Biodiversity Manager	Record of any invasive species removal programmes	Bi-annually throughout operational phase
			7.5	Any action taken to control a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material, and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.	EO/ Biodiversity Manager	Record of any invasive species removal programmes	Bi-annually throughout operational phase
			7.6	An environmental contingency plan for freshwater ecosystems should be included in the Operational EMPr for the development. This plan should assist in the identification of abnormal/unforeseen environmental incidents and provide guidance for action in the event of an environmental emergency. The contingency plan should provide a framework of organisational responsibility and actions to be taken in the event of an incident. The plan should identify key personnel and their responsibilities in terms of preparing for abnormal incidents/events and identifying and responding to incidents including reporting on emergencies, and implementing measures to contain and mitigate impacts to aquatic ecosystems.	EO/ Biodiversity Manager	Environmental Contingency Plan on-site	Start of operational phase.
			7.7	Sewage treatment plant design and operation must meet relevant discharge standards with compliance monitoring. The design of the sewage treatment plant must allow for any large variations in flow and organic loading, both on a diurnal and seasonal basis, that are typically experienced by small treatment plants serving small groups of people. Some form of flow balancing may be necessary to deal with these variations (often accomplished by incorporating an enlarged septic tank ahead of the biological treatment stage).	Engineer/ EO	Design specifications Water quality monitoring data	Throughout operational phase
			7.8	As far as possible, treated water should be reused in the mining process.	Engineer/ EO	Water quality data post treatment Water balance to show reuse	Throughout operational phase
			7.9	Avoid delineated wetlands and riparian areas during mining, including the dumping of overburden and placement of stockpiles.	Engineer/ EO	Visual inspection	Throughout operational phase
			7.10	Restrict worker and machinery access to areas outside of sensitive environments.	Engineer/ EO	Visual inspection	Throughout operational phase
			7.11	Remove temporary diversions and impoundments once repair/maintenance work is complete.	Engineer/ EO	Visual inspection	Throughout operational phase
8	• Operational activities • Blasting for the open pit • WRD dumping • Haul trucks	Increased dust and other air emissions impacts on human health and nearby agriculture	8.1	Undertake ongoing dust and ambient air quality monitoring as per Table 30-1.	EO	Dust monitoring data Ambient air quality data	Throughout operational phase
			8.2	Addition of surfactants and dust suppressants when watering, specifically in working areas takes place close to the project boundaries.	Engineer/ EO	Visual inspection	Throughout operational phase
			8.3	Maintenance of the large trees and thick indigenous vegetation established along the Project boundary to reduce wind speeds and provide visual buffer between mining activities and community.	Engineer/ EO	Visual inspection Photographic records	Throughout operational phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			8.4	Reduce vehicle speeds to 40km/hr on paved site roads and 20 km/hr on unpaved haul routes.	Engineer/ EO	Visual inspection Grievance mechanism	Throughout operational phase
			8.5	Utilise chutes at material handling transfer points.	Engineer/ EO	Engineering design	Throughout operational phase
			8.6	While the processing plant will be enclosed, all bag filters on extraction points should be designed for 30 mg/Nm^3.	Engineer/ EO	Engineering design	Throughout operational phase
			8.7	Ensure that vehicles carrying dry soil and other materials are covered during travel.	Engineer/ EO	Visual inspection	Throughout operational phase
			8.8	Maintain the surface of haul routes with less erodible aggregate material such as compacted and treated crusher run / aggregate.	Engineer/ EO	Visual inspection Maintenance records	Throughout operational phase
		Air quality during blasting	8.9	Monitoring during the test phase should include a continuous ambient air quality analyser capable of measurement of PM_{10}, $PM_{2.5}$, NO_2 and CO. The analyser should be located downwind of the blast, at the boundary of the danger zone. Once the test blasting is complete and the proponent has demonstrated that concentrations of these pollutants are below the corresponding standard, this requirement can be removed and replaced by the long term monitoring campaign.	Engineer/ EO	Visual inspection Air quality monitoring results	Initial blasting in operational phase
			8.10	Blasting should only be undertaken during low winds speeds (< 5 m/s). No blasting should be undertaken where wind speeds are greater than 20m/s from a design safety perspective, however for dust dispersion purposes, 10m/s should be the maximum threshold.	Engineer/ EO	Visual inspection Air quality monitoring results Grievance mechanism	Throughout operational phase
			8.11	Avoidance of blasting during winds from the West and South West will minimise potential impacts on agricultural receptors.	Engineer/ EO	Visual inspection Air quality monitoring results Grievance mechanism	Throughout operational phase
			8.12	Avoid early morning blasting and late in the afternoon in winter when there is a possibility of atmospheric inversion.	Engineer/ EO	Visual inspection Air quality monitoring results Grievance mechanism	Throughout operational phase
			8.13	Do not blast in fog, or low overcast clouds.	Engineer/ EO	Visual inspection Air quality monitoring results Grievance mechanism	Throughout operational phase
			8.14	Do not blast in the dark (day time hours only).	Engineer/ EO	Visual inspection Air quality monitoring results Grievance mechanism	Throughout operational phase
			8.15	Refrain from blasting when wind is blowing strongly in the direction of the closest nearby receptors.	Engineer/ EO	Visual inspection Air quality monitoring results Grievance mechanism	Throughout operational phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			8.16	Watering or application of palliatives on the blast area following the charging of the blast holes with explosives is recommended where feasible.	Engineer/ EO	Visual inspection Air quality monitoring results Grievance mechanism	Throughout operational phase
9	- Operational activities - Blasting for the open pit - WRD dumping - Haul trucks	Noise nuisance to nearby sensitive receptors	9.1	Develop overburden dumps in such a way that the dumps act as a noise berm for closest receptors.	Engineer/ EO	Visual inspection Air quality monitoring results Grievance mechanism	Throughout operational phase
			9.2	Use of noise barrier walls or berms, especially around crushing area location.	Engineer/ EO	Visual inspection Grievance mechanism	Throughout operational phase
			9.3	Site inductions for all employees that operate machinery with the potential to generate significant noise should cover the importance of noise control and available noise reduction measures.	Engineer/ EO	Proof of noise awareness training	Throughout operational phase
			9.4	Plant operations should always be carried out using equipment that is in good working order and that meets current best practice noise emission levels.	Engineer/ EO	Proof of maintenance / servicing.	Annually throughout operational phase
			9.5	As far as reasonably practicable, sources of significant noise should be enclosed. The extent to which this can be done depends on the nature of the machines to be enclosed and their ventilation requirements. Enclosures are specifically recommended for pumps and compressors.	Engineer/ EO	Visual inspection Grievance mechanism	Throughout operational phase
			9.6	Minimise reversing of equipment to prevent nuisance caused by reversing alarms.	Engineer/ EO	Visual inspection Grievance mechanism	Throughout operational phase
			9.7	Driver practice when approaching and leaving the site should minimise noise emissions created through activities such as unnecessary acceleration and breaking noise.	Engineer/ EO	Visual inspection Grievance mechanism	Throughout operational phase
			9.8	Material stockpiles and mobile equipment staging, parking, and maintenance areas shall be located as far as practicable from SRs.	Engineer/ EO	Visual inspection Grievance mechanism	Throughout operational phase
			9.9	Permanent haul-road speed limits shall be established and enforced, especially where SRs are located close to the roads, typical speed limits are 40km/hr on paved site roads and 20km/hr on unpaved haul routes.	Engineer/ EO	Visual inspection TMP Grievance mechanism	Throughout operational phase
			9.10	The use of noise-producing signals, including horns, whistles, alarms, and bells shall be for safety warning purposes only.	Engineer/ EO	Visual inspection Grievance mechanism	Throughout operational phase
			9.11	Ensure that all haul roads are maintained and kept free of potholes, ruts and bumps in order to reduce vehicle noise.	Engineer/ EO	Visual inspection Grievance mechanism	Throughout operational phase
10	- Operational activities - Blasting for the open pit - WRD dumping - Haul trucks	Loss of soil resources	10.1	Store all chemicals and toxins in a bunded area with sufficient capacity to retain 110% of the volume of the stored substances.	Engineer/ EO	Environmental inspection report	Throughout operational phase
			10.2	Maintain vehicles and equipment either on impermeable surfaces or drip trays should be used.	Engineer/ EO	Inspection report	Throughout operational phase
			10.3	Store all waste in specified areas and should be on impermeable surfaces where required.	Engineer/ EO	Visual verification and Report	Throughout operational phase
			10.4	Spill kits must be available on site to ensure that any fuel or oil spills are cleaned up immediately and disposed of correctly.	Engineer/ EO	Report on Spill kit availability and conditions	Throughout operational phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			10.5	Provide awareness training to all workers (temporary and permanent) on the required steps to enable fast reaction to contain and remediate pollution incidents. In situ treatment is generally considered to be the preferred option because with successful in situ remediation the soil resource can be retained in the correct place. The in-situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bio remediation at a designated area after which the soils are returned	Engineer/ EO	Incident Report Waste volume reports to bioremediation site Training records	Throughout operational phase
			10.6	Undertake post rehabilitation audits to ascertain whether the remediation of any polluted soils and re-establishment of soil functionality has been successful and if not, to recommend and implement further measures.	EO/Biodiversity Manager	Audit findings	Throughout operational phase
			10.7	Any areas where erosion is evident need to be immediately rehabilitated to minimise loss of soil.	EO/Biodiversity Manager	Proof of rehabilitation Visual inspection	Throughout operational phase
			10.8	All compacted areas such as roads and stockpiles areas, during the last phases of site rehabilitation, must be ripped and planted in accordance with the rehabilitation plan.	EO/Biodiversity Manager	Proof of rehabilitation Visual inspection	Throughout operational phase when rehabilitation is required
11	- Active mining of open pit - WRD - Processing plant - Vehicular movement	Change in landscape and related visual impacts	11.1	Undertake continued rehabilitation of areas not being used for operational phase activities.	EO/Environmental Manager	Concurrent rehabilitation desiGNReport	Until rehabilitation is complete.
			11.1	Apply dust suppression methods to limit the dust generated on haul roads and at the crushing and processing plant areas.	Engineer/ EO	Visual inspection Grievance mechanism	Throughout operational phase
			11.2	Where new vegetation is proposed to be introduced to the site, an ecological approach to rehabilitation, as opposed to a horticultural approach, should be adopted as per the approved Rehabilitation Plan. For example, communities of indigenous plants will enhance biodiversity, a desirable outcome for the area. This approach can significantly reduce long-term costs as less maintenance would be required over conventional landscaping methods as well as the introduced landscape is more sustainable.	Engineer/ EO	Visual inspection Grievance mechanism	Throughout operational phase
			11.3	Install light fixtures that provide precisely directed illumination to reduce light “spillage” beyond the immediate surrounds of the site, i.e. lights (spotlights) are to be aimed away from sensitive viewing areas.	Engineer/ EO	Visual inspection Grievance mechanism	Bi-annually throughout operational phase
			11.4	Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on illegal entry to the site.	Engineer/ EO	Visual inspection Grievance mechanism	Bi-annually throughout operational phase
			11.5	Minimise the number of light fixtures to the bare minimum, including security lighting.	Engineer/ EO	Visual inspection Grievance mechanism	Bi-annually throughout operational phase
12	- Use of construction equipment and other machinery during construction activities.	Impact of the project on climate change	12.1	Some potential options for energy use reduction to be considered include: - Decarbonisation of the electricity supply: This could come in several forms, such as the decarbonisation of the grid emission factor as new renewable energy comes online in the national grid system. Alternatively, some decarbonisation could be achieved through the installation of on-site renewable energy for own use. - Electrification of the fleet: This option could mitigate emissions by electrifying the mine vehicle fleet and reducing the fuel consumption in mobile machinery. The electrification could be combined with renewable energy for further mitigation.	Jindal Iron Ore (Pty) Ltd/	Research on potential alternative sources of power Cost benefit analysis	Annually throughout operational phase
			12.2	Regularly service vehicles and machinery to ensure optimal fuel efficiency.	Engineer	Maintenance Schedule Maintenance records	Annually throughout operational phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
13	- Blasting of open pit	Ground vibration, air blast and fly rock	13.1	Conduct a test blast to assist with defining expected air blast levels for future blast designs.	Blast Engineer/ EO	Photographic record of blast Grievance mechanism	Test blast at start of mining operations
			13.2	Do blast design that considers the actual blasting and the air blast levels to be adhered too.	Blast Engineer/ EO	Blasting design approved/ signed off	Throughout the operational phase
			13.3	Do design for smaller diameter blast holes that will use fewer explosives per blast hole. Smaller diameter blastholes will also have better stemming vs explosive column ratio.	Blast Engineer/ EO	Blasting design approved/ signed off	Throughout the operational phase
			13.4	Blast design to consider proper stemming management.	Blast Engineer/ EO	Blasting design approved/ signed off	Throughout the operational phase
			13.5	Use of crushed aggregate with size of 10% the drill diameter.	Blast Engineer/ EO	Blasting design approved/ signed off	Throughout the operational phase
			13.6	Consider increase of stemming lengths to ratio of 25 to 30 times the blast diameter.	Blast Engineer/ EO	Blasting design approved/ signed off	Throughout the operational phase
			13.7	Only apply electronic initiation systems to facilitate single hole firing.	Blast Engineer/ EO	Blasting design approved/ signed off	For every blast throughout the operational phase
			13.8	Good housekeeping practices should be implemented and maintained with monitoring of each blast.	Blast Engineer/ EO	Photographic record of blast Grievance mechanism	For every blast throughout the operational phase
			13.9	Evacuating of people and animals out of the danger zone.	Blast Engineer/ EO	Photographic record of blast Proof of evacuation Grievance mechanism	For every blast throughout the operational phase
			13.10	Undertake independent structural surveys on a regular basis.	Independent structural engineer/ EO	Structural report from independent engineer signed off	Bi-annually throughout operational phase
14	- Blasting for open pit	Discovery of fossiliferous rocks	14.1	Implement the Fossil Chance Find Protocol	Engineer/ EO/ Palaeontological specialist	Proof of contact of specialist and stopped works.	As required throughout operational phase
15	- Increased heavy traffic and vehicular movement	Road disturbance and traffic safety	15.1	Avoid transport of product/ by-product during peak traffic periods as far as possible.	Logistics Manager	Logistics Schedule Grievance mechanism	Throughout operational phase
			15.2	Implement a transport safety programme to achieve the mitigation objectives. Key components of the programme include: - Education and awareness training; - Speed limit enforcement; - Maintenance of the transport system where appropriate; and - Use of dedicated loading and off-loading areas on site.	Safety Manager/ Commercial Manager/ EO	Training records	Throughout operational phase
			15.3	Implement a road safety awareness campaign and TMP which should be updated throughout the operational phase.	Jindal Iron Ore (Pty) Ltd/ Safety Manager	TMP Grievance mechanism	Throughout operational phase
16	- Open pit mining	Discovery of cultural heritage resources or unknown graves	16.1	Implement the Chance Finds protocol as per the CEMPr.	Engineer/ EO	Proof of contact of Amafa/ heritage specialist and stopped works.	Throughout operational phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
17	- Operational phase employment opportunities (direct and indirect). - Project expenditure. - Local procurement	Employment creation and economic stimulus Multiplier effect on the local and regional economy Economic benefits Significance of project expenditure	17.1	Jindal must engage in open and transparent discussions with community members, through the mandated channels to effectively manage community expectations. Continual engagement with local community and labour representatives throughout the operational phase, including traditional leadership and ward committees.	Stakeholder Relations Manager/ HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout operational phase
			17.2	Ongoing discussions and engagements with local commercial farmers to understand potential issues.	Engineer/ EO/ Stakeholder Manager	Minutes of meetings	Quarterly for 1st year of operations, Bi-annually thereafter.
			17.3	Tourism establishments focussed on business activities are likely to see a boost in business as people travel to the area to do business with the Jindal MIOP. Those tourism establishments that can shift their business model to capture a new market could see success. Jindal should actively promote and encourage its visitors to utilise the tourism products that are present in the area, especially those offering board and lodging.	Stakeholder Relations Manager	Records of local businesses use for Jindal MIOP related accommodation etc.	Annual reporting throughout operational phase
			17.4	Jindal must work with tourism product owners to understand if there are opportunities for collaborating around mine tourism, which is becoming a popular attraction in other parts of the world.	Stakeholder Relations Manager	Records of local businesses use for Jindal MIOP related accommodation etc.	Annual reporting throughout operational phase
			17.5	The mine should participate in the R66 Zululand Heritage Route as well as engage with the tourism and local economic development (LED) officers at the King Cetshwayo District Municipality to understand ways in which it can support the sector.	Stakeholder Relations Manager	Records of discussions with the relevant municipality.	Ongoing throughout operational phase
			17.6	Through a structured stakeholder engagement programme, ensure that communities are aware of local employment requirements and opportunities that are available. Where required, the local resident status of applicants should be verified in consultation with community representatives and municipal structures.	Stakeholder Relations Manager/ HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout operational phase
			17.7	Clearly advertise the nature and numbers of jobs available in surrounding communities, and ensure that communities understand the local recruitment procedures. Eligibility criteria should be informed by local authorities, or similar, and clearly communicated to any potential beneficiaries.	HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout operational phase
			17.8	Co-ordinate recruitment through local offices for recruitment from local communities. If this is not feasible, locate the recruitment offices at a central point (but not on-site) to control access and movement of jobseekers. A recruitment registry should be created for jobseekers to record relevant qualifications, work experience and contact details.	HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout operational phase
			17.9	Formalise preferential employment of women and youth in the company recruitment policy. Performance indicators for promoting the employment of women and youth should be developed and implemented by the Jindal MIOP and its Construction Contractors. The positions reserved for these groups may only be filled with persons outside of these categories when it can be clearly demonstrated that no suitable persons are available.	HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout operational phase
			17.10	Engage with the relevant municipal departments and/or active NGOs in developing and updating a skills database. The database should include documentation verifying the eligibility status of applicants.	HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date	Throughout operational phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
						Records of employee places of origin	
			17.11	Include local procurement targets in the Jindal MIOP 's procurement policy and Construction Contractor contract agreements.	Commercial manager	Procurement policy Construction Contractor contracts	Throughout operational phase
			17.12	Develop procedures for the procurement policy to ensure preferential procurement in accordance with BBBEE and the Mining Charter requirements.	Commercial Manager	Procurement policy Construction Contractor contracts	Throughout operational phase
			17.13	Develop and implement skills development and training targets for local procurement and include these in Construction Contractor contracts.	Stakeholder Relations Manager/HR Manager	Skills development and training targets Construction Contractor contracts	Annually throughout operational phase
			17.14	Procure from local suppliers throughout the life of the project to maximise the empowerment of Historically Disadvantaged South African's companies (and sharing in project benefits by disadvantaged communities in general).	Commercial Manager	Procurement policy Construction Contractor contracts	Throughout operational phase
			17.15	Update existing supplier database to include suppliers that may qualify for procurement opportunities after receiving training/ support. Identify procurement opportunities and goods/ services that could be supplied by local Construction Contractors.	Stakeholder Relations Manager/Commercial Manager	Database of local and district service providers Record of suppliers used	Throughout operational phase
	• Community health		17.16	Ongoing support of all programmes initiated during the construction phase as part of the CEMPr: • Coordination with the relevant government departments (i.e. health and social development) to establish vector awareness programs. • Education on household and food hygiene and waste management for the control of vectors and vermin, keeping household surfaces clean, sealing off food storage must be undertaken. • Ongoing provision/support of basic clinic services. This could be through investment projects with existing clinics and/or the development of private clinics, for example onsite clinics for workers and their families, and potentially opening these up to the local community. • Provision/support of private ambulance services. • Support of local hospitals, particularly for emergency/casualty care. • Health and healthy living (e.g. diet and exercise, dental care, clean water and food hygiene), and vaccination information campaigns to raise the baseline health level of the local community and limit the need for urgent healthcare. • Engagement with the Department of Health to ensure that any investment in local healthcare projects is aligned with state healthcare plans for the region. • Engagement with flight emergency services to ensure availability for critical cases that local hospitals are not equipped to care for and identification of (and engagement with) nearest equipped hospitals to receive these cases	Jindal Iron Ore (Pty) Ltd (Project Manager, HSE Manager)	Signed agreements with healthcare providers	Throughout operational phase

28.5 DECOMMISSIONING/ CLOSURE PHASE IMPACT MANAGEMENT ACTIONS

The impact management actions that have been identified for the decommissioning phase of the Jindal MIOP are summarised in Table 28-4.

Table 28-4 Description of Impact Management Actions – Decommissioning/ Closure Phase

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
1	• Compliance with EMPr and EA	Confirm commitment to adherence to EMPr and Contractor Compliance Standards	1.1	Ensure that the EMPr, Contractor Compliance Standards and EA are available on- site throughout decommissioning and are implemented.	EO	Copy of signed EMPr and EA with Contractor	Throughout decommissioning
		Ensure that all relevant permits/ licences have been issued.	1.2	Meet all relevant legal requirements.	Jindal MIOP Project Manager	Relevant Permits	Prior to decommissioning
		Auditing of compliance with EMPr and EA	1.3	An audit shall be undertaken by an independent auditor at the end of the decommissioning phase, and a report shall be submitted to DMRE. The audit report shall indicate the date of the audit, name of auditor, and outcome of audit in terms of compliance with the EA and conditions of the EMPr.	Environmental Manager/ EO	Audit report and proof of submission to DMRE	Once decommissioning has been completed
2	• Compliance with Closure Plan	Site Closure	2.1	The Jindal MIOP should implement the Closure Plan to achieve the Closure Objectives.	Environmental Manager/ EO	Close out of Closure Plan	From the start of decommissioning phase
		Auditing of compliance with Closure Plan	2.2	An audit shall be undertaken by an independent auditor at the end of the closure phase, and a report shall be submitted to DMRE. The audit report shall indicate the date of the audit, name of auditor, and outcome of audit in terms of compliance with the Closure Plan and conditions of the EMPr.	Environmental Manager/ EO	Audit report and proof of submission to DMRE	Once closure is finalised
3	• Rehabilitation Plan	Rehabilitation of all areas impacted by the Jindal MIOP	3.1	Implementation of the Rehabilitation Plan. This should be ongoing throughout all phases.	Environmental Manager/ EO	Ongoing monitoring of success, monthly reporting Final audit report	Throughout all phases, to be completed before mine closure
			3.2	A post rehabilitation audit should be undertaken at the end of life of mine to ascertain whether the remediation has been successful and if not, further measures should be recommended and implemented.	Environmental Manager/ Auditor	Audit Report	At end of decommissioning
4	• Health and Safety of employees during decommissioning related activities	Ensure the health and safety of Contractors and site users	4.1	Adhere to the Health and Safety Plan to avoid work related accidents.	Decommissioning Contractor/ EO/ Environmental Manager/ Closure project Manager	Signed Health and Safety Plan	Throughout decommissioning
			4.2	Appropriate PPE must be worn by all construction personnel. This shall include the use of ear protection in areas where the 8-hour ambient noise levels exceed 75dBA.	Decommissioning Contractor/ EO/ Environmental Manager/ Closure project Manager	Signed Health and Safety Plan, Incident report	Throughout decommissioning
			4.3	Undertake a bi-annual audit of all health and safety related management plans.	Decommissioning Contractor/ EO/	Health and Safety Audit reports	Bi-annually during decommissioning

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
					Environmental Manager/ Closure project Manager		
5	- All decommissioning related activities resulting in environmental impacts	General site requirements	5.1	Adhere to good health and safety and good housekeeping practices on site during decommissioning.	Decommissioning Contractor/ EO	All incidents recorded in an Incident Report.	Throughout decommissioning
			5.2	Awareness training should be provided to all workers (temporary and permanent) on the required steps to enable fast reaction to contain and remediate pollution incidents. In situ treatment is generally considered to be the preferred option because with successful in situ remediation the soil resource can be retained in the correct place. The in-situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bio remediation at a designated area after which the soils are returned	Decommissioning Contractor/ EO	Training records	Throughout decommissioning
			5.3	Establish good waste management practices on site, to include recycling, separation and storage of hazardous waste at suitable lined/bunded areas. All wastes that cannot be reused or recycled shall be collected by approved waste Decommissioning Contractors and disposed of in a registered landfill or licensed hazardous waste site.	Decommissioning Contractor/ EO	Waste Management Plan compliance report	Throughout decommissioning
			5.4	Implement a grievance procedure whereby any issues can be raised / reported and transparently and timeously addressed.	Closure Project Manager/ ECO	Grievance mechanism Proof of close out of grievance	Throughout operational phase
			5.5	All hard infrastructure should be removed from the site and recycled or disposed of in the appropriate manner.	Decommissioning Contractor/ EO	Proof of disposal	Throughout decommissioning
			5.6	Store all hazardous materials such as fuel, oil, etc. in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills or contaminated soils should be cleaned up in the appropriate manner and disposed of as hazardous waste.	Decommissioning Contractor/ EO	Record of incidents	Throughout decommissioning
6	- Rehabilitation of all disturbed areas once decommissioning is complete	Rehabilitation of site	6.1	A Rehabilitation Plan needs to be developed and implemented for the whole Jindal MIOP once decommissioning phase begins.	Jindal Iron Ore (Pty) Ltd/ Environmental Manager/ Ecologist	Progress reports Rehabilitation plan Rehabilitation schedule Monitoring reports	Site audits to continue until it is concluded that rehabilitation is successful.
7	- Potential spills/ contamination from decommissioning activities.	Deterioration of groundwater quantity and quality	7.1	Supply chemical toilets for use by personnel undertaking decommissioning works, which should be regularly, maintained at sites where worker/ contractor numbers are high.	Decommissioning Contractor/ EO	Proof of maintenance and cleaning schedules	Throughout decommissioning
			7.2	Oil spill kits should be available on site in case of spills of hydrocarbon chemicals and the relevant training on the use of spill kits must be provided.	Decommissioning Contractor/ EO	Proof of spill kits on site Signed awareness training register	Throughout decommissioning
			7.3	Develop and implement a decommissioning phase ERP in case of a discharge incident that could result in the pollution of surface/ ground water resources.	Decommissioning Contractor/ EO	Record of incidents	Throughout decommissioning
			7.4	Traffic and movement over stabilised areas should be controlled (minimised and kept to certain paths), and damage to stabilised areas should be repaired timeously and maintained.	Decommissioning Contractor/ EO	Compliance with TMP	Throughout decommissioning

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			7.5	Update the numerical groundwater model as a management and predictive tool to include the following: - Long-term monitoring data and optimised groundwater monitoring network would provide valuable information to update and re-run the model at least every two years during closure. - The updated groundwater model should be used in the closure modelling and closure planning. process. - Updates to the model would have to include mining plan, infrastructure data, and rehabilitation and closure options. Regular updates would increase the prediction accuracy as well as providing long-term trends and allowing for intervention and timeous prevention measures. - The update of the numerical groundwater model for closure modelling and planning should include an updated geochemical assessment and model to characterise the closure source terms more accurately.	Environmental Manager/ hydrogeological specialist	Updated numerical groundwater model Updated geochemical assessment	Every 2 years during closure
			7.6	Pit lake modelling to be undertaken prior to the closure of the Jindal MIOP.	Environmental Manager/ hydrogeological specialist	Pit lake model	Prior to decommissioning phase
			7.7	Post mining monitoring should be carried out for a period of 5 years in order to validate the findings of the modelling.	Environmental Manager/ hydrogeological specialist	Monitoring data	Quarterly for 5 years
			7.8	Depressed water levels should be mitigated by drilling deeper supply boreholes for water users located near to the pit/ mining area, if required.	Environmental Manager/ hydrogeological specialist	Proof of drilling undertaken	During the decommissioning phase.
			7.9	Water quality monitoring must be undertaken as per Table 30-1.	EO	Monitoring report	Monthly throughout decommissioning
8	- Potential spills/ contamination from decommissioning activities.	Deterioration of surface water quality and quantity and impacts on wetland and aquatic ecology	8.1	Implement the decommissioning phase ERP in case of a discharge incident that could result in the pollution of surface water resources, the ERP should be implemented.	Decommissioning Contractor/ EO	Incident Investigation report Record of incidents	Throughout decommissioning
			8.2	Oil spill kits should be available on site in case of spills of hydrocarbon chemicals and the relevant training on the use of spill kits must be provided.	Decommissioning Contractor/ EO	Proof of spill kits on site Signed awareness training register	Throughout decommissioning
			8.3	Any on-site maintenance of vehicles must be undertaken within a lined bunded area or off-site.	Decommissioning Contractor/ EO	Incident Investigation report Maintenance records kept on-site Record of incidents	Throughout decommissioning
			8.4	Phase/ schedule earthworks in order to minimise the footprint that is at risk of erosion at any given time, or schedule works according to the season.	Decommissioning Contractor/ EO	Earthworks schedule Record of incidents	Throughout decommissioning
			8.5	Phase working areas and progressive rehabilitation in case of linear earthworks to minimise the footprint and the extent of the disturbance at any given time.	Decommissioning Contractor/ EO	Earthworks schedule Record of incidents	Throughout decommissioning

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			8.69.1	Water quality monitoring should be undertaken as per the monitoring programme in Table 30-1.	EO	Monitoring Report	Throughout decommissioning
9	• Decommissioning activities. • Earthworks on-site. • Movement of vehicles.	Impact on fauna and flora	9.2	Compile a Closure and Decommissioning Plan with a detailed plan for restoration and rehabilitation in accordance with the identified Closure objectives.	Environmental Manager/ ecologist	Closure and Decommissioning Plan Proof of final rehabilitation achieved.	Throughout decommissioning until final closure
			9.3	Removal of any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities by appropriately trained persons to a safe location (such as secured offset properties) prior to the commencement of decommissioning activities.	Decommissioning Contractor/ EO	Record of relocations	Throughout decommissioning
			9.4	All vehicles accessing the site should adhere to a low speed limit (typical speed limits are 40km/hr on paved site roads and 20 km/hr on unpaved haul routes.) to avoid collisions with susceptible species such as snakes and tortoises.	Decommissioning Contractor/ EO	TMP Speed limit testing Record of incidents	Throughout decommissioning
			9.5	No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped.	Decommissioning Contractor/ EO	Visual inspections of trenches/ excavations for fauna Incident report	Throughout decommissioning
			9.6	Rip or scarify hardened soils and reseed or revegetate bare areas to allow regrowth and colonisation of a near natural ground cover of indigenous plants. Decompaction and other earthworks to mitigate further dust generating impacts.	Decommissioning Contractor/ EO	Rehabilitation plan	Throughout decommissioning
			9.7	All cleared and disturbed areas remaining after decommissioning should be rehabilitated with locally occurring species in accordance with the Rehabilitation Plan.	EO/ Ecologist if required	Rehabilitation plan Visual inspections against closure plan and design	Throughout decommissioning
			9.8	Any alien vegetation or erosion problems observed should be rectified as soon as possible using the appropriate revegetation and erosion control works.	EO/ Ecologist if required	Rehabilitation plan Photographic records	Throughout decommissioning
10	• Movement of construction equipment and other vehicle during construction activities. • Clearance of vegetation during the construction phase.	Potential human health impacts due to dust and emissions	10.1	Land clearance must be limited to what is required and should only be undertaken when necessary to limit land being left open for extended periods of time.	Decommissioning Contractor/ EO	Land clearance schedule	Throughout decommissioning
			10.2	Vehicles should adhere to a low speed, typical speed limits are 40km/hr on paved site roads and 20 km/hr on unpaved haul routes.	Decommissioning Contractor/ EO	TMP Speed limit testing Record of incidents	Throughout decommissioning
			10.3	Dust suppression should be used on areas where there is significant vehicle movement and dust generating activities through chemical binding agents and/or water sprays.	Decommissioning Contractor/ EO	Record of incidents	Throughout decommissioning
			10.4	Operate and maintain any generators and vehicles/equipment according to supplier specification at maintenance workshops.	Decommissioning Contractor/ EO	Maintenance records	Throughout decommissioning
11	• Noise generated due to decommissioning activities i.e. vehicle and machinery noise.	Nuisance impact on surrounding landowners	11.1	Limit decommissioning activities to day-time hours as defined by DMRE as far as possible.	Decommissioning Contractor/ EO	Construction activities between the hours of 06h00 and 19h00 or as specified in the EA Grievance mechanism	Throughout decommissioning

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			11.2	Review equipment to ensure the quietest available technology is used. Equipment with lower sound power levels should be selected in such instances and vendors/contractors should be required to guarantee optimised equipment design noise levels.	Decommissioning Contractor/ EO	Proof of equipment specifications	Throughout decommissioning
			11.3	Shut down or throttle down to a minimum machines and mobile equipment used intermittently to reduce noise and conserve energy.	Decommissioning Contractor/ EO	Grievance mechanism Incident report	Throughout decommissioning
			11.4	As far as reasonably practicable, sources of significant noise should be enclosed. The extent to which this can be done depends on the nature of the machines to be enclosed and their ventilation requirements.	Decommissioning Contractor/ EO	Grievance mechanism Incident report	Throughout decommissioning
			11.5	Doors to pump houses and generators should be kept closed when in use.	Decommissioning Contractor/ EO	Grievance mechanism Incident report	Throughout decommissioning
			11.6	A gradual start to noisy activities and as far as it is feasible, establish a schedule for noisy activities to reduce overlapping of works.	Decommissioning Contractor/ EO	Grievance mechanism Incident report	Throughout decommissioning
			11.7	Equipment should be regularly and effectively maintained.	Decommissioning Contractor/ EO	Maintenance records	Throughout decommissioning
12	• Soil erosion resulting from cleared and disturbed areas. • Soil compaction from decommissioning vehicles.	Loss of soil resources and land capability	12.	Demarcate the footprint for the proposed decommissioning activities sh to restrict soil clearing activities as far as practically possible.	Decommissioning Contractor/ EO	Visual verification of demarcated areas	Throughout decommissioning
			1	Implement dust suppression measures on exposed soils .	Decommissioning Contractor/ EO	Visual inspection of dust suppression effectiveness Soil stripping plan	Throughout decommissioning
			12.2	Replace soils 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 to the previous land capability rating, in compliance with the rehabilitation plan.	Decommissioning Contractor/ EO	Rehabilitation plan	Throughout decommissioning
			12.3	Rip infrastructure footprint areas to alleviate compaction post closure before rehabilitation.	Decommissioning Contractor/ EO	Visual verification Rehabilitation plan	Throughout decommissioning
			12.4	Re-vegetate infrastructure footprints according to the rehabilitation plan, preferably in spring and early summer to stabilize the soil and prevent soil loss during the rainy season .	Decommissioning Contractor/ EO	Compliance with rehabilitation plan	Throughout decommissioning
13	• Demolition related activities	Loss of soil resources	13.1	Revegetation of all bare surfaces should be done as soon as infrastructure is removed.	Decommissioning Contractor/ EO	Visual inspection Rehabilitation Plan	Throughout decommissioning
			13.2	No additional areas outside of the demarcated footprint must be affected by vegetation removal during decommissioning of infrastructure.	Decommissioning Contractor/ EO	Visual inspection Rehabilitation Plan	Throughout decommissioning
			13.3	Final landform of sloped areas such as waste rock dumps must have concave areas and longer footslopes, to limit sedimentation of nearby areas.	Decommissioning Contractor/ EO	Visual inspection Rehabilitation Plan	Throughout decommissioning

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
			13.4	Do not allow vehicle and equipment movement or parking outside of demarcated areas.	Decommissioning Contractor/ EO	Visual inspection Rehabilitation Plan	Throughout decommissioning
			13.5	Materials must be off-loaded and stored in designated laydown areas.	Decommissioning Contractor/ EO	Visual inspection Rehabilitation Plan	Throughout decommissioning
			13.6	Rip all compacted areas such as roads and stockpiles areas, during the last phases of site rehabilitation and rehabilitate with approved indigenous species as per the Rehabilitation Plan.	Decommissioning Contractor/ EO	Visual inspection Rehabilitation Plan	Throughout decommissioning
			13.7	Undertake post rehabilitation audits to ascertain whether the remediation of any polluted soils and re-establishment of soil functionality has been successful and if not, to recommend and implement further measures.	Decommissioning Contractor/ Environmental Manager	Audit findings	Throughout decommissioning
14	- Presence of infrastructure; - Vehicular movement; - Lighting; and - Decommissioning activities.	Change in landscape and related visual impacts	14.1	Rehabilitate all disturbed areas as soon as possible after deconstruction is complete in an area. Progressive rehabilitation, where feasible, of disturbed areas should be carried out to minimise the amount of time bare soils are exposed, creating a sharp contrast with the existing landscape.	Decommissioning Contractor/ EO	Visual inspection Rehabilitation Plan	Throughout decommissioning
			14.2	At closure, all remaining exposed terraced areas should be formed, contoured, and revegetated to appear natural and blend with the surrounding topographic features in conformance with the Rehabilitation Plan.	Decommissioning Contractor/ EO	Visual inspection Rehabilitation Plan Rehabilitation Audit finding	Throughout decommissioning
			14.3	Where areas are required to be rehabilitated and vegetation is proposed to be introduced to the site, an ecological approach, as opposed to a horticultural approach should be adopted. Communities of indigenous plants will enhance biodiversity which is a desirable outcome for the area. This approach can significantly reduce long-term costs as less maintenance would be required over conventional landscaping methods as well as the introduced landscape being more sustainable.	Decommissioning Contractor/ EO	Visual inspection Rehabilitation Plan Rehabilitation Audit finding	Throughout decommissioning
			14.4	Keep deconstruction sites neat and tidy at all times with litter and dust management measures.	Decommissioning Contractor/ EO	Housekeeping reports	Throughout decommissioning
			14.5	All lights used for illumination during deconstruction should be faced inwards and shielded to avoid light spillage to the surrounding areas.	Decommissioning Contractor/ EO	Visual inspection to ensure illumination installed correctly	Throughout decommissioning
15	- Use of construction equipment and other machinery during construction activities.	Impact of the project on climate change	15.1	The use of fuel additives which improve fuel economy should be investigated for vehicles and machinery.	Decommissioning Contractor/ EO	GHG reporting and modelling Records of fuel additives purchase/ used	Throughout decommissioning
			15.2	Vehicles and machinery should be regularly serviced to ensure optimal fuel efficiency.	Decommissioning Contractor/ EO	Visual inspection Maintenance records	Throughout decommissioning
16	- Increased heavy traffic and vehicular movement	Road disturbance and traffic safety	16.1	Erect suitable traffic and construction signage to control traffic, raise awareness of potential risks/hazards and indicate alternative access routes, if needed.	Decommissioning Contractor/ EO	Visual verification of signage presence Grievance mechanism Awareness training records	Throughout decommissioning
			16.2	Implement suitable consultation procedures to ensure that potentially affected parties are informed about pending decommissioning activities and potential disruptions.	Decommissioning Contractor/	Record of consultation Grievance mechanism	Throughout decommissioning

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
					Environmental manager		
			16.3	All project related transport associated with the decommissioning activities must adhere to stipulated national speed limits as displayed.	Decommissioning Contractor/ EO	Grievance mechanism	Throughout decommissioning
			16.4	Peak traffic periods should be avoided as far as possible by heavy delivery vehicles.	Decommissioning Contractor/ EO	Grievance mechanism	Throughout decommissioning
			16.5	Implement a transport safety programme to achieve the mitigation objectives. Key components of the programme include: - Education and awareness training; - Speed limit enforcement; - Maintenance of the transport system where appropriate; and - Use of dedicated loading and off-loading areas on site.	Decommissioning Contractor/ EO	Training records	Throughout decommissioning
			16.6	Implement a road safety awareness campaign and TMP.	Decommissioning Contractor/ EO	Awareness training schedule and material Training records	Throughout decommissioning
17	- Decommissioning phase employment opportunities (direct and indirect). - Expenditure on construction activities.	Employment during decommissioning Economic benefits Multiplier effect on the local and regional economy Significance of project expenditure	17.1	Through a structured stakeholder engagement programme, ensure that communities are aware of local employment requirements and opportunities that are available. Where required, the local resident status of applicants should be verified in consultation with community representatives and municipal structures.	Stakeholder Relations Manager/ HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout decommissioning
			17.2	Clearly advertise the nature and numbers of jobs available in surrounding communities, and ensure that communities understand the local recruitment procedures. Eligibility criteria should be informed by local authorities, or similar, and clearly communicated to any potential beneficiaries.	HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout decommissioning
			17.3	Co-ordinate recruitment through local offices for recruitment from local communities. If this is not feasible, locate the recruitment offices at a central point (but not on-site) to control access and movement of jobseekers. A recruitment registry should be created for jobseekers to record relevant qualifications, work experience and contact details.	HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout decommissioning
			17.4	Formalise preferential employment of women and youth in the company recruitment policy. Performance indicators for promoting the employment of women and youth should be developed and implemented by the Jindal MIOP and its Construction Contractors. The positions reserved for these groups may only be filled with persons outside of these categories when it can be clearly demonstrated that no suitable persons are available.	HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date	Throughout decommissioning

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
						Records of employee places of origin	
			17.5	Engage with the relevant municipal departments and/or active NGOs in developing and updating a skills database. The database should include documentation verifying the eligibility status of applicants.	HR Manager	Local Employment Policy on file Recruitment records Labour pool database developed and kept up-to-date Records of employee places of origin	Throughout decommissioning
18	• Construction phase employment opportunities (direct and indirect). • Expenditure on construction activities.	Loss of employment due to closure	18.1	Develop a Social Closure Plan (which includes socio-economic measures) at the start of the Jindal MIOP to include the following: • Predict the likely socio-economic impact of closure on employee households, local communities and the region, and recommended measures to address these impacts; • Identify critical issues which could affect the on-going sustainability of employees and communities during closure, by means of a detailed consultation process; • Identify alternative livelihood and socio-economic development opportunities for employees, as well as community-based projects which may become sustainable over the long-term; and • Provide financial and/ or technical support for the establishment of sustainable community projects.	HR Manager/ Stakeholder Relations Manager	Social Closure Plan Proof of relevant stakeholder engagement	Prior to and throughout closure
			18.2	It is recommended that the Closure Plan provide more detail on how the Jindal MIOP would assess and mitigate/manage the social and economic impacts on individuals, communities and the local economy when retrenchments and closure is certain. When downscaling and/or retrenchment take place, the Jindal MIOP should assist affected employees in finding alternative employment or livelihood opportunities. This should be done if workers cannot be integrated or redeployed to other operations or if they are not of a retirement age.	HR Manager/ Stakeholder Engagement Manager	Closure Plan Proof of relevant stakeholder engagement	Prior to and throughout closure
			18.3	Establishment of a Future Forum for the purposes of: • Promoting on-going discussions between employer and employee regarding the future of the Jindal MIOP ; • Identifying solutions to problems/challenges which could arise and impact on the operation of the Jindal MIOP ; • Discussing issues concerning retrenchment and downscaling, and identifying turnaround strategies; • Developing and implementing prevention and/or redeployment strategies in the management of retrenchments; • Coordinating the notification process during retrenchments or closure; and • Mobilising the Department of Labour Social Plan Services for technical assistance on job advice, and retrenchment during retrenchment and closure.	HR Mananger	Establishment of Future Forum	Prior to decommissioning and closure
			18.4	Implementation of a consultation process in terms of Sections 189 and 189 (A) of the Labour Relations Act. Project management and members of the Future Forum would administer this consultation process.	HR Manager	Proof of consultation	Consultation process would commence when the Jindal MIOP decides to reduce its operational activities.
			18.5	Approach the Department of Labour for the utilisation of its resources and support services, such as counselling services and placement services offered by its Labour Centres.	HR Manager	Proof of consultation	Consultation process would commence

#	Activity	Potential Impact	Mitigation Measures		Responsible parties	Compliance with Standards/ Parameters for Monitoring	Time Period for Implementation
			#	Management Actions			
							when the Jindal MIOP decides to reduce its operational activities.
			18.6	Inform affected areas, such as the local municipality and labour sending areas, of imminent retrenchments. The full impact of such retrenchments would be disclosed to the municipalities and possible solutions discussed.	Stakeholder Relations Manager	Proof of consultation	Consultation process would commence when the Jindal MIOP decides to reduce its operational activities.
			18.7	Integration of the workforce into various LED projects, if required, would be done in collaboration with local municipalities, and other stakeholders serving on the LED Forum. Where workers cannot be absorbed into LED initiatives, they should be furnished with skills training opportunities, enabling them to find alternative employment after decommissioning or retrenchment. Other initiatives could focus on assessment and counselling services for affected individuals.	HR Manager	List of LED projects and employee integration into these projects.	Throughout decommissioning
			18.8	Liaise with institutions (for example the National Productivity Institute) to identify other economic sectors and ventures that could absorb employees. This would involve the development of alternative livelihoods over a number of years to ensure that these livelihoods are well developed by the time the Jindal MIOP is decommissioned.	HR Manager	Proof of consultation	Consultation process would commence when the Jindal MIOP decides to reduce its operational activities.
			18.9	Partner with LED programmes of other projects and the local municipalities, as this would strengthen project initiatives, whereas initiatives funded by the Jindal MIOP alone may not be as effective.	HR Manager	Proof of partnerships in LED programmes	Throughout decommissioning
			18.10	Ensure that employees are trained in alternative skills and link this training to the initiatives described above.	HR Manager	Training Programme Proof of training	Throughout decommissioning
			18.11	Provide financial life skills to employees.	Jindal Iron Ore (Pty) Ltd)/ ECO	Proof of training	Throughout decommissioning
			18.12	Develop an exit plan for the hand-over of the Jindal MIOP post closure. This should be done in conjunction with the KZN Provincial Government and local authorities.	Environmental Manager/ Stakeholder Relations Manager	Exit Plan Proof of consultation with relevant government departments	Prior to closure

29. FINANCIAL PROVISION

29.1 DETERMINATION OF THE AMOUNT OF FINANCIAL PROVISION

29.1.1 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 environmental objective for closure is to minimise the impacts associated with the closure and decommissioning of the mine and to restore the land to a useful land use not dissimilar to the pre-mining land use. The conceptual closure plan objectives and principles include the following:

- Rehabilitate disturbed areas, excluding the tailings dam and return water dam, to their pre-mining land capability and land use potentials. The rehabilitation of disturbed land will be to the extent that it is within compliance of current national environmental quality objectives.
- Limit the short- and longer-term impacts of pollution on surface and ground water and related biodiversity.
- Control the further generation of dust.
- Minimize the visual impact of the permanent features at the mine e.g., WRD.
- Ensure that people and animals are not harmed by falling off or into hazardous excavations or steep slopes. The management objectives for these are to minimize safety risks to the public and livestock.
- Limit the impact on staff whose positions become redundant on closure of the mine.
- Keep relevant authorities informed of the progress of the decommissioning phase.
- Submit monitoring data to the relevant authorities.
- Build and maintain meaningful relations with all stakeholders (I&AP's).

29.1.2 Confirm Specifically that the Environmental Objectives in Relation to Closure Have Been Consulted with Landowners and Interested and Affected Parties

The broad closure objectives were outlined in the Scoping Report which was made available to I&APs, including landowners for review and comment. Further to this I&APs, including landowners, will be given a further opportunity to review the closure objectives associated with the proposed project as part of the review of the EIA and EMPr report.

The Financial Provision and initial Closure Plan are included in Appendix U for review by landowners and I&AP's.

29.1.3 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

According to the Financial Provisioning Regulations, 2015 (GNR 1147), the objective of the annual rehabilitation plan is to:

- Review concurrent rehabilitation and remediation activities already implemented.
- Establish rehabilitation and remediation goals and outcomes for the forthcoming 12 months, which contribute to the gradual achievement of the post-mining land use, closure vision and objectives identified in the holder's final rehabilitation, decommissioning and mine closure plan.
- Establish a plan, schedule and budget for rehabilitation for the forthcoming 12 months.
- Identify and address shortcomings experienced in the preceding 12 months of rehabilitation.

- Evaluate and update the cost of rehabilitation for the 12 month period and for closure, for purposes of supplementing the financial provision guarantee or other financial provision instrument.

Once environmental authorisation for the Jindal Project has been obtained, and the construction phase underway, then the annual rehabilitation plan for the forthcoming 12 months will be prepared.

Rehabilitation and remediation activities associated with the annual rehabilitation plan (during the initial 3 year construction phase) will focus primarily on:

- Clearing of vegetation in accordance with the relevant vegetation management procedures.
- Destructing and disturbing as little vegetation and biodiversity as possible (i.e., maintaining a small ‘construction buffer zone’), and retaining as much natural vegetation as possible.
- Stripping and stockpiling of soil resources in areas designated for surface infrastructure in line with a soil conservation procedure to be developed for the Project.
- Establishment of stormwater management facilities.
- Establishment of dust suppression techniques.
- General, hazardous and medical waste collection, storage and disposal.
- Monitoring of groundwater, surface water and air quality.

29.1.4 Explain Why it Can Be Confirmed that the Rehabilitation Plan is Compatible with the Closure Objectives.

The Rehabilitation Plan will be developed to be compatible with the closure objectives given that the closure objectives were taken into account during the determination of the financial provision.

29.1.5 Calculate and State the Quantum of The Financial Provision Required to Manage and Rehabilitate the Environment in Accordance with the Applicable Guideline

Based on the calculations it was determined that Jindal would be required to financially provide for FY2032 out of the closure forecast. The closure forecast considers the following factors:

- Current proposed mine works program;
- Pit growth design; and
- Waste rock dump design.

The total financial provision required for the Jindal proposed activities (including P&G’s, Contingencies and value added tax (VAT)) has been estimated to be **R 241 753 945.22** (Refer to Appendix U for the detailed cost breakdown per component and closure forecast).

The Financial Provisioning Regulations, 2015 (GNR 1147) require the closure cost estimate to have an accuracy of approximately 70% since the LOM is more than 10 years and less than 30 years. The calculated quantum of financial provision is included in Table 29-1.

Table 29-1: Calculated Quantum of Financial Provision (E-Tek, 2023)

Time-frame	Closure Cost Calculations based on the following activities	Financial Liability incurred during the year (incl. VAT)	Progressive Financial Liability (incl. VAT)	Progressive Liability as a % of LOM liability
End of Year 1	Construction underway	R 24,526,564.22	R 24,526,564.22	25%
End of Year 2	Construction ongoing	R 167 562 157,26	R 55,025,547	65%

Time-frame	Closure Cost Calculations based on the following activities	Financial Liability incurred during the year (incl. VAT)	Progressive Financial Liability (incl. VAT)	Progressive Liability as a % of LOM liability
End of Year 3	Construction complete	R 188 341 706,29	R 80,421,953	95%
End of Year 4	Mine operational for 1 year	R 208 598 436,13	R 84,654,687	100%
End of Year 5	Mine operational for 2 years	R 209 112 527,87	R 84,654,687	100%
End of Year 6	Mine operational for 3 years	R 221 731 482,36	R 84,654,687	100%
End of Year 7	Mine operational for 4 years	R 223 929 953,20	R 84,654,687	100%
End of Year 8	Mine operational for 5 years	R 231 709 837,36	R 84,654,687	100%
End of Year 9	Mine operational for 6 years	R 236 078 907,63	R 84,654,687	100%
End of Year 10	Mine operational for 7 years	R 241 753 945,22	R 84,654,687	100%
LOM	At life of mine closure	R -	R 84,654,687	100.0 %

29.1.6 Confirm that the Financial Provision Will be Provided as Determined

In terms of Section 41, Regulations 53 and 54 of the MPRDA, Jindal is required to make financial provision for the interim and final rehabilitation activities on the site. This provision is reviewed annually for adequacy and amended to compensate for new activities and/or inflation. During the annual review, confirmation will be provided that this amount can be provided for from operating expenditure.

Jindal will provide for the closure liability associated with the Project through the purchase of a Bank Guarantee as allowed by the Financial Provision for Prospecting, Exploration, Mining or Production Operations Regulations, with the Bank Guarantee provided to the DMRE following authorisation of the Project.

30. MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE EMPR THEREON

Environmental impacts requiring monitoring are listed in Table 30-1.

As a general approach, Jindal Iron Ore (Pty) Ltd would ensure that the monitoring programmes comprise the following:

- A formal procedure;
- Appropriately calibrated equipment;
- Where samples require analysis they would be preserved according to laboratory specifications;
- An accredited, independent, commercial laboratory would undertake the sample analyses;
- Parameters to be monitored would be identified in consultation with a specialist in the field and/or the relevant authority;
- If necessary, following the initial monitoring results, certain parameters may be removed from the monitoring programme in consultation with a specialist and/or the relevant authority;
- Monitoring data would be stored in a structured database;
- Data would be interpreted and reports on trends in the data would be compiled by an appropriately qualified person on a quarterly basis; and
- Both the data and the reports would be kept on record for the LOM.

Table 30-1 Monitoring Programme

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Relevant Standards</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td>1</td><td>EMPr monitoring and performance assessment for overall impact of the project</td><td>EMPr, EA conditions, project scope as provided for in this report</td><td>- Site inspection and verification of monitoring data against EMPr and EA conditions.
- Include photographic record, incident register, grievance register.
- Annual EMPr Compliance Audit</td><td>NEMA</td><td>Construction Manager, EO and ECO
Environmental Manager</td><td>Internal reports - Weekly (ECO)
Internal reports - Monthly (EO)
External audit to DMRE - Annually</td></tr>
<tr><td>2</td><td>- Potential spills from construction activities.
- Potential abstraction of groundwater during construction.
- Potential spills from operational activities.
- Open pit mining and associated dewatering</td><td>Change in groundwater levels and quality</td><td>The existing boreholes within the pit area will ultimately be mined out. However, they should be monitored prior to mining in order to better characterise the hydrogeology in the area. The TSF boreholes must be included into the monitoring network. The coordinates of TSF5-05 must be sourced and the coordinates of TSF5-04 must be validated. One additional borehole is proposed in this area based on the mass transport modelling in order to monitor the RWD.
<u>Jindal MIOP (Figure 30-1)</u>
Additional boreholes required for characterisation and monitoring in the pit area (Figure 30-1)
<table>
<tr><th>Borehole Name</th><th>East</th><th>South</th><th>Description</th></tr>
<tr><td>Proposed BH 1</td><td>349694</td><td>6822771</td><td>Pit perimeter – Characterisation & Monitoring</td></tr>
<tr><td>Proposed BH 2</td><td>351248.4</td><td>6822768</td><td>Pit perimeter – Characterisation & Monitoring</td></tr>
<tr><td>Proposed BH 3</td><td>353432.4</td><td>6822103</td><td>Pit perimeter – Characterisation & Monitoring</td></tr>
<tr><td>Proposed BH 4</td><td>349972.5</td><td>6822007</td><td>Pit perimeter – Characterisation & Monitoring</td></tr>
<tr><td>Proposed BH 5</td><td>352729.3</td><td>6821570</td><td>Pit perimeter – Characterisation & Monitoring</td></tr>
<tr><td>Proposed BH 6</td><td>351128.8</td><td>6821719</td><td>Pit perimeter – Characterisation & Monitoring</td></tr>
<tr><td>Proposed BH 7</td><td>349353.6</td><td>6823674</td><td>Down gradient of WRD</td></tr>
<tr><td>Proposed BH 8</td><td>350492.6</td><td>6823311</td><td>Down gradient of WRD</td></tr>
<tr><td>Proposed BH 9</td><td>349444.3</td><td>6824340</td><td>Upgradient of WRD</td></tr>
</table>
Existing boreholes in the pit area
<table>
<tr><th>Borehole</th><th>X</th><th>Y</th><th>Description</th></tr>
<tr><td>GJ01</td><td>352600</td><td>6821934</td><td>Community Borehole - In Pit Area</td></tr>
<tr><td>GJ02</td><td>350123</td><td>6822277</td><td>Community Borehole - In Pit Area</td></tr>
</table>
</td><td>SANS Drinking Water Standards,
South African Water Quality Guidelines: Domestic Use,
DWA Livestock water guidelines 1996,
Site IWUL</td><td>EO
Independent consultant</td><td>Groundwater levels: Monthly monitoring to measure the depth of groundwater levels at all boreholes
Groundwater Quality: Quarterly monitoring at all boreholes for all parameters specified</td></tr>
</table>

No.	Activity	Impact requiring monitoring	Functional requirements for monitoring	Relevant Standards	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions

GJ03	348358	6821714	Community Borehole - In Pit Area
GJ07	335681	6824806	Community Borehole - In Pit Area
GJ11	337321	6824016	Community Borehole - In Pit Area
GJ13	338028	6824029	Community Borehole - In Pit Area
GJ14	350371	6822260	Community Borehole - In Pit Area
GJ15	350622	6822232	Community Borehole - In Pit Area
STH-56	353271	6821880	DD - In Pit Area
STH-57	352387	6821819	DD - In Pit Area
STH-59A	350499	6822407	DD - In Pit Area
STH-66	351770	6822196	DD - In Pit Area
STH-69	352039	6822074	DD - In Pit Area
STH-71	352576	6821979	DD - In Pit Area
STH-75	350837	6822372	DD - In Pit Area
STH-76	349952	6822534	DD - In Pit Area
STH-80	350967	6822272	DD - In Pit Area
STH-85	350407	6822316	DD - In Pit Area
STH-86	353364	6821917	DD - In Pit Area
STH-88	350725	6822290	DD - In Pit Area
MWGA02	353119	6823280	Golder (2015) Drilled Characterisation hole
MWGA03	353305	6821966	Golder (2015) Drilled Characterisation hole
MWGA04	352932	6821798	Golder (2015) Drilled Characterisation hole
MWGA05	351396	6821726	Golder (2015) Drilled Characterisation hole

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Relevant Standards</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>MWGA06</td><td>350251</td><td>6822312</td><td>Golder (2015) Drilled Characterisation hole</td></tr>
<tr><td>MWGA07</td><td>351335</td><td>6822348</td><td>Golder (2015) Drilled Characterisation hole</td></tr>
<tr><td>MWGA01</td><td>353008</td><td>6822266</td><td>Golder (2015) Drilled Characterisation hole</td></tr>
</table>

Jindal TSF (Figure 30-2)

<table>
<tr><th>Borehole</th><th>Latitude (East)</th><th>Longitude (South)</th><th>Description</th></tr>
<tr><td>TSF5-01</td><td>358549.45</td><td>6818911.48</td><td>North of TSF (down gradient) between TSF and Mhlatuze River</td></tr>
<tr><td>TSF5-02</td><td>360005.43</td><td>6818748.19</td><td>East of TSF (down gradient) between TSF and Mhlatuze River</td></tr>
<tr><td>TSF5-03</td><td>360726.62</td><td>6816815.96</td><td>Southeast of TSF on a tributary of the Mhlatuze</td></tr>
<tr><td>TSF5-04</td><td>356315.91</td><td>6817134.16</td><td>Northwest are of the TSF</td></tr>
<tr><td>TSF5-05</td><td>356315.91</td><td>6817134.16</td><td>Redrill of TSF5-04</td></tr>
</table>

Monitoring Parameters

The following elements are required to be tested for as part of the monitoring process.

<table>
<tr><td>Al</td><td>Mn</td><td>K</td><td>HCO_3</td><td>Cr</td></tr>
<tr><td>As</td><td>Mo</td><td>Na</td><td>pH</td><td>Cu</td></tr>
<tr><td>B</td><td>Ni</td><td>Mg</td><td>Conductivity (µs/cm)</td><td>Fe</td></tr>
<tr><td>Ba</td><td>Pb</td><td>Cl</td><td>TDS</td><td>PO_4 as P</td></tr>
<tr><td>Be</td><td>Sb</td><td>SO_4</td><td>Zn</td><td>CO_3</td></tr>
<tr><td>Ca</td><td>Se</td><td>NO_3 as N</td><td>Hg</td><td></td></tr>
<tr><td>Cd</td><td>Tl</td><td>NO_2 as N</td><td>Si</td><td></td></tr>
</table>
</td><td></td><td></td><td></td></tr>
</table>

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Relevant Standards</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td></td><td></td><td></td><td><table><tr><td>Co</td><td>V</td><td>NH4</td><td>F</td><td></td></tr></table></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>
- Potential spills from construction activities.
- Potential spills from operational activities.
- Increased sedimentation due to erosion.
</td><td>Contamination of surface water resources</td><td>
The following parameters must be monitored upstream and downstream of the Jindal MIOP. Surface water monitoring locations are identified in and the following tables and Figure 30-3.

SLR Water Quality Monitoring Stations

<table>
<tr><th rowspan="2">Point</th><th colspan="2">Coordinates</th><th rowspan="2">Description</th></tr>
<tr><th>Latitude</th><th>Longitude</th></tr>
<tr><td>SW2</td><td>-28.717768°</td><td>31.274721°</td><td>Near Ntabandlovu Village, a small river crossing</td></tr>
<tr><td>SW3</td><td>-28.772743°</td><td>31.368183°</td><td>Upstream of Goedertroudam.</td></tr>
<tr><td>SW5</td><td>-28.653209°</td><td>31.407021°</td><td>West of R66 Road</td></tr>
<tr><td>SW7</td><td>-28.540284°</td><td>31.503128°</td><td>Near Ncayini Village on unnamed road</td></tr>
<tr><td>SW8</td><td>-28.631711°</td><td>31.567029°</td><td>Approximately 2 km southwest of Makhaseni Village</td></tr>
<tr><td>SW9</td><td>-28.715301°</td><td>31.509862°</td><td>Approximately 1.4 km East of the proposed Mine Pit</td></tr>
</table>

DWS Water Quality Monitoring Stations

<table>
<tr><th rowspan="2">Station Number</th><th colspan="2">Coordinates</th><th rowspan="2">Station Description</th></tr>
<tr><th>Latitude</th><th>Longitude</th></tr>
<tr><td>W12_103330</td><td>-28.7724</td><td>31.46878</td><td>Normanhurst 3023 - Goedertrou Dam on Mhlatuze River: at Dam Wall (NEMP nmmp) A01</td></tr>
<tr><td>W12_102826</td><td>-28.7725</td><td>31.46667</td><td>Goedertrou Dam on Mhlatuze River: Point in Dam Q02</td></tr>
<tr><td>W12_102825</td><td>-28.7725</td><td>31.46667</td><td>Normanhurst 3023 - Goedertrouw Dam (Lake Phobane) on Mhlatuze River: near Dam Wall (NCWQ) Q01</td></tr>
<tr><td>W12_102820</td><td>-28.7725</td><td>31.46667</td><td>Goedertrou Dam on Mhlatuze River: Down Stream Wei</td></tr>
<tr><td>W12_102819</td><td>-28.5522</td><td>31.15833</td><td>Mhlatuze River at Naauwkloof (Mtuza)</td></tr>
<tr><td>W12_102814</td><td>-28.7017</td><td>31.65139</td><td>Mfule River at Quneba/Rail (Mful)</td></tr>
<tr><td>W12_102808</td><td>-28.7725</td><td>31.46667</td><td>Mfulazane River at Golden Reef (NCWQ)</td></tr>
<tr><td>W12_102807</td><td>-28.5717</td><td>31.39278</td><td>Mhlatuze River at Normanhurst</td></tr>
</table>

<table>
<tr><td>pH</td><td>Nitrate as N</td></tr>
<tr><td>Electrical conductivity</td><td>Ammonia</td></tr>
<tr><td>Total dissolved solids</td><td>Potassium</td></tr>
</table>
</td><td>SANS for drinking water quality (SANS241:2006)
DWS guidelines 1996, irrigation, aquatic ecosystems and livestock watering
Site IWUL</td><td>EO
Independent consultant</td><td>
- Internal Reporting – Monthly for:
  - Water levels in holding dams; and
  - Drainage Inspections.
- External Reporting – Annual for:
  - Water Quality; and
  - Spillages/ emissions.
- Accidental spillages and overflows should be reported as and when they occur to the relevant authorities.

Monitoring for erosion during construction - after every rainstorm or flood event.
Operational phase - monthly during first the wet season or during routine maintenance inspections, as applicable.
</td></tr>
</table>

<table>
<thead>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Relevant Standards</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
</thead>
<tbody>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>Total suspended solids</td><td>E.coli</td></tr>
<tr><td>Aluminium</td><td>Manganese</td></tr>
<tr><td>Calcium</td><td>Magnesium</td></tr>
<tr><td>Fluoride as F</td><td>Iron</td></tr>
<tr><td>Total alkalinity as $CaCO_3$</td><td>Copper</td></tr>
<tr><td>Chloride as Cl</td><td>Lead</td></tr>
<tr><td>Sulphate as SO_4</td><td>Sodium</td></tr>
</table>
</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>Road Crossings
Flood protection/stormwater infrastructure
Workshop/office areas
Areas around the WRD, pit and processing plant.</td><td>Flooding of infrastructure</td><td>Monitoring and inspection of channels, containment berms, silt traps, culverts, pipelines and PCDs for signs of erosion, cracking, silting and blockages of inflows, to ensure the performance of the storm water infrastructure. Monitoring should be undertaken.</td><td>Visual inspections Inspection for flooding of infrastructure and land areas prone to flooding must be undertaken. Especially with the increased impervious areas, during an intense event flood water is likely to pond affecting areas that were not found to be inside the 1:100-year flood line.</td><td>EO</td><td>Daily during construction phase.
Monthly during wet season and after storm events.</td></tr>
<tr><td>5</td><td>Clearance of surface areas and earthworks</td><td>Impact on local species of conservation concern</td><td>Fixed vegetation plots with fixed point photography providing a representative picture of vegetation and plant species diversity within the larger study area and which will enable monitoring of any changes in vegetation condition and species diversity over time, multiple control sites which will be unaffected by planned mining should be included within each vegetation type occurring within the study area, areas immediately downslope as well as progressively further away from the mine should also be included to gauge the area affected by indirect impacts associated with mining.
Faunal surveys (birds, amphibians, reptiles, mammals, insects) which provide a representative picture of faunal species diversity within the larger study area and which will enable monitoring of any changes in species diversity overtime, likewise multiple control survey sites which will be unaffected by planned mining should be included within each habitat type occurring with the study area.
Sample plots to be advised by a biodiversity specialist before construction phase.</td><td>N/A</td><td>EO, Biodiversity specialists</td><td>Monthly assessment of the specified plots during construction.
Quarterly assessment of plots during operational phase
Quarterly reporting during construction phase
Annual reporting during operational phase</td></tr>
</tbody>
</table>

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Relevant Standards</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr>
<td>6</td>
<td>

Clearance of surface areas and earthworks
Construction of infrastructure in proximity to wetlands and freshwater resources
General mining activities

</td>
<td>Impact to aquatic biota and freshwater ecosystems</td>
<td>
<p>Prior to construction aquatic biomonitoring points to be identified by a qualified aquatic ecologist. The following components are to be assessed:</p>
<table>
<tr><th>Component</th><th>Tool/Method</th></tr>
<tr><td rowspan="3">In-stream biota and water quality</td><td>Macroinvertebrate Surveys SASS (South African Scoring System)</td></tr>
<tr><td>Diatoms</td></tr>
<tr><td>Fish Surveys</td></tr>
<tr><td>In-stream habitat</td><td>Index of Habitat Integrity (IHI)</td></tr>
<tr><td rowspan="3">Riparian vegetation</td><td>Riparian Vegetation Response Assessment Index (VEGRAI)</td></tr>
<tr><td>Sampling spatial extent, age, and structure of invasive plant species</td></tr>
<tr><td>Fixed point photos</td></tr>
<tr><td rowspan="8">Geomorphology</td><td>Geomorphic Assessment Index (GAI)</td></tr>
<tr><td>In-stream sediment sampling to monitor riverbed composition and distribution</td></tr>
<tr><td>Monitoring to assess changes in the distribution and abundance of in-stream habitats such as pools and riffles and off-channel habitats such as oxbows, distributaries, etc</td></tr>
<tr><td>Use of sediment pins/chains</td></tr>
<tr><td>River channel cross-sections using topographical surveys</td></tr>
<tr><td>Visual assessment and rating of bank erosion and channel scouring</td></tr>
<tr><td>Fixed point photos</td></tr>
</table>
<p>Water quality samples to be collected at the same sampling site include:</p>
<table>
<tr><th>Determinands</th><th>Unit of measure</th></tr>
<tr><td>Temperature</td><td>^{0}C</td></tr>
<tr><td>pH</td><td>pH units</td></tr>
<tr><td>Conductivity mS/m</td><td>mS/m</td></tr>
<tr><td>Total suspended solids (TSS)</td><td>mg/l</td></tr>
<tr><td>Total dissolved solids (TDS)</td><td>mg/l</td></tr>
<tr><td>Turbidity</td><td>NTU</td></tr>
<tr><td>Nitrate</td><td>mg N/l</td></tr>
<tr><td>Ammonia</td><td>mg N/l</td></tr>
<tr><td>Iron</td><td>mg Fe/l</td></tr>
<tr><td>Manganese</td><td>mg Mn /l</td></tr>
<tr><td>Phosphorus</td><td>SRP µg P/l, TP µg P/l)</td></tr>
<tr><td>Coliforms, <i>E. coli</i></td><td>Count/100ml</td></tr>
<tr><td>TPH (Total Petroleum Hydrocarbon) concentration</td><td>Gasoline Range Organics Diesel Range Organics phases. BTEX (benzene, toluene, ethylbenzene, and xylene)</td></tr>
<tr><td>Sulphates</td><td>mg/l</td></tr>
<tr><td>Full metal screening</td><td>mg/l</td></tr>
</table>
<p>Water samples are to be collected at a site where there is running water. If depth allows for sampling options, the water must come from the middle of the water column. All analyses must be done by an</p>
</td>
<td>TWQR for Aquatic Ecosystems
South African Water Quality Guidelines for Aquatic Ecosystems (DWAF, 1996).</td>
<td>EO/ Qualified aquatic ecologists</td>
<td>
<p>Biomonitoring:</p>

Quarterly throughout operational phase
Annual aquatic monitoring report

<p>Water quality analysis</p>

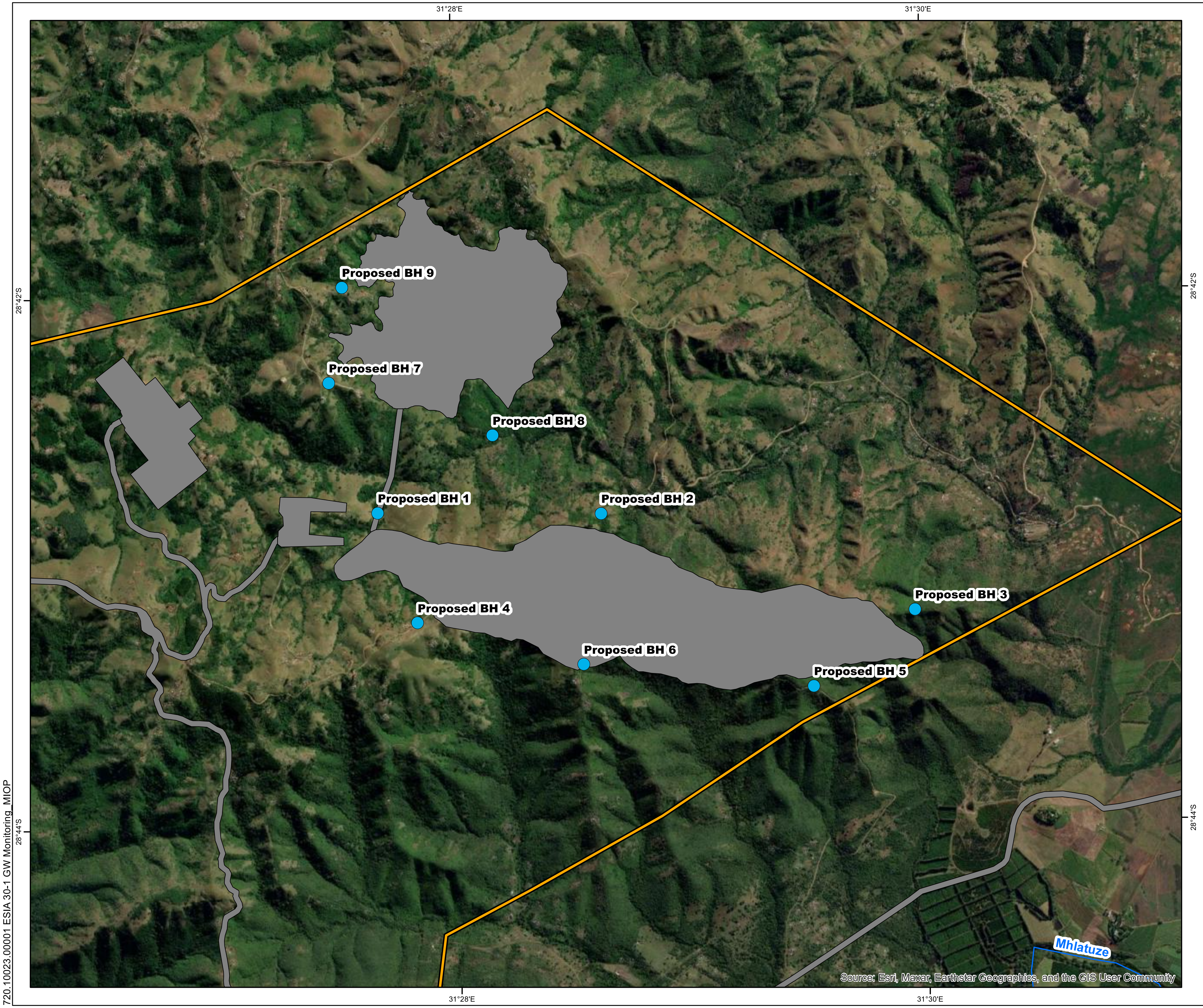
Monthly during pre-construction and construction phase and into mining operation.
The frequency of monitoring may be reduced to a bi-monthly or even quarterly programme upon review of the monitoring results by an aquatic ecologist.

</td>
</tr>
</table>

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Relevant Standards</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td></td><td></td><td></td><td>accredited (SANAS) laboratory. Sampling procedure, storage and delivery times should be according to the relevant laboratory requirements for water samples which will be dictated by the particular water parameters requiring analysis (the specific laboratory responsible for sample analysis should be approached for these details prior to water sampling).</td><td></td><td></td><td></td></tr>
<tr><td>7</td><td>- Generation of dust due to project related activities.
- Materials handling and vehicle movement.
- Blasting</td><td>Potential human health impacts due to dust and emissions
Potential impacts to commercial agriculture</td><td>- Install at least two continuous analyzers (for PM_{10} and $PM_{2.5}$) at the Project boundary (or at other suitable locations such as homesteads), one upwind and one downwind (Figure 30-4)
- Install dust fallout gauges at a minimum of 8 locations (principal wind directions) (Figure 30-5), with monitoring commencing at least one year prior to construction commencing.</td><td>NAAQS
NDCR</td><td>EO/ Air quality specialist</td><td>All phases:
- Monthly analysis
- Quarterly reporting</td></tr>
<tr><td>8</td><td>- Construction related noise
- Processing plant
- Dumping of waste rock
- Vehicular movement
-</td><td>Nuisance noise</td><td>- Noise monitoring should be undertaken in order to determine the operational noise emission levels and to aid the selection of additional noise controls where necessary.
- These locations should be determined based on the closest SR’s to the site and should be chosen to determine the noise levels in all directions around the site (eg locations to the North, South, East and West of the site).
- Additional noise controls such as portable screening can be employed if monitoring indicates the need or in response to concerns.</td><td>IFC Guidelines
SANS 10103</td><td>Environmental Manager
EO
Occupational Health Manager</td><td>Noise monitoring to be undertaken in response to any noise complaints.</td></tr>
<tr><td>9</td><td>- Surface clearance and earthworks</td><td>Erosion of soils</td><td>- Inspections around surfaced areas and topsoil stockpiles to detect early signs of soil erosion developing.
- Inspections around the constructed infrastructure to detect early signs of soil erosion developing.</td><td>N/A</td><td>EO</td><td>Monthly</td></tr>
<tr><td>10</td><td>- Blasting</td><td>Ground vibration, air blast and fly rock</td><td>- A monitoring programme for recording blasting operations is recommended. The following elements should be part of such a monitoring program:
  - Ground vibration and air blast results;
  - Blast Information summary;
  - Meteorological information at time of the blast;
  - Video Recording of the blast; and
  - Fly rock observations.
- Ground vibration and air blast monitoring requires identified locations for monitoring. Monitoring of ground vibration and air blast is done to ensure that the generated levels of ground vibration and air blast comply with recommendations.
- Eleven monitoring positions were identified as possible locations that will need to be considered. Not all points will be required at once but active monitoring and observation of where blasting is done will dictate the requirements for the areas around the pit. These points will need to be re-defined after the first blasts done and the monitoring programme defined.

The following locations are recommended (see also Figure 30-6)
<table>
<tr><th>Tag</th><th>Description</th><th>Y</th><th>X</th></tr>
<tr><td>14</td><td>Community Houses</td><td>-46884.02</td><td>3177554.37</td></tr>
<tr><td>18</td><td>Informal Housing</td><td>-46618.65</td><td>3177677.91</td></tr>
<tr><td>28</td><td>Community Houses</td><td>-45393.59</td><td>3178279.01</td></tr>
<tr><td>33</td><td>Community Houses</td><td>-46401.76</td><td>3178805.60</td></tr>
<tr><td>56</td><td>Community Houses</td><td>-48364.03</td><td>3177552.93</td></tr>
<tr><td>72</td><td>Community Houses</td><td>-49605.93</td><td>3178512.42</td></tr>
</table></td><td>MHSA
United States Bureau of Mines (USBM)</td><td>EO/ Blasting Engineer</td><td>For each blast</td></tr>
</table>

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Relevant Standards</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td></td><td></td><td></td><td><table>
<tr><td>77</td><td>Power Line/Pylon</td><td>-49336.95</td><td>3179311.43</td></tr>
<tr><td>117</td><td>Community Houses</td><td>-47393.99</td><td>3179628.01</td></tr>
<tr><td>125</td><td>Community Houses</td><td>-44801.19</td><td>3178586.79</td></tr>
<tr><td>141</td><td>Community Houses</td><td>-44216.79</td><td>3177885.02</td></tr>
<tr><td>322</td><td>Hydrocencus Borehole (MWGA05)</td><td>-46741.00</td><td>3178691.01</td></tr>
</table></td><td></td><td></td><td></td></tr>
<tr><td>11</td><td>• Employment at Jindal MIOP</td><td>Employment creation, skills development and economic stimulus
Health, safety and security of community members and local residents</td><td>• Monitoring of annual skills audit should be undertaken in the community and in the labour force to identify skills deficits against the mine’s future operational requirements.
• Monitoring of implementation of all skills development interventions must be monitored against Jindal’s commitments as articulated in the SLP.
• Regular monitoring of the impacts of the mine on tourism sector through engagement with tourism product owners, associations, and municipal tourism officers.
• Procurement of goods and services for the establishment of the MIOP should be monitored to ensure ring-fenced procurement is implemented and that local empowered suppliers fulfil their contractual obligations of hiring local residents.
• A database of all labourers in the construction companies should be compiled and submitted to Jindal, including proof of residence.</td><td>N/A</td><td>EO/ Environmental Manager/ HR Manager</td><td>Annual throughout all phases</td></tr>
</table>



Legend

▭ Proposed South Block Mining Right Area

▨ Proposed Mine Layout

— Rivers

Groundwater Monitoring Network

● Proposed Monitoring Points

N

0 0,5 1
KM

Scale: 1:25 000 @ A3
Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984

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FIGURE 30-1
GROUNDWATER MONITORING NETWORK - MIOP

SLR

PO BOX 1596
CRAMERVIEW
JOHANNESBURG
2060

T: +27 (11) 467-0945
www.slrconsulting.com

Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 7-30	Date: 04/07/2023

720.10023.00001 ESIA 30-1 GW Monitoring_MIOP

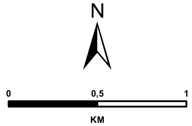
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

▇	Proposed Mine Layout
—	Proposed TSF and RWD
—	Rivers

Groundwater Monitoring Network

●	Proposed Monitoring Points



Scale: 1:30 000 @ A3
Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984

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FIGURE 30-2
GROUNDWATER MONITORING NETWORK - TSF

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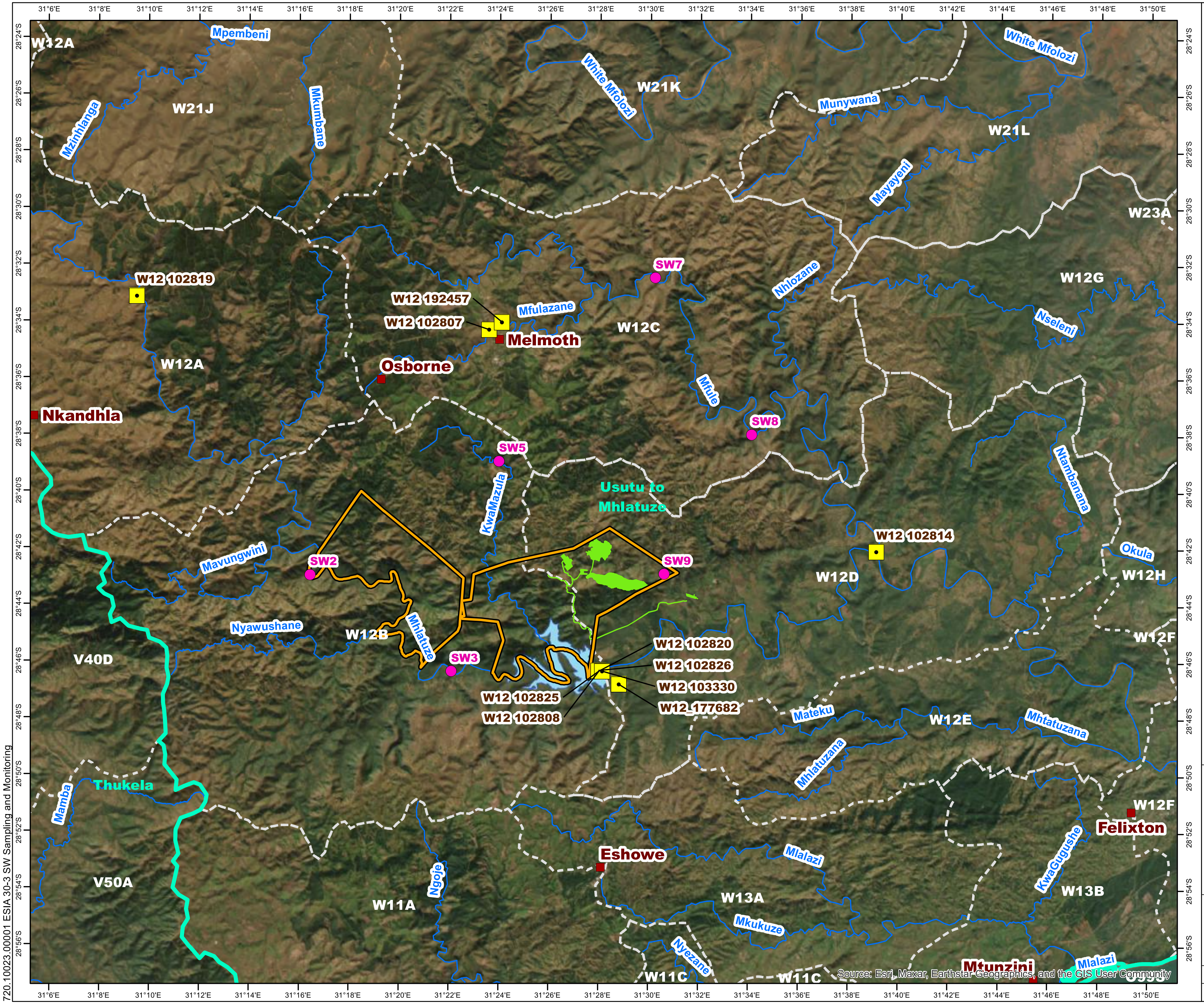
Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 30-2	Date: 04/07/2023



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

■	Towns / Villages
🟦	Goedetrouw Dam
⬚	Quaternary Catchment Boundaries
▢	Water Management Areas
▣	DWS Water Quality Sampling Points
●	SLR Proposed Water Quality Sampling Points

Proposed Project Components

▢	South Block Mining Right Area
🟩	Mine Layout

Scale: 1:233 303 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 30-3
SURFACE WATER QUALITY SAMPLING AND MONITORING POINTS

SLR

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2060

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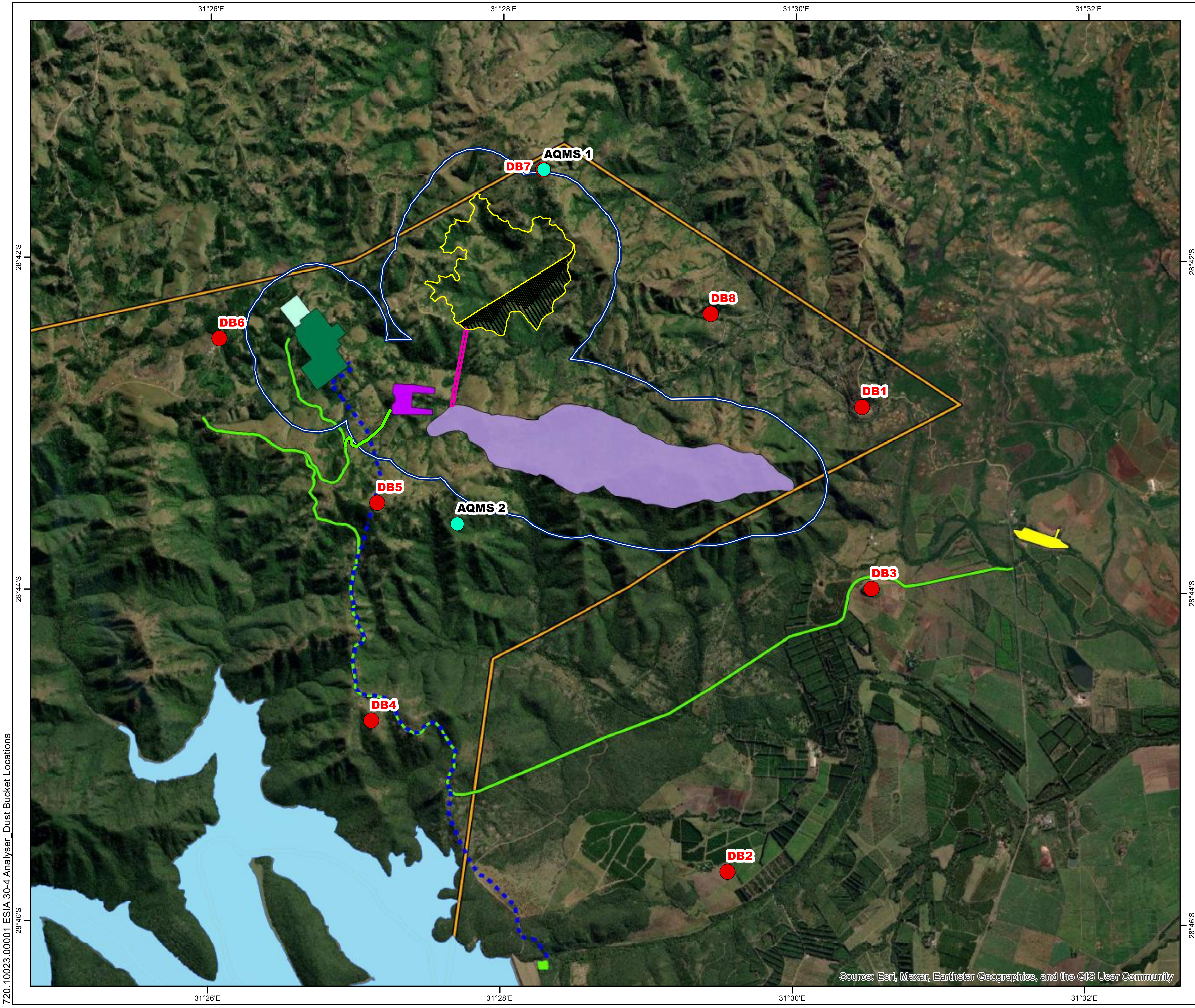
Project No: 720.10023.00001
Prepared By: BG
Map Ref No: EIA 30-3
Date: 04/07/2023

720.10023.00001 ESIA 30-3 SW Sampling and Monitoring



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Goedetrouw Dam
- 500m Buffer
- ● Proposed Continuous Analyser Locations
- ● Proposed Dust Bucket Locations

Proposed Project Components

- South Block Mining Right Area
- South East Pit
- Raw Water Pump
- Processing Plant
- Primary Crusher
- Incoming Power Yard
- Rail Siding
- Haul Road
- Access Road Option 1 - Preferred
- Overland Piping
- Waste Rock Dump

N

0 1 2
KM

Scale: 1:40 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 30-4
PROPOSED CONTINUOUS ANALYSER AND DUST BUCKET LOCATIONS

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2060

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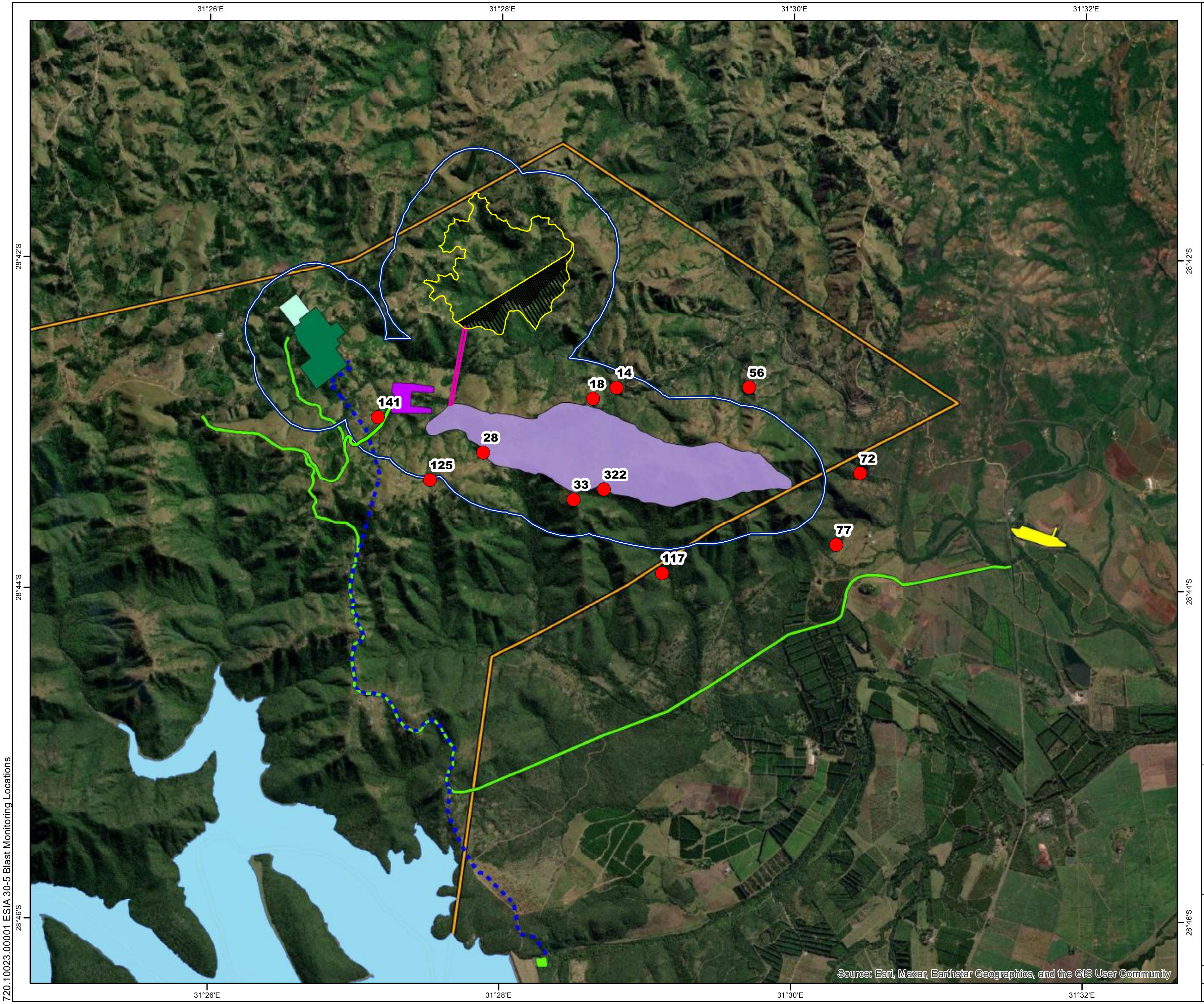
Project No: 720.10023.00001
Prepared By: BG
Map Ref No: ESIA 30-4
Date: 04/07/2023



Legend

- Goedetrouw Dam
- 500m Buffer
- ● Blast Monitoring Points

Proposed Project Components

- South Block Mining Right Area
- South East Pit
- Raw Water Pump
- Processing Plant
- Primary Crusher
- Incoming Power Yard
- Rail Siding
- Haul Road
- Access Road Option 1 - Preferred
- Overland Piping
- Waste Rock Dump

N

0 1 2
KM

Scale: 1:40 000 @ A3
Coordinate System: TM WG31
Projection: Transverse Mercator
Datum: Hartebeesthoek 1994

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FIGURE 30-5
BLAST MONITORING LOCATIONS

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2060

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Project No: 720.10023.00001	Prepared By: BG
Map Ref No: ESIA 30-5	Date: 04/07/2023

31. FREQUENCY OF THE PERFORMANCE ASSESSMENT REPORT

A site inspection and verification of monitoring data against the approved EMPr and EA conditions needs to be undertaken on a monthly basis by the ECO. In compliance with NEMA this would consist of internal reporting which needs to be kept on site and be available for inspection should it be requested.

Annual external audits would need to be undertaken and submitted to the DMRE.

32.ENVIRONMENTAL AWARENESS PLAN

In Terms of the MPRDA an Environmental Awareness Programme is to be submitted as part of the EMPr for approval by the DMRE. This framework details the basics of what would be included in the final Environmental Awareness Plan which would be submitted should the development of the Jindal MIOP proceed.

32.1 MANNER IN WHICH APPLICANT INTENDS TO INFORM EMPLOYEES OF THE ENVIRONMENTAL RISKS

The content of the Environmental Awareness programme would include:

- Induction training, and
- Ongoing awareness programmes.

32.1.1 Induction Training

All personnel including contractors will undergo an initial integrated environmental awareness programme at the beginning of their contract. This programme would include:

- General environmental awareness;
- Health and safety;
- Specific issues relating to the mine that have been identified as potential impacts on the environmental, socio economic condition and historical and cultural aspect for the relevant phase of the mining project;
- Incident reporting mechanisms;
- Conditions of the SLP; and
- Conditions of the EMPr.

The environmental awareness programme would also comply with the relevant legislation:

- Constitution of South Africa, No. I 08 of 1996;
- Minerals and Petroleum Resources Development Act (Act 28 of 2002);
- Mine Health and Safety Act, No 29 of 1996;
- National Environmental Management Act, No. I 07 of 1998;
- Environmental Conservation Act, No. 73 of 1989;
- National Water Act, No. 36 of 1998, and
- Other relevant legislation.

Each employee would be trained to assess the risks associated with the work that he/she is doing on an ongoing basis.

32.1.2 Regular Awareness Training

At the start of each new phase or where a potential for impact exists specific training sessions would be held to discuss the mitigation measures planned for that phase. Training and awareness sessions would be held as follows:

- When it is identified that specific improvements are required so that the EMPr commitments can be met.

- In response to incidents and or complaints being reported.

Work procedures will include attention to implementation of the required mitigation measures as stipulated in the EMPr (Section 28).

32.1.3 Managers Duties for Health and Safety

The following is extracted from the MHSA Chapter 2 As far as reasonably practical managers must:

- Provide employees with any information, instruction, training or supervision that is necessary to enable them to perform their work safely and without risk to health;
- Ensure that every employee becomes familiar with work-related hazards and risks and the measures that must be taken to eliminate, control and minimise those hazards and risks.
- Ensure that every employee is properly trained -
    - to deal with every risk to the employee's health or safety that:
        - is associated with any work that the employee has to perform; and
        - has been recorded.
    - in the measures necessary to eliminate, control and minimise those risks to health or safety;
    - in the procedures to be followed to perform that employee's work; and
    - in relevant emergency procedures.
- In respect of every employee, these provisions must be complied with:
    - before that employee first starts work;
    - at intervals determined by the manager after consulting the health and safety committee;
    - before significant changes are introduced to procedures, mining layouts, mining methods, plant or equipment and material; and
    - before significant changes are made to the nature of that employee's occupation or work.
- Employees must not be made to pay for health and safety training.

32.1.4 Employees Duties for Health and Safety

- Every employee at the Jindal MIOP, while on duty, must comply with the following:
    - Take reasonable care to protect their own health and safety;
    - Take reasonable care to protect the health and safety of other persons who may be affected by any act or omission of that employee;
    - Use and take proper care of protective clothing, and other health and safety facilities and equipment provided for the protection, health or safety of that employee and other employees;
- Employers have a duty to provide personal protective equipment (PPE) for employees.
- It is an offence to discriminate against an employee who has asserted any right granted by this Act. Any offence against this should:
    - Report promptly to their immediate supervisor any situation which the employee believes presents a risk to the health and safety of that employee or any other person and which that employee cannot properly deal with,
    - Co-operate with any person to permit compliance with the duties and responsibilities placed on that person in terms of this Act; and
    - Comply with prescribed health and safety measures.

32.2 MANNER IN WHICH RISKS WILL BE DEALT WITH TO AVOID POLLUTION OR DEGRADATION

This Section describes monitoring and management actions, procedures to be employed in case of environmental emergencies and options to deal with remediation of impact in cases of environmental emergency.

32.2.1 On-Going Monitoring and Management Actions

The monitoring programme as described in Section 30 will be undertaken to provide early warning systems necessary to avoid environmental emergencies.

32.2.2 Procedures in Case of Environmental Emergencies

Emergency procedures apply to incidents that are unexpected and that may be sudden, and which lead to serious danger to the public and/or potentially serious pollution of, or detriment to the environment (immediate and delayed). Procedures to be followed in case of environmental emergencies are described in Table 32-1.

32.2.2.1 General Emergency Procedure

The general procedure that should be followed in the event of all emergency situations is as follows:

- An applicable incident controller defined in emergency plans must be notified of an incident upon discovery;
- An area should be cordoned off to prevent unauthorised access and tampering of evidence;
- To undertake actions defined in emergency plan to limit/contain the impact of the emergency;
- If residue facilities/dams, stormwater diversions, etc., are partially or totally failing and this cannot be prevented, the emergency siren is to be sounded (nearest one available). After hours the Operations Engineer on shift must be notified;
- To take photographs and samples as necessary to assist in investigation;
- To report the incident immediately to the environmental department for emergencies involving environmental impacts or to the safety department in the case of injury;
- The Environment department must comply with Section 30 of the NEMA such that:
    - The Environment department must immediately notify the Director-General (DWS and DMRE and Inspectorate of Mines as appropriate), the South African Police Services, the relevant fire prevention service, the provincial head of DMRE, the head of the local municipality, the head of the regional DWS office and any persons whose health may be affected of:
        - The nature of the incident;
        - Any risks posed to public health, safety and property;
        - The toxicity of the substances or by-products released by the incident; and
        - Any steps taken to avoid or minimise the effects of the incident on public health and the environment.
- The Environment Department must as soon as practical after the incident:
    - Take all reasonable measures to contain and minimise the effects of the incident including its effects on the environment and any risks posed by the incident to the health, safety and property of persons;
    - Undertake clean up procedures;

  - Remedy the effects of the incident; and
  - Assess the immediate and long term effects of the incident (environment and public health).
- Within 14 days the Environment Department must report to the Director-General DWS and DFFE, the provincial head of DMRE, the regional manager of the DMRE, the head of the local and district municipality, the head of the regional DWS office such information as is available to enable an initial evaluation of the incident, including:
  - the nature of the incident;
  - the substances involved and an estimation of the quantity released;
  - the possible acute effects of the substances on the persons and the environment (including the data needed to assess these effects);
  - initial measures taken to minimise the impacts;
  - causes of the incident, whether direct or indirect, including equipment, technology, system or management failure; and
  - measures taken to avoid a recurrence of the incident.

32.2.2.2 Identification of Emergency Situations

The site wide emergency situations that have been identified together with specific ERPs are outlined in Table 32-1.

32.2.3 Technical, Management and Financial Options

Technical, management and financial options that will be put into place to deal with the remediation of impacts in cases of environmental emergencies are described below:

- The applicant will appoint a competent management team with the appropriate skills to develop and manage a mine of this scale and nature;
- To prevent the occurrence of emergency situations, the mine will implement as a minimum the mine plan and management actions as included in this EMPr report;
- The mine must have an environmental management system in place whereby all environmental incidents are identified, reported, investigated, addressed and closed out;
- As part of its annual budget, the Jindal Iron Ore (Pty) Ltd will allow a contingency for handling of any risks identified and/or emergency situations; and
- Where required, Jindal Iron Ore (Pty) Ltd will seek input from appropriately qualified people.

Table 32-1 Emergency Response Procedures

Item	Emergency situation	Response in addition to general procedures
1	Spillage of chemicals, engineering substances and waste	Where there is a risk of contamination of the land (leading to a loss of resource), surface water and/or groundwater, Jindal Iron Ore (Pty) Ltd will: • notify residents/users downstream of the pollution incident; • identify and provide alternative resources should contamination impact adversely on the existing environment; • cut off the source if the spill is originating from a pump, pipeline or valve (e.g. refuelling bays) and the infrastructure be 'made safe'; • Contain the spill (e.g. construct temporary earth bund around source such as road tanker); • pump excess hazardous liquids on the surface to temporary containers (e.g. 210 litre drums, mobile tanker, etc.) for appropriate disposal; and • remove hazardous substances from damaged infrastructure to an appropriate storage area before it is removed/repaired.

2	Discharge of dirty water to the environment	• Apply the principals listed for Item 1 above.
		• 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; and
		  • apply for emergency discharge as a last resort.

3	Pollution of surface water (where relevant)	• Personnel discovering the incident must inform the Environment Department of the location and contaminant source. • Apply the principals listed for Item 1 above. • 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. • The Environment Department will collect in-stream water samples downstream of the incident to assess the immediate risk posed by contamination.

Item	Emergency situation	Response in addition to general procedures
4	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/management actions.
5	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 stormwater diversions during the storm event (e.g. emergency supply of sandbags). • Close the roads affected by localised flooding or where a stormwater surge has destroyed crossings/bridges.
6	Risk of drowning from falling into water dams	• Attempt rescue of individuals from land by throwing lifeline/lifesaving ring. • Get assistance from 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.
7	Veld fire	• Evacuate mine employees from areas at risk. • Notify downwind residents and industries of the danger. • Assist those in imminent danger/less-able individuals to evacuate until danger has passed. • Provide emergency firefighting assistance with available trained mine personnel and equipment.
8	Falling into hazardous excavations	• Personnel discovering the fallen individual or animal must mobilise the emergency response team to the location of the incident and provide a general appraisal of the situation (e.g. human or animal, conscious or unconscious, etc.). • Trained professionals such as the mine emergency response team should recover the injured party. • A doctor (or appropriate medical practitioner)/ambulance should be present at the scene to provide first aid and transport individual to hospital.
9	Road traffic accidents (on site)	• The individual discovering the accident (be it bystander or able casualty) must raise the alarm giving the location of the incident. Able personnel at the scene should shut down vehicles where it is safe to do so. • Access to the area should be restricted and access roads cleared for the emergency response team. • Vehicles must be made safe first by trained professionals (e.g. crushed or overturned vehicles).

Item	Emergency situation	Response in addition to general procedures
		• Casualties will be moved to safety by trained professionals and provided with medical assistance. • Medical centres in the vicinity with appropriate medical capabilities will be notified if multiple seriously injured casualties are expected. • A nearby vet should be consulted in the case of animal injury.
10	Development of informal settlements	• The mine will inform the local authorities (municipality and police) that people are illegally occupying the land and ensure that action is taken within 24 hrs.
11	Uncovering of graves, sites, and fossils	• Personnel discovering the grave or site must inform the Environment Department immediately and all work must be stopped immediately The environmental department must inform Amafa or the South African Heritage Resource Agency (SAHRA) and contact an archaeologist and/or palaeontologist, depending on the nature of the find, to assess the importance and rescue them if necessary (with the relevant permit). No work may be resumed in this area without the permission from the Environmental Control Officer (ECO) and Amafa/ SAHRA. • If the newly discovered heritage resource is considered significant a Phase 2 assessment may be required. • Historical buildings older than 60 years fall under the jurisdiction of Amafa. If any sites are affected this provincial authority should be contacted. • Prior to damaging or destroying any identified graves, permission for the exhumation and relocation of graves must be obtained from the relevant descendants (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local Police. • The exhumation process must comply with the requirements of the relevant Ordinance on Exhumations, and the Human Tissues Act, 65 of 1983.

33.SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No specific information has been requested by the competent authority.

34. UNDERTAKING BY THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

I, K. de Courcy Hamilton, the EAP responsible for compiling this report, undertake that:

- the information provided herein is correct;
- the comments and inputs from I&APs have been correctly recorded;
- information and responses provided to I&APs by the EAP is correct to the best of SLR's knowledge at the time of compiling the report; and
- the level of agreement with I&APs has been correctly recorded and reported.

KH

13 July 2023

K. de Courcy Hamilton
(Registered EAP)

Date

I certify that the DEPONENT has acknowledged that he/she knows and understands the contents of this affidavit, he/she does not have any objection to taking the oath, and he/she considers it to be binding on his/her conscience and that the administering oath complied with the regulations contained in GNR 1258 of July 1972.

Name
(Signature of Commissioner of Oaths)

Date

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