DMRE REFERENCE:

(MP) 30/5/1/2/2/83 MR

2021

DRAFT SCOPING REPORT FOR TGME EXISTING UNDERGROUND MINE REDEVELOPMENT PROJECT NEAR PILGRIM'S REST

/ Solutions

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

DRAFT SCOPING REPORT

FOR LISTED ACTIVITIES ASSOCIATED WITH THE MINING RIGHT FOR THE PROPOSED MINING ACTIVITIES FOR GOLD ORE, SILVER ORE, COPPER ORE AND STONE AGGREGATE LODGED IN TERMS OF REGULATION 16 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT 107 OF 1998) (NEMA): ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REGULATIONS 2014 (AS AMENDED), IN RESPECT OF PORTIONS OF THE FARMS FRANKFORT 509KT (REMAINING EXTENT (RE), PORTION 1, PORTION 2, PORTION 3, PORTION 4, PORTION 5); KRUGERS HOOP 527KT; VAN DER MERWESREEF 526KT (RE, PORTION 1); MORGENZON 525KT (RE, PORTION 1, PORTION 2); PEACH TREE 544KT AND PONIESKRANS 543KT (RE, PORTION 18, PORTION 42, PORTION 43, PORTION 44).

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED). AN AMENDMENT IN TERMS OF SECTION 102 OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT 28 OF 2002): SECTION 23 (A), (B) AND (C) READ TOGETHER WITH REGULATION 11(1) (G). NATIONAL WATER ACT, ACT 36 OF 1998 (NWA) IN TERMS OF SECTION 40. NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT, ACT 39 OF 2004 (NEMAQA) AND ASSOCIATED LISTED ACTIVITIES; THE NATIONAL HERITAGE RESOURCES ACT (NO. 25 OF 1999).

NAME OF APPLICANT: TRANSVAAL GOLD MINING ESTATES LTD (TGME)

FILE REFERENCE NUMBER SAMRAD: (MP) 30/5/1/2/2/83 MR

DRAFT SCOPING REPORT FOR TGME EXISTING UNDERGROUND MINE REDEVELOPMENT PROJECT, NEAR PILGRIMSREST

Prepared by

OMI SOLUTIONS (PTY) LTD

On behalf of

TRANSVAAL GOLD MINING ESTATES LTD

In respect of

DMRE REFERENCE: (MP) 30/5/1/2/2/83 MR

Dated:

NOVEMBER 2021

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PLEASE NOTE:

The outline of this report was compiled in terms of the official scoping report template provided by the Department of Mineral Resources and Energy (DMRE). Where repetition occurs as a result of the template being used, the relevant information will be cross referenced. An executive summary of the most important aspects of the report is provided in order to assist the reader. The DMRE template furthermore requires the report to contain preliminary impacts and provide mitigation measures for the impacts identified. It should be noted that the identified impacts and mitigation measures will be subject to change in the Environmental Impact Assessment and Environmental Management Programme Report (EIA&EMPr) once the environmental specialist impact assessment studies become available and input from Interested and/or Affected Parties (I&APs) is taking into consideration.

EXECUTIVE SUMMARY

INTRODUCTION

Transvaal Gold Mining Estates Limited (TGME), a subsidiary of Theta Gold Mines Limited, is the holder of an existing mining right with Department of Mineral Resources and Energy (DMRE) Reference Number: MP 30/5/1/2/2/83 MR (83 MR) with effective date 16 October 2013.

The 83 MR mining area comprises Portions 1, 2, 3, 4, 5 and the Remaining Extent of the farm Frankfort 509KT, the farm Krugers Hoop 527KT, Portion 1 and the Remaining Extent of the farm Van Der Merwes Reef 526KT, Portions 1, 2 and the Remaining Extent of Portions of the farm Morgenzon 525KT, the farm Peach Tree 544KT, and Portions 18, 42, 43, 44 and the Remaining Extent of the farm Ponieskrans 543KT (mining area).

TGME propose to re-develop its historical underground mines within the 83 MR mining area which includes Frankfort, Beta North, and the Clewer Dukes and Morgenzon (CDM) underground mines.

The proposed project will require additional surface infrastructure to support the underground working, the expansion of the current Tailings Storage Facility (TSF) and an upgrade of the old TGME process plant. The area involved in the new disturbance outside the exiting historical footprint in total is less than 2 Ha.

To mitigate the risk of loss of Critical Biodiversity Areas (CBAs), sensitive floral communities, threatened ecosystems and floral Species of Conservation Concern (SCCs) a biodiversity verification and pre-feasibility assessment was conducted in May 2021 to identify environmental buffer zones. The assessment informed the engineering concept designs to ensure that the surface infrastructure layout is limited to previously disturbed areas where possible.

Various approvals are required to be obtained by TGME in terms of environmental legislation from the Competent Authorities before commencing with underground mining. TGME is applying for the environmental authorisations and licenses:

- An Environmental Authorisation, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).
- A Waste Management Licence (WML) in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008);
- An amendment to the current Environmental Management Programme (EMPr) approved by the DMRE in terms of the MPRDA on 16 October 2013.
- An Integrated Water Use Licence in terms of the National Water Act, 1998 (Act No.36 of 1998) (NWA);
- An Atmospheric Emission Licence (AEL) under the National Environmental Management: Air Quality Act No. 39 of 2004;
- Heritage Permits in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999) from the South African Heritage Resources Agency (SAHRA); and
- Licences in terms of the National Forest Act, 1998 (Act 84 of 1998).

OMI Solutions (Pty) Ltd (OMI) has been appointed as the independent environmental assessment practitioner to undertake the Scoping and Environmental Impact Assessment (EIA) process which is aimed at critically evaluating the potential environmental and social impacts of the proposed project.

PROJECT DESCRIPTION

TGME propose to recommence the historical underground mines within the 83 MR mining area which includes Frankfort, Beta North, and the CDM underground mines.

The proposed project will require additional surface infrastructure to support the underground working, the expansion of the current TSF and an upgrade of the old TGME process and beneficiation plant.

The planned infrastructure at each shaft includes (but is not limited to):

- Trackless mobile machinery (TMM) workshops;
- Fuel storage facilities;
- Oil storage facilities;
- Mining and engineering stores;
- First aid station;
- Mining waste sorting /management and salvage yard;
- Sewage handling facilities;
- Diesel generator sets;
- Power distribution transformers;
- Water supply and distribution infrastructure;
- Reservoir and water tanks;
- Surface water management infrastructure;
- Upgrading of river crossings and rehabilitation of Peach Tree stream;
- Site security and access control;
- Mining settling and collection dam (stormwater and pollution control);
- Emulsion storage tanks;
- Underground infrastructure;
    - Power supply by Generator at the shaft;
    - Water supply from the Blyde (Current Approved Permit);
    - Ore handling infrastructure (Ore passes, conveyors, incline winder with required shaft equipment); and
    - Dewatering system.
- Offices – mobile/prefabricated offices;
- Surface ore handling and load-out facilities;
- Dense medium separation (DMS) plant;
- Mine residue facility (waste rock)
- Run of Mine (RoM) stockpile area
- Conveyor from Beta North to the plant
- Single drum winder
- Steel rope haulage system.

For detail on each shaft infrastructure requirements as well as the conceptual drawings refer to Section 4.3.

NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

International conventions, national plans and programmes, as well as the relevant Integrated Development Plans (IDP) were taken into account in assessing the proposed development in a spatial

context. Trends in the South African and international gold and associated minerals markets have also been taken into consideration in this assessment of the need and desirability of the project.

The project is aligned with the objectives of the MPRDA:

- To promote economic growth and mineral development in South Africa;
- To promote employment and advance the social and economic welfare of all South Africans;
- To ensure that the nation's mineral resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and
- To ensure that holders of mining rights contribute towards the social-economic development of the area in which they are operating.

The main benefits of the re-development of the underground mining sections are:

- Direct economic benefits will be derived from wages, taxes and profits;
- Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees;
- Increased job security for employees;
- The project will result in economic mining of a known resource and existing surface and underground infrastructure will be utilised for future re-development.
- About 1500 direct jobs, and four times that in indirect jobs. 70% of labour will be sourced from local community.
- Theta will contribute directly to the national fiscus by way of taxes and royalties paid, enabling government to provide social infrastructure and services. Indirect contribution through the payment by employees of personal income tax and of municipal rates and taxes.
- Local procurement opportunities: 30% skilled labour from mining industry

ALTERNATIVES

The DFFE[1] guidelines for an Integrated Environmental Management (IEM) procedure requires that an environmental investigation considers feasible alternatives for any proposed development. Furthermore, the EIA Regulations (2014) (as amended) require that a number of alternatives for accomplishing the same objectives should be considered.

Various alternatives have been assessed for the project at scoping level, and workshopped during specialist, applicant, and engineering team interactions. The alternatives were also influenced by the existing baseline environmental data and specialist inputs, and by discussions with authorities and with I&APs.

Alternatives relevant to this development can be categorized into the following:

- Site location alternatives;

[1] At the time the Department of Environmental Affairs and Tourism (DEAT).

The sites are all previous underground mining areas, approved as part of the EMPR for the 83Mining right area. As the cut-off grade required by modern processing technology is much lower than what was historically viable, the re-development and mining of these areas is now economically viable and can be done with minimal additional impact.

- Layout alternatives;
  - Frankfort layout

    The engineers will refine the layouts for the EIA phase, to allow for final construction designs. Aspects that will be taken into account include heritage and paleontological findings, and the summer terrestrial and aquatic surveys.
- Technology alternatives;
  - Electrical supply;

    Various options for electricity have been weighed up during the planning and discussed with Eskom. However, due to the location of the shafts it was decided that diesel-powered generators will initially be used instead of powerlines to various shaft areas. This will, however, change in future if electricity lines and supply capacity become available to the area.
  - Renewable Energy

    From an environmental perspective, the benefit of using renewable energy would be a reduced carbon footprint for the project. However, due to the sensitive nature of the biodiversity around the site areas it was decided to keep the footprint areas to a minimum (i.e. within previously disturbed areas), which would not provide the space required for a large enough solar panel farm to satisfy the operation's electricity requirements.
  - Mining method;

    TGME's underground mines will all be mining narrow reef orebodies. The mining method selected is mechanised long hole drilling, which requires pre-development of a mining block in preparation for stoping operations. Resue mining will be applied to the development ends allowing separate extraction of the reef and waste cuts.

    The feasibility study identified the following advantages to this method:

    - Maximum grade with reduced dilution can be achieved;
    - Less waste will be produced which in turns also leads to smaller WRD footprints;
    - This modern mining method can lead to optimised productivity.

    This method therefore is preferred from both an environmental and an economic perspective
- The "no-go" alternative.

  The no-go alternative for the proposed evaluates not proceeding with the proposed project. Proceeding with the proposed project attracts potential economic and social benefits and potential negative environmental impacts.

  Not proceeding with the proposed project leaves the status quo of no additional negative social or environmental impacts than what is currently experienced. Similarly, none of the possible positive impacts from the project would realise.

Not proceeding with the project is, however, expected to create further negative sentiment against investment into the area and particularly into mining investment opportunities in South Africa.

It will also allow the illegal mining trade in the area to continue growing, as one of the only ways to keep the illegal mining at bay is by actively mining in the old adits. The impacts of illegal mining on the Blyde River system would continue accumulating and potentially impact on the ecology of the whole catchment as well as negative social impact on the host communities. Please refer to section 10.1.

Another negative effect of the project not proceeding would be the continued proliferation of Alien Invasive Plant species (AIPs) in the area. If AIPs are left uncontrolled, the problem will double within 15 years. The current state of AIPs within the area poses a very high risk to the local biodiversity, which includes the riparian zone of the Blyde River and immediate surrounding habitat. AIPs consume a vast amount of water; reduce the ability to farm; intensify flooding and fires; cause erosion; cause destruction of rivers and may cause a mass extinction of indigenous plants (indigenous forests) and animals.

With the intervention of mining in the area, funds can be made available to eradicate AIPs and secure the Strategic Water Source (SWSA) by facilitating the establishment of native grasslands and forests, ecological connectivity and optimising the hydrological functioning of the Blyde catchment.

The no-go alternative will further be investigated in the EIA Phase through each of the specialist input fields.

PUBLIC PARTICIPATION

The public participation process (PPP) is undertaken in line with Chapter 6 of the EIA Regulations (2014) (as amended). The process will be undertaken to ensure compliance with the requirements in terms of the MPRDA (as amended), EIA Regulations (2014) (as amended), as well as the Integrated Water Use Licence Application (IWULA) requirements in terms of the NWA

The PPP as required by the environmental laws and regulations specified therein will be followed as best practice.

The PPP will be undertaken in line with the statutory requirements for public participation. The following legislation will be considered when developing and implementing the PPP:

- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)
- Public Participation guideline in terms of NEMA;
- The Environmental Impact Assessment (EIA) Regulations, 2014 (as amended);
- The Constitution of the Republic of South Africa, 1996;
- Protection of Personal Protection Act, 2013 (Act No. 4 of 2013) (POPIA);
- Promotion of Access to Information Act, 2000 (Act No. 2 of 2000) (PAIA); and
- International good-practice guidelines for public participation and the Core Values of the International Association for Public Participation.

The PPP is facilitated by Kongiwe Environmental (Pty) Ltd (Kongiwe) an independent contractor.

The table below provides an overview of communication and engagement tools that will support the implementation of this public participation for the project. (Kongiwe, 2021).

Engagement tool	Description
Background Information Document (BID)	The BID (Annexure E3) provided important information regarding the following: A project description of the proposed 83 MR project. The Scoping and EIA and the PPP to be undertaken in support of the relevant environmental authorisations/permits and the contact details of the Environmental Assessment Practitioner (EAP) and the stakeholder engagement consultants. Details about how stakeholders can register as an Interested and Affected Party (I&AP) and be kept informed about the project developments. The public review and comment period for environmental reports; and Invitation to attend an open day. The BIDs were emailed on Tuesday, 30 November 2021, and hand delivered to project stakeholders registered in the stakeholder database (Appendix E6). The BID is available on the following websites: Kongiwe's website: http://www.kongiwe.co.za/publications-view/public-documents/ OMI Solutions' website: https://omisolutions.co.za/public-review-projects/ Comment and Registration Form: An I&AP registration form was sent out to stakeholders to register formally and/or to submit comments (Annexure E3)..
Newspaper advertisements	A newspaper advert (Annexure E4) was placed in The Steelburger, on Thursday, 2 December 2021 and The Lowvelder, on Thursday, 2 December 2021. The advert included the following details: Brief project description. Legal framework, the competent authorities. How stakeholders can access the Draft Scoping report for public review and comment. The details of the open day. Registration as stakeholders. The contact details of the EAP and the stakeholder engagement consultants..
Site Notices	The site notice provides an overview of the project and highlights the applicable legislation, environmental authorisation/ permits applicable to the project. It also outlined the stakeholder engagement process to be followed and where relevant information could be obtained from. A locality map of the project site was included in the site notice. Details of the open day and how stakeholders can register as I&APS were included in the Site Notice. Pictures and co-ordinates of where the site notices were placed were also recorded in the site notice report and a site notice map was developed (Annexure E5)

Engagement tool	Description
Notification Letter with a Comment and Registration Form	An email was sent to stakeholders to inform them about the proposed 83 MR project. The email also shared details of the open day and invited the greater public to formally register as I&APs. A Comment and Registration Form was also provided for stakeholders to use for formal registration and to submit their comments or concerns (Annexure E3)..
Telephonic discussions	Stakeholders are also consulted by means of telephonic discussions. These discussions facilitate the process of inviting stakeholders to stakeholder meetings and provide stakeholders with a platform to raise issues of concern and suggestions regarding the proposed 83 MR Project. Comments and/or concerns raised through telephonic discussions are recorded and addressed by the project team (EAP and the relevant specialists).
Online engagement sessions	Online meetings will be held with key stakeholders via virtual platforms such as Microsoft Teams and Zoom. These meetings will be seen as formal consultation. This will be done by means of a PowerPoint Presentation which will be shared and discussed online.
Site Visit	The purpose of the site visit was to share the impacts of the primary threats to the receiving environment including the Blyde River, in the context of the proposed promulgation of an extension of the Morgenzon Forest Nature Reserve over certain of TGME's 83 MR mining right areas; and to receive input from relevant stakeholders. After the site visits, minutes were developed, and the stakeholder database was updated. (Annexure E8).
Landowner Meetings	Consultation meetings were held with directly affected landowners on a one-on-one basis. An overview of the Proposed Project, land tenure and locality plans were presented. Landowners were provided with an opportunity to raise issues of concern and comments/suggestions regarding the Proposed Project. Refer to (Annexure E8) for a list of meetings and consultations that was undertaken. Outcomes from these meetings are recorded in the landowner/ land occupier engagement reports (Annexure E8)
Authority Meetings	Authority meetings were held with various Organs of State, the purpose of the meetings was to discuss the 83 MR project and obtain initial comments which informed specialist studies and project planning. The project team presented an overview of the proposed 83 MR project, locality, infrastructure and land tenure maps were distributed as part of the meeting. Refer to (Annexure E8) for a list of meetings and consultations that were undertaken.
Open day	Stakeholders are invited to participate through virtual and non-virtual engagements. One-on-one consultation meetings will be held via on-line forums such as Microsoft Teams, or telephonically. On-line engagement activities will be available during the public review period. Additionally, an Open Day will be held at the Town Hall, Main Street, Pilgrims Rest on Saturday, 15 January 2022 from 10H00-14H00
Delivery of notices	Consultation with the relevant Ward Councillors and seek advice on the best and practicable way to distribute notices in their wards to inform representatives of the communities of the proposed project.

ENVIRONMENTAL BASELINE

The area over which the existing TGME mining right is located is currently facing two major threats causing deterioration to the area. It should be noted that TGME is not currently actively mining on the mining right areas. The following threats are currently noted in the mining area:

- Illegal mining leading to the following issues:
  - Physical disturbance of vegetated areas;
  - Diversions of streams;
  - Contamination and sedimentation of the Blyde River, drainages, and streams;
  - Social disruptions in the communities (crime, child labour etc.);
- Alien Invasive Plants (AIPs) proliferated in the area.

This sections aims to provide a summary of the baseline environment that has been described in Section 10 of the Scoping report.

Climate

The climatic conditions for this region are typical of the eastern Mpumalanga region, consisting of very hot summers and cool to cold winters. Rainfall occurs during summer thunderstorms, which are accompanied by lightning and occasional hail. Morning fog is common in summer but usually clears up by midday (Glynn's Lydenburg EMP, 2009).

Air Quality

The air quality baseline assessment was done by Airshed. Mining and agriculture are the predominant land uses in the region. There are several historical underground and surface gold mining deposits, with disturbed areas as a remnant from these activities. Forestry is the main agricultural activity surrounding the three Project areas (WSP, 2019).

The main pollutant of concern would be particulate matter resulting from vehicle entrainment on the roads (paved, unpaved, and treated surfaces), windblown dust as well as mining and exploration activities. Gaseous pollutants such as sulphur dioxide (SO2), oxides of nitrogen (NOx), carbon monoxide (CO) and carbon dioxide (CO2) would result from vehicles and combustion sources, but these are expected to be at low concentrations as there are few combustion sources in the region.

Geology

The Project Areas are situated within the Sabie-Pilgrim's Rest Goldfield, approximately 300 km northeast of the Witwatersrand Basin. This metallogenic province extends for approximately 140 km in a north-north-easterly direction, over a maximum width of 30 km along the Great Escarpment of southern Africa. Gold mineralisation occurs within shear zones located within the sedimentary host rocks of the Transvaal Supergroup. The orebodies considered for the underground operations may be described a thin, sheet-like near horizontal deposits. The reefs considered for extraction through the underground operations, namely the Beta Reef (Beta Mine), Bevetts Reef (Frankfort Mine) and Rho Reef (CDM) are all concordant reefs which dip shallowly westwards between 3°and 12°.

Topography and drainage

The project area is located in the midst of the Drakensberg mountain range, with Pilgrims Rest at an elevation of 1,300 m above sea level and the Lowveld stretching eastwards from the Great Escarpment with an elevation of under 750 metres above mean sea level (mamsl). The project area is dissected by river erosion, with the Blyde River Canyon reaching a depth of over 770 m (GCS, 2005).

The project is located in the upper Blyde River catchment, within quaternary catchments B60A (Plant, TSF, Beta North and CDM), and B60B (Frankfort) in the Olifants Water Management Area

Soil and landuse

Scientific Aquatic Services (SAS) was commissioned to undertake a soil, land use and land capability verification and pre-feasibility assessment as part of the scoping and pre-feasibility studies to identify risks to the proposed project and to guide the development of a project layout for further assessment of risk.

A high-level site visit was undertaken from 19 to 22 April 2021, to verify the pre-determined soil, land use and land capability during the desktop phase; the results of which are presented in this report.

Current land use activities associated with the investigation area and surrounding areas are mainly wilderness, forestry, and historic mining infrastructure. No large-scale commercial agricultural activities were observed (SAS, 2021 (a)).

It is evident that around the footprint areas the dominant land capability is Grazing VII, associated with the Mispah and Glenrosa soil forms. The identified Mispah/Glenrosa soil forms are of poor (Class VII) land capability and are not suitable for arable agricultural land use. Theses soils are, at best, suitable for natural pastures for light grazing. Therefore, these soils are not considered to make a substantial contribution to extensive subsistence farming on a local scale.

Areas along drainages and rivers are classified as Grazing V, associated with Alluvial soils. The footprint areas of the sites are classified as Wildlife Class VIII – Witbank soils - as these soils are associated with previous disturbance. These identified Witbank soils have very poor (class VIII) land capability attributed to forestry and mining activities. In addition, some of these soils have been subjected to long term compaction and erosion.

Surface water

The surface water conditions across the project area, based on sampling results from May 2020 to September 2021 have been assessed.

As none of the sites are currently operational and access to some areas is often prohibited by illegal miners, the data sets are not complete. The available data is, however, sufficient for assessing the baseline conditions, and for drawing conclusions as to the current status of the area's surface water

Analysis of the samples upstream of the plant generally show a neutral pH, low salt load, and low concentrations of iron, manganese, and sulphates. These results indicate that the Blyde upstream of the TGME footprint is unimpacted by TGME's activities. It is, however, known that illegal mining activities take place in the area, and illegal miners have often been seen washing ore in the Blyde upstream of the plant. The June 2020 results show a spike in Total Dissolved Solids (TDS), Sulphates, Magnesium, Sodium and Calcium, and a substantial drop in pH; this most likely resulted from artisanal mining, given that it is upstream of TGME.

The overall surface water quality in the Morgenzon Creek upstream and downstream of Morgenzon/Clewer is generally good, with parameters within the WUL limits. The water at the historically flooded Morgenzon adit shows the impact of previous mining activities, with elevated sulphates, calcium and magnesium, and thence high TDS values. Decant volumes were low when sampling was done and thus one would not expect much impact from this source on either surface or groundwater at that time. This is confirmed by analysis results at both the nearby borehole and the downstream sampling point.

Surface water quality around Frankfort is generally good. The Electrical Conductivity (EC) in the water samples taken near the TGME shafts - from the waterfall, Theta stream and Bevetts stream - are consistently low. The same trends are seen in TDS and sulphates. The pH is generally below the WUL limit. These points are located in tributaries which join the Molototsi before the hostel monitoring point, and thus are not causing the values seen in the Molototsi itself. This suggests that another tributary is causing the contamination, which manifests as increased conductivity and sulphate contamination.

The pH and the EC in the Molototsi downstream of the old Frankfort hostel and near the Vaalhoek road has been fluctuating substantially since November 2020. The reason for these fluctuations is not clear..

Geohydrology

Groundwater boreholes in the region are scarce and mainly restricted to scattered mine investigative/monitoring boreholes. Boreholes drilled during previous investigations were used to form an understanding of the geohydrological regime of the study area. This understanding was supplemented by information obtained from exploration boreholes in the study area (MvB Consulting, 2021).

Groundwater occurrences in the study area are predominantly restricted to the following types of terrains.

- Primary aquifers consisting of the quaternary sediments which are restricted to the river valleys;
- Weathered and fractured rock aquifer in the Timeball Hill formations;
- Dolomitic and karst aquifers.

Sources of contamination have been determined by a waste classification. This will inform the groundwater modelling for the project. Based on the criteria in Section 7 of GN R635, the mineral waste classifies as the following types:

- Type 3: TGME New tailings.
- Type 2: DS01 Old tailings, DS02 Old tailings, DMS float.

The mineral waste contains sulphide minerals, which are unstable once exposed to the Earth's atmosphere. Most of the LCT and TCT exceedances are contained in sulphide minerals.

A Risk assessment has been done by HydroScience CC which also showed that due to the low leachability of constituents in the new tailings, it is expected to react more like Type 4 waste than Type 3 waste and therefore the impact on the receiving environment is expected to be insignificant.

The following is observed regarding the groundwater quality:

- The groundwater quality is generally good and only a few parameters exceed the very stringent WUL limits.
- Most of the pH values are within the WUL limits and SANS 241 limits with the exception of BGW 09 and the Frankfort Security borehole.
- Boreholes BGW9 and BGW10 at Morgenzon mining area have been monitored consistently and show that the groundwater conditions are good, with metal content below detection limit. This suggests that water emanating from the adit is not seeping into surrounding groundwater (OMI, July 2020).

- Frankfort Security Borehole exceeded the WUL limit for Ammonium and Orthophosphate (SANS limits).

- The boreholes close to the TSF (BGW06 and BGW07) shows some impact with elevated TDS (BGW06), Sulphate (BGW07), Ammonium (BGW06), Calcium, Sodium, Aluminium (BGW07) and Manganese (BGW06). Additional monitoring boreholes will be drilled to better understand the potential impact from the TSF.

- The borehole BGW04, which is down-gradient from the TSF and RWDs, shows no impact and none of the parameters exceed the guideline limits.

- Borehole BGW02, which is down-gradient from the plant, shows no impact and none of the parameters exceed the guideline limits.

- The water quality decanting from the Beta workings (BGW15) only exceeds the WUL limits for Sulphate, which indicates that water emanating from the historical mine workings does not pose a threat to the environment.

Generally, the groundwater quality is good and there are no parameters of concern in the groundwater which exceed the SANS 241 drinking water guidelines significantly.

Terrestrial Biodiversity

Scientific Terrestrial Services (STS) and SAS were commissioned to undertake the Terrestrial and Aquatic Ecological assessments respectively as part of the scoping and pre-feasibility studies, to identify risks to the proposed projects and to guide the development of a project layout for further assessment of risk.

The aim of the studies was to identify preliminary areas of increased sensitivity or importance within the development areas that could place constraints on the planned underground mining activities, and on the associated surface infrastructure required to support underground mining, so as to determine if there are any major flaws with regards to sensitive habitat and Species of Conservation Concern (SCC). The report includes a detailed desktop study highlighting the Ecological Importance and Sensitivity (EIS) of the areas based on all relevant national and provincial databases, including the Mpumalanga Biodiversity Sector Plan (2019) and all available biodiversity databases provided on the Biodiversity Geographic Information Systems (BGIS) website (STS, 2021).

Four vegetation types are associated with the 83 MR UG areas; however, the Northern Escarpment Dolomite Grassland and the Long Tom Pass Montane Grassland make up the largest of the vegetation types associated with the project. Smaller sections of Dukes, Frankfort and Morgenzon are traversed by the Northern Mistbelt Forest (Figure 34). More specifically, the following vegetation types are associated with each of the 83 MR UG areas:

- Dukes: The western section of Dukes lies within both the Long Tom Pass Montane Grassland and the Northern Mistbelt Forest vegetation types, with the eastern section occurring within the Northern Escarpment Dolomite Grassland.

- Frankfort: A small section in the western section falls in the Long Tom Pass Montane Grassland, with a small portion of the northern section falling in Northern Mistbelt Forest. The central and eastern sections lie in the Northern Escarpment Dolomite Grassland.

- Morgenzon: The western section is classified as Northern Mistbelt Forest, with the central sections lying in the Long Tom Pass Montane Grassland, and the eastern section within the Northern Escarpment Dolomite Grassland.

- Beta North: Entire extent falls within the Northern Escarpment Dolomite Grassland.

The Northern Escarpment Dolomite Grassland and the Long Tom Pass Montane Grassland are endemic to South Africa, with the Northern Mistbelt Forest likely being endemic to South Africa, Lesotho and Eswatini.

Dukes is entirely located in an Irreplaceable CBA, with the southern section of Morgenzon and the northern section of Beta also within an Irreplaceable CBA. These are areas required to meet targets and with irreplaceability values of more than 80%; Critical linkages or pinch-points in the landscape that must remain natural; and often include Critically Endangered Ecosystems, or hosts species of conservation concern. 4

The north-western section of Frankfort is within an Optimal CBA. None of the other 83 MR UG areas occur in these CBAs.

The CBA Optimal Areas (previously called ‘important and necessary’ in the Mpumalanga Biodiversity Conservation Plan - MBCP) are the areas optimally located to meet both the various biodiversity targets and other criteria defined in the analysis. Although these areas are not ‘irreplaceable’ they are the most efficient land configuration to meet all biodiversity targets and design criteria.

Various protected and sensitive environments have been identified in and around the 83 MR area.

Aquatic Biodiversity

SAS concluded in their assessment of the aquatic ecology of the project area (SAS, 2021 (b)), that:

- Beta, Frankfort, and Dukes:
  - Project areas are not fatally flawed;
  - Cognisance must be taken of the very high level of sensitivity of the general environment, the very high level of ecological importance and sensitivity of the Blyde River, and the regional and national importance of the Blyde River.
- Morgenzon:
  - Very high sensitivity area;
  - The complex nature of the landscape will require very careful planning of the proposed mining project prevent any significant impact on this unique and very sensitive receiving environment throughout the life cycle of the mine.
- The mine will need to ensure practically, and demonstrate through the EIA and WULA process, a high level of Duty of Care of this receiving environment.

At this time, delineation of watercourse extents are based on high level ground truthing. This is confounded by the trees growing in the kloofs which makes differentiation between forest habitat and riparian habitat difficult. In addition, many areas had limited access due to terrain and due to safety concerns with the artisanal miners (particularly in the Dukes area). The mapped extent of watercourses must thus be considered with caution and further refinement must take place in the EIA phase of the project and the detailed design once the final detailed delineations are available

Noise baseline

Baseline measurements were conducted on 3 October 2021 at three (3) localities. Measurements were analysed to compile a subjective and objective determination of the Rating levels (LReq) based on the LAIeq measurements (LAIeq: A-weighted, impulse, leq sound level).

The conclusions drawn during analysis of the data, desktop information and onsite investigations

Receptor/Measuring Point	Conclusions
AB01 - dwellings [Min 10-minute measurement on outside boundary]	• Calculated LAIeq was 39,8 dBA – The measurements reflected a rural area (daytime) • The measurements were influenced by one vehicle passing along the R533 route
AB02 – Pilgrim's Rest	• Calculated LAIeq was 42,4 dBA – The measurements reflected a developed suburban area (daytime). There is moderately high confidence in this measurement (based on desktop assessment, onsite investigations and noises/sounds heard during measurements) • The measurements were influenced by some domestic sounds and local routes (namely R533)
AB03 - Pilgrim's Rest	• Calculated LAIeq was 38,8 dBA – The measurements reflected a rural area (daytime)

Visual landscape

The landscape quality associated with the TGME MR 83 UG Project Areas is considered high, due to the mountainous terrain forming part of the scenery of the greater region, the area being of national cultural and heritage importance, the town of Pilgrim's Rest being a tourist attraction, and the Blyde River being a dominant factor in the landscape (SAS, 2021 (c)).

The area can be described as calm, tranquil, peaceful and undeveloped, with a strong association to a semi-natural environment. The proposed large-scale mechanised mining infrastructure is likely to lower the landscape value of the area; however, the impact can be considered limited as the above-ground footprints will be limited.

The site has a moderate visual absorption capacity (VAC), indicating that the proposed mining activities will be partially absorbed in the area The vast mountainous backdrop of the larger region is the main contributing factor to the VAC, since the hills and mountains are unified, making it difficult to observe distinguishing features within the landscape from significant distances (SAS, 2021 (c)).

The town of Pilgrim's Rest is situated in a valley, thus the undulating landscape and local vegetation associated with the town will serve to somewhat limit the visual intrusion, especially central plant area, from certain receptor sites. The Dukes, Morgenzon and Beta Project Areas will be highly visible from the Mount Sheba hiking trail, especially from the S3 viewpoint of the Lost City Hiking Trail.

Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. It is created by the land use, character, and quality of a landscape, as well as by the tangible and intangible value assigned thereto. The landscape character type is defined as rural, mountainous area dominated by grassland, plantations and natural forests interspersed with watercourses, especially the Blyde River, villages, the town of Pilgrim's Rest and historic mining infrastructure.

Socio- Economic environment

The socio-economic baseline was determined by Southern Economic Development (SED). The available Stats SA data regarding the population and infrastructure dates largely from 2011, with some data being available for 2016. However, as virtually no development has taken place in Pilgrim's Rest since 2016, these figures may be taken as valid for the baseline economic conditions. The field verification around some of the data will take place during the EIA level study.

The project is located in Ward 13 of the Thaba Chweu Local Municipality (TCLM) within the Ehlanzeni District Municipality (EDM) in Mpumalanga Province. The main socio-economic sensitive receptors in the local area close to the project include Pilgrim's Rest Town, Brown's Hill, Darks Gully, Newtown/Schoonplaas, and a number of rural tourist establishments in and around Pilgrim's Rest town.

The population of the larger Pilgrim's Rest area ranges between 1,700 to 2,500. The majority lives in Newtown/Schoonplaas and Darks Gully close to the old town, while around 250 people live in the old historic part of the town. The population of the larger Pilgrim's Rest area represents less than 3% of the estimated 102,000 people living within the larger TCLM. The area is characterised by high historic (sporadic) in-migration to Newtown/Schoonplaas, resulting from periodic short-term construction works in the area.

Young people possibly leave Pilgrim's Rest for better job opportunities elsewhere, while illegal miners move into Pilgrim's Rest from areas as far afield as Free State, Lesotho, and Mozambique. In-migration of illegal miners has substantially increased in the last year. The illegal mining activities have significantly influenced the downstream biodiversity in and around the Blyde River, as well as the flow pattern of the Blyde River. Sedimentation from their activities is a further source of concern.

Pilgrim's Rest was sold to government as a living national museum village in 1971 when mining activities in the town closed down. The town was declared a National Monument and became a provincial heritage site in 1986. The Mpumalanga Department of Public Works, Roads and Transport (DPWRT) is currently custodian of the town on behalf of the government and is responsible for the maintenance and restoration of Pilgrim's Rest. The TCLM is responsible for basic service provision while the other provincial departments (e.g. health, education) are responsible for their respective mandates in Pilgrim's Rest.

Economic

The local economy experienced a sharp decline since its peak in the early 1990's due to the general decline in tourism to Mpumalanga Province, deteriorating safety and hygiene conditions in Pilgrim's Rest, factors related to illegal mining activities, increased vagrancies due to poverty and unemployment and lack of public facilities and municipal functions such as street cleaning. Another contributing factor was the closure of many businesses due to the provincial government not renewing existing business leases, with the subsequent tender processes allegedly being irregular (The Public Protector, 2014).

Since 2018, the allocation of leases to business owners has improved and a new local business forum was established. The provincial Department of Public Works has improved services such as cleaning, and - despite the Covid-19 pandemic which hampered tourism between March 2020 and September 2021 - there are positive revival signs in Pilgrim's Rest.

Only limited opportunities are provided for the tourism sector of Pilgrim's Rest, formal and informal. The unemployment and poverty rates were much higher than the provincial and municipal averages in South Africa, with an estimated 48% of Ward 13 households living below the lower bound poverty line. This emphasizes the pressing need to create job opportunities for the working age group in the Pilgrim's Rest area.

Heritage and Palaeontological baseline

Heritage Management Consulting was commissioned to undertake the Heritage and Paleontological assessments as part of the scoping specialist studies. A notice of intent to develop (NID) was submitted to SAHRA in terms of section 38 of the NHRA.

The study area has evidence for occupation over an extensive period of time, spanning from the Stone Age through to the historical period. Briefly, the Stone Age is associated with the manipulation of lithics to create tools. These date from as many as 2.5 million years to less than 150 years ago. This period overlaps with the migration of Bantu speakers into southern Africa, bringing with them agricultural technologies, herding and a settled way of life manifested through stone walling. For the purposes of this study, the literature review was primarily focused on the historical period as activities associated with the project are planned within a predominantly Historical Period landscape.

The farm Ponieskrans, which would later become Pilgrim's Rest, was officially declared a gold field in September 1873, heralding the dawn of one of South Africa's largest and most significant gold rushes. Initially, alluvial gold was found where diggers were panning in the streams around Pilgrims Rest - some from as far away as California and Australia. Pilgrims Rest was declared a public digging in 1875 but gold panning declined in 1876 and subsequently, heavy equipment was employed to locate and mine subsurface reefs. Several smaller companies were formed which mined smaller claims, while larger conglomerates commenced with mining in deeper gold-bearing ore. In 1895, several small mining companies amalgamated to form the TGME. This company was listed on the London Stock Exchange and became the first listed gold mining company in South Africa. As the volumes of gold ore increased, the engineers constructed small, local hydro-electric plants to generate electricity for the electric tramway and the ore crushers at the reduction works, which was constructed in 1897.

Mining in Pilgrim's Rest town ceased in 1971 and the village was acquired by the authorities for the formation of a National Museum and tourism destination.

The TGME Mine is situated within the larger Pilgrim's Rest heritage landscape, which is regarded as highly significant and of national significance. Pilgrim's Rest and the farm Ponieskrans were declared a Provincial Heritage Site in 1986 and an application for World Heritage Site status for the Reduction works was lodged in November 2006, but the declaration was never formalized.

The Pilgrim's Rest landscape represents a striking visual representation of mining, evoking images of time, place, and historical patterns associated with past mining epochs. The historical mining horizon provides clues to past activity and many historical layers form part of this significant landscape. However, the historical landscape is unfortunately highly compromised with vast site transformation in past decades - and in recent years in particular.

This scoping assessment attempted to capture as much of the remaining mining heritage in the baseline environment and the project development areas within notable project constraints,

Cognizant of the above, the following observations and recommendations are made based on sites within the TGME Mining Project areas that risk direct impact from the project activities:

- In the proposed Beta North mining area, a number of features of significance were noted. These include Historical/extant adits and a Historical/extant drainage shaft (NH-TGME-2430DC-01 , NH-TGME-2430DC-02), the remains of the Historical tram line/cocopan line (NH-TGME-2430DC-03), the remains of a Historical concrete water furrow (NH-TGME-2430DC-04), Historical suspension bridge remains (NH-TGME-2430DC-06), the Historical Farmer's Race remains (NH-TGME-2430DC-08), Historical concrete structures (NH-TGME-2430DC-05, NH-TGME-2430DC-07) and a Historical concrete low-level bridge (NH-TGME-2430DC-09).

- In the CDM mining area, Historical/extant adits (NH-TGME-2430DC-14, NH-TGME-2430DC-15, NH-TGME-2430DC-16, NH-TGME-2430DC-17, NH-TGME-2430DC-18), the remains of the Historical tram line/cocopan line (NH-TGME-2430DC-12) a Historical/contemporary water furrow (NH-TGME-2430DC-13) and a burial site (NH-TGME-2430DC-19) were noted. In many instances, these features are poorly preserved or destroyed but the sites are nonetheless intrinsically linked to the highly significant Pilgrim's Rest Mining legacy thus bearing high heritage value. In addition, the sites and features are older than 60 years and protected under the National Heritage Resource Act (NHRA 1999).

- In the proposed Frankfort mining area, the remains of the Historical MET plant building (NH-TGME-2430DC-10) and the remains of a Historical suspension bridge or pulley system (NH-TGME-2430DC-11) were noted.

Various mitigation measures and plans have been recommended by the specialist and will have to be implemented by TGME. Where sites cannot be avoided, the necessary permitting application process will have to be followed.

The Pilgrims Rest Museum will be involved at EIA level in order to provide input in final impact assessments and the final HIA Report.

To comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PDA is necessary to confirm if fossil material could potentially be present in the planned mining area and to evaluate the impact of the proposed development on the Palaeontological Heritage.

The proposed mining site is underlain by Quaternary alluvium and scree, diabase, and the Timeball Hill Formation (Pretoria Group, Transvaal Supergroup) as well as the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup). According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Quaternary superficial sediments is low but locally High, the diabase is igneous in origin and has an insignificant Palaeontological Sensitivity while that of the Timeball Hill Formation is High and the Palaeontological Sensitivity of the Malmani Subgroup (Transvaal Supergroup) is Very High (Almond and Pether 2008, SAHRIS website). Further detailed site work will be done as part of the EIA.

IMPACTS AND MITIGATION

Key aspects identified by the EAP, specialists and I&AP's to be assessed as part of the EIA include inter alia:

- Groundwater impacts
- Surface water impact and pollution
- Stormwater management
- Air quality pollution (dust and emissions)
- Noise pollution
- Biodiversity impacts (Fauna and Flora)
- Impact on land use and land capability
- Soil degradation and pollution
- Visual impacts and Sense of place
- Heritage impacts
- Vibration/Blasting Concerns
- Mine closure and rehabilitation

Preliminary impacts without mitigation have be identified and management measures have been proposed by the various specialist. These impacts and management measures will be refined during the EIA phase.

WAY FORWARD

As part of the Environmental Authorisation Process, a number of investigations will be undertaken and updated by suitably qualified specialists in order to gather baseline information pertaining to the current state of the environment as well as to identify the environmental impacts that may be associated with the proposed Project. The specialist studies to be undertaken include the following:

- Air Quality impact assessment and Greenhouse Gas Assessment (GHG)
- Biodiversity impact assessment
- Blasting and Vibration study
- Freshwater and aquatic ecology impact assessment
- Geohydrological impact assessment
- Dolomite Stability assessment
- Phase 1 Heritage impact assessment and paleontological assessment
- Noise impact assessment
- Socio-economic impact assessment
- Soil and land use capability
- Stormwater management plans
- Traffic impact assessment
- Visual impact assessment
- Waste classification

The following actions will be conducted for the process going forward:

- Completion of the PPP: The comments received from I&APs on the Scoping report will be included and assessed in the EIA&EMPR.
- Appointment of Specialists: The identified specialists were appointed to undertake the specialist studies as identified in this SR for the EIA.
- Draft EIA&EMPR: The results of the specialist studies will be synthesized by the project team to provide a draft EIA&EMPR.
- Draft EIA&EMPR published: The draft EIA&EMPR will be circulated to key I&APs for comment for a period of 60 days.
- Revise Draft EIA&EMPR: The draft report will be updated by addressing and responding to the issues raised in by I&APs.
- Final EIA&EMPR. The revised final report will be published with the various specialist reports appended. This will be submitted to the DMRE.

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List of Abbreviations

ABBREVIATION	DESCRIPTION
AEL	Air Emissions Licence
AIP	Alien Invasive Plant
BIC	Bushveld Igneous Complex
BoQ	Bill of Quantities
CARA	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries, and the Environment
DMRE	Department of Mineral Resources and Energy

ABBREVIATION	DESCRIPTION
DMS	Dense Medium Separation
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPR	Environmental Management Programme Report
GIS	Geographic Information System
GG	Government Gazette
GN	Government Notice
GNR 1147	Financial Provisioning Regulations, 2015 (GN R1147 in GG 39425 of 20 November 2015, as amended) published under the National Environmental Management Act, 1998 (Act 107 of 1998)
GVA	Gross Value Added
HIA	Heritage Impact Assessment
IAIAsa	International Association for Impact Assessment South Africa
IBA	Important Bird and Biodiversity Area
IEMA	Institute of Environmental Management and Assessment
IWUL	Integrated Water Use Licence
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
LaRSSA	Land Rehabilitation Society of Southern Africa
LoM	Life of Mine
LRS	Land Rehabilitation Specialist
MAP	Mean Annual Precipitation
MBCP	Mpumalanga Biodiversity Conservation Plan
MHSA	Mine Health and Safety Act, 1996 (Act 29 of 1996)
MTPA	Mpumalanga Tourism and Parks Agency
NEC	National Executive Committee
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)
NEMWA	National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
NEMWAA	National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014)
NPAES	National Protected Area Expansion Strategy

ABBREVIATION	DESCRIPTION
NR	Nature Reserve
OGL	Original Ground Level
OMI	OMI Solutions (Pty) Ltd
PCD	Pollution Control Dam
PDA	Palaeontological Desktop Assessment
PMI®	Project Management Institute
Pr.Sci.Nat.	Professional Natural Scientist
QDS	Quarter Degree Squares
ROM	Run of Mine
RWD	Return Water Dam
SACAD	South Africa Conservation Areas Database
SACNASP	South African Council for Natural Scientific Professionals
SAPAD	South African Protected Areas Database
SAS	Scientific Aquatic Services
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services
SWSA	Strategic Water Source Area
TGME	Transvaal Gold Mining Estates Limited
TMM	Trackless mobile machinery
TSF	Tailings Storage Facility
UG	Underground
VAC	Visual absorption capacity
WISA	Water Institute of South Africa
WRD	Waste Rock Dump
WSA	Water Source Area
WUL	Water Use Licence
WULA	Water Use Licence Application

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP) WHO PREPARED THE REPORT[2]

1.1.1 DETAILS AND EXPERTISE OF THE EAP

Name of the Registered Environmental Assessment Practitioner: Reneé Kruger

E-mail address: renee@omisolutions.co.za

1.1.2 EXPERTISE OF THE EAP AND PAST EXPERIENCE

The curricula vitae of the independent EAPs who compiled this report are included in ANNEXURE A. A company profile with summary information of the OMI team's qualifications and experience is included in ANNEXURE B.

1.1.3 DIRECTOR OF ENVIRONMENTAL LICENSING

Reneé Kruger has a Masters' Degree in Environmental Management from North-West University. Preceding this Degree, she obtained a BSc Honours Geography and Environmental Management and BSc in Geography and Zoology. She is registered as an Environmental Assessment Practitioner at EAPASA, and as a Professional Natural Scientist with SACNASP. She is also a member of the National Executive Committee (NEC) of the International Association for Impact Assessment in South Africa (IAIAsa). She is also a voluntary Member of the Environmental Law Association.

She has over 14 years' experience working as an Environmental Assessment Practitioner, conducting and implementing the Environmental Impact Assessment Process throughout all phases – specializing in residential, mine, industrial, and commercial developments. Her experience also includes water and waste licence applications, integrated waste and water management plans and assisting with air emissions licences. She has extensive experience in conducting public participation processes and liaison with government departments. Furthermore, her experience is complemented by project management and geographic information systems (GIS) skills.

1.1.4 HEAD OF ENVIRONMENTAL LICENSING

Chantal Uys is an Environmental Assessment Practitioner who has been working in the environmental management field since 2008. She has an Honours degree in Archaeology from the University of Pretoria; subsequent to this degree she completed qualifications in Geographical Information Systems (UP) and Environmental Management (NWU). She is experienced in the facilitation of Environmental Authorisation processes and the compilation of Environmental Management Programmes.

She has experience in various other environmental authorisation processes such as Mining Right Applications, Water Use Licensing, Waste Licensing, and assisting with Atmospheric Emission Licence Applications. She is also experienced in GIS Mapping, Environmental and Legal Compliance Audits, compiling Integrated Waste and Water Management Plan, public participation processes and project management.

Her project experience is extensive in scope and covers all aspects of development from structures, roads, dams, bridges, bulk water, and sewerage services to industrial, residential, and mining developments. She has project experience in South Africa as well as other African countries. She is a

[2] Required as per the EIA regulations Appendix 2: 1. (a) details of- (i) details of-(i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae

voluntary member of the International Association for Impact Assessment South Africa (IAIAsa) and the Water Institute of Southern Africa (WISA).

1.1.5 HEAD OF PROJECT MANAGEMENT

Annechris Sewards holds an MSc in Computer Science and a BSc in Metallurgical Engineering. She has more than thirty years' experience in the mining/minerals processing sector, during which time she held senior positions in different functional units, including plant operations, projects, asset management & maintenance planning, IS&T, and strategic planning. She also has experience in the manufacturing industry, both in South Africa and in the United Kingdom. In the 12 years before joining OMI in 2020, she managed projects as an independent consultant, in both mining/minerals processing and public sectors. Since February 2020 she has co-authored a variety of reports related to environmental licencing and compliance. Her practical experience in the mining and manufacturing sectors has provided insight into the day-to-day issues facing operations, the possible solutions and the obstacles to successful implementation of measures to limit environmental damage. This includes underground and surface operations.

Table 1: Summary of the Details of the Team who Compiled the Report

Name	Designation	Input into Project	Qualifications & Professional Registrations
Annechris Sewards	Head of Project Management	Report writing and review	MSc (Comp Sci), Victoria University of Manchester BSc (Eng.) (Minerals Processing), University of the Witwatersrand IAIASA Membership: 6648
Chantal Uys	Head of Environmental Licensing	Technical input	BSc (Hons) Archaeology, Pretoria University Post Grad Certificate: Environmental Management, North West University Post Grad Certificate: Geographical Information Systems, University of Pretoria IAIASA Membership: 5608 WISA Membership: 40143
Reneé Kruger	Director of Environmental Licensing	Report writing, Authority liaison, Specialist management and input into public consultation	M Environmental Management, North West University Pr. Sci Nat. (SACNASP): 115667 Reg. EAP (EAPASA): 2019/854 Environmental Law Association Member IAIASA Membership: 6444 IAIASA NEC Member

2 DESCRIPTION OF THE PROPERTY[3]

Table 2: Property Details

Farm Name	• Portions 1, 2, 3, 4, 5 and the Remaining Extent of the farm Frankfort 509KT • The farm Krugers Hoop 527KT • Portion 1 and the Remaining Extent of the farm Van Der Merwes Reef 526KT • Portions 1, 2 and the Remaining Extent of Portions of the farm Morgenzon 525KT • The farm Peach Tree 544KT • Portions 18, 42, 43, 44 and the Remaining Extent of the farm Ponieskrans 543KT • Portion 1 of Grootfontein 562KT (Plant area)
Application area (Ha)	Total mining right area: 9,413.3366 ha. The footprint of the development proposed is over previously disturbed areas. The sizes below are the complete surface disturbance which includes the current footprint/infrastructure. The sizes of the areas can be divided and described as: • Clewer and Morgenzon – 4.5 ha • Dukes – 10 ha • Beta North – 10 ha • Frankfort- 6 ha • TSF and Plant area- 42 ha
Magisterial district	Ehlanzeni District Municipality and the Local Municipality of Thaba Chweu.
Distance and direction from nearest town	The existing plant area is located 2.5km southwest of the town of Pilgrim's Rest. The distance from the plant area to the neighbouring towns of Graskop to the east is 19km, Sabie to the southeast is 30km and Mashishing (previously known as Lydenburg) to the southwest is 58km.
21-digit Surveyor General Code for each farm portion	**Farm Frankfort 509KT:** • T0KT00000000050900000 • T0KT00000000050900001 • T0KT00000000050900002 • T0KT00000000050900003 • T0KT00000000050900004 • T0KT00000000050900005

[3] Required as per the EIA regulations Appendix 2: (b) the location of the activity, including-(i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;

	Farm Krugers Hoop 527KT: • T0KT00000000052700000 **Farm Van der Merwes Reef 526KT:** • T0KT00000000052600000 • T0KT00000000052600001 **Farm Morgenzon 525KT:** • T0KT00000000052500001 • T0KT00000000052500002 • T0KT00000000052500000 **Farm Peach Tree 544KT:** • T0KT00000000054400000 **Farm Ponieskrans 543KT:** • T0KT00000000054300000 • T0KT00000000054300018 • T0KT00000000054300042 • T0KT00000000054300043 • T0KT00000000054300044 **Portion 1 of Grootfontein 562KT** • T0KT00000000056200001

3 LOCALITY MAP[4]

Please refer to **Figure 1** and ANNEXURE C for the map showing the locality of the Mining Right Area. **Figure 2** shows the directly affected properties and surrounding properties and landowners for the Mining right area.

[4] Required as per the EIA regulations Appendix 2 (c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is-(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.

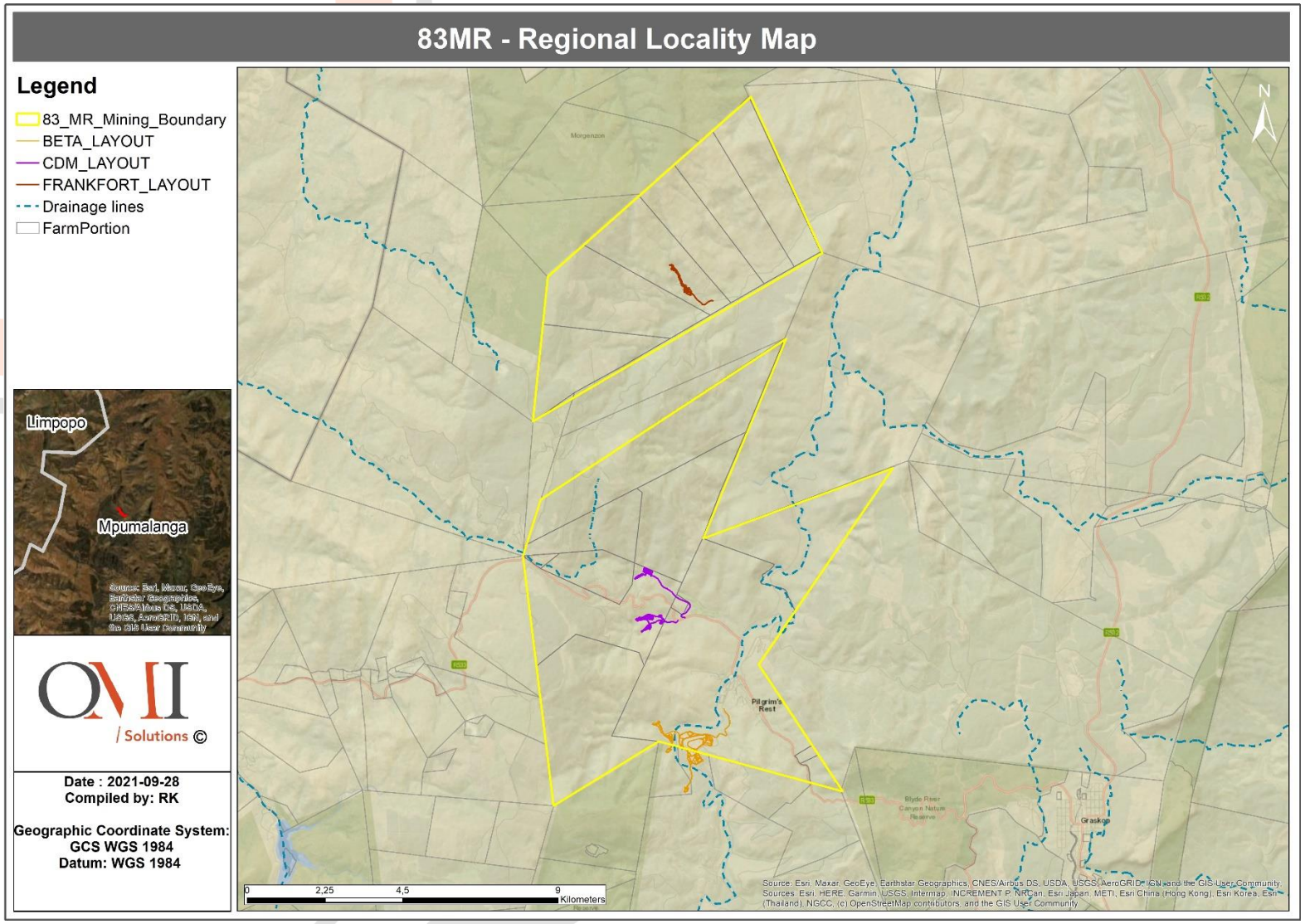

Figure 1: Locality Map of the Mining Right Area

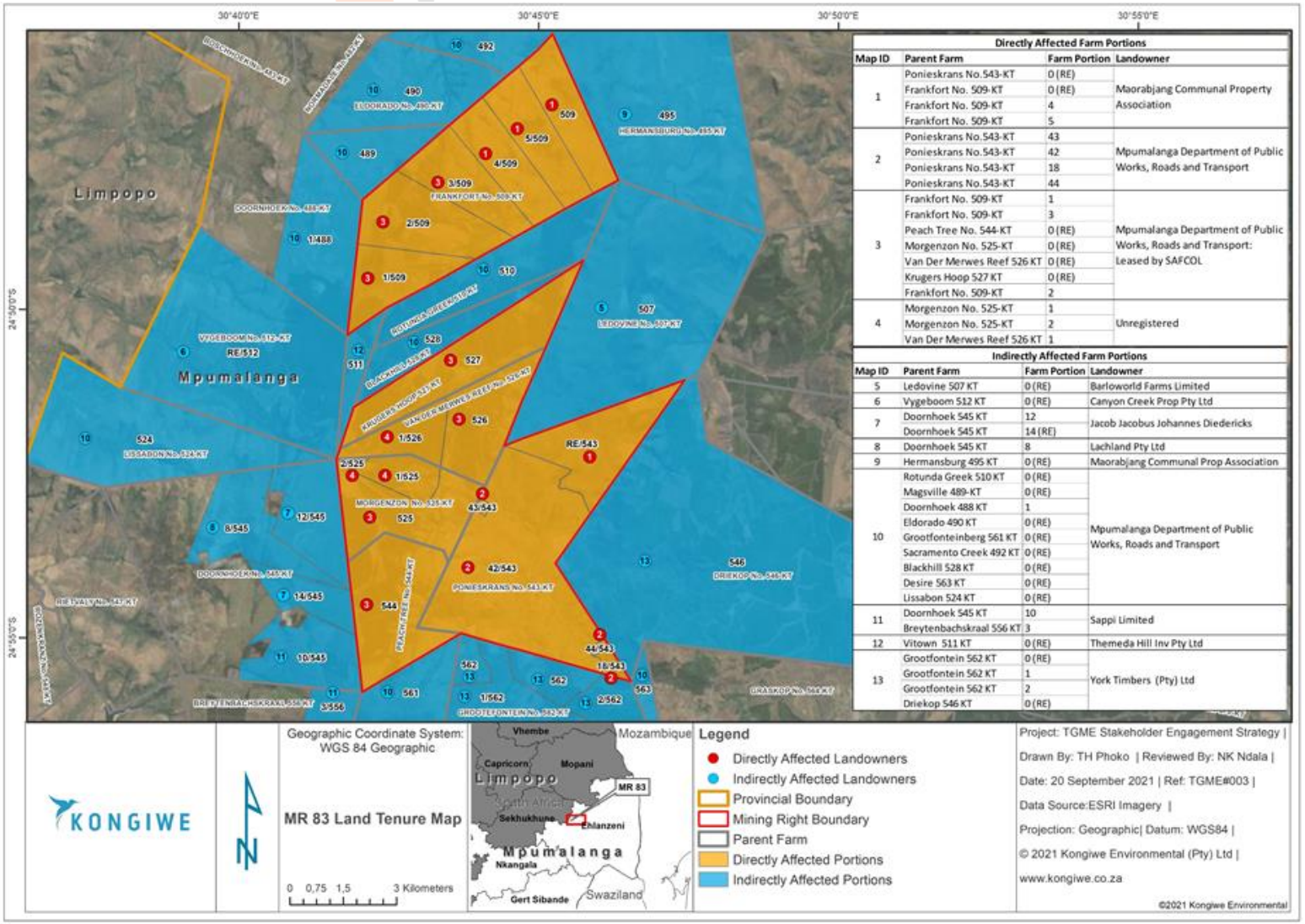

Figure 2: Directly and indirectly affected properties and ownership (Kongiwe, 2021)

4 PROJECT DESCRIPTION [5]

4.1 LISTED AND SPECIFIC ACTIVITIES

The site plans are shown in **Figure 4** and ANNEXURE D.

[5] Required as per the EIA regulations Appendix 2: (d) a description of the scope of the proposed activity, including (i) all listed and specified activities triggered; (ii) a description of the activities to be undertaken, including associated structures and infrastructure;

Table 3: Listed Activities to be Authorised under NEMA, NEMWA and NWA

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Underground mining over three areas	MR area is 99,413.3366 ha	Activity 17 Listing Notice 2	"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 Listing Notice 2 applies."	None	Section 21 a and j – for dewatering water to be re-used underground
Section 102 amendment of the Mine Works Programme		Activity 21D Listing Notice 1	"Any activity including the operation of that activity which requires an amendment or variation to a right or permit in terms of section 102 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity contained in this Listing Notice or in Listing Notice 3 of 2014, required for such amendment." [Activity 21D inserted by GN 517/2021]	None	None

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Reworking of old residue dumps (waste rock) to rehabilitate areas	Various dumps in the Mining right area	Activity 21F Listing Notice 1	"Any activity including the operation of that activity required tor the reclamation of a residue stockpile or a residue deposit as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required for the reclamation of a residue stockpile or a residue deposit." [Activity 21F will be applicable from a date yet to be published][6]	Category B: Activity 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)."	Section 21 g
Plant: Mine residue (waste rock dump (WRD)) and RoM stockpile	Mine residue: 9,500 m^2 RoM Stockpile: 1,100 m^2	Activity 6 Listing Notice 2	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.	Category B: Activity 10 - "The construction of a facility for a waste management activity listed in Category B of this Schedule." Activity 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)."	Section 21 g

[6] This activity is included for completeness even though it is not yet in force.

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Stormwater dams, pollution control dams (PCD), silt traps and systems (previous dams to be upgraded)	PCD 1: 0.37 ha (upgrade on previous footprint) PCD 2: 0.32 ha (upgrade on previous sump location) Plant make-up water dam: 0.4 ha (upgrade on previous footprint)	Activity 6 Listing Notice 2	"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."	None	Section 21 g
		Activity 34 Listing Notice 1	"The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence, or for an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent, or pollution, excluding- (i) where the facility, infrastructure, process, or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water, or sewage where the capacity will be increased by less than 15,000 cubic meters per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day."	None	Section 21 g

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Upgrading of the plant requiring Air Emissions licence[7] for the following activity: Subcategory 4.17: Precious and Base Metal Production and Refining	Current and upgraded plant area is located on 10 ha	Activity 17 Listing Notice 2	"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 Listing Notice 2 applies."	None	None
		Activity 6 Listing Notice 2	"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."		
		Activity 34 Listing Notice 1	"The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial		

[7] The new electrical line that will feed to the plant is proposed to go up to 22kV: Activity 11 of listing notice 1 is not applicable as the trigger is 33kV.

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			legislation governing the release of emissions, effluent, or pollution, excluding- (i) where the facility, infrastructure, process, or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water, or sewage where the capacity will be increased by less than 15,000 cubic meters per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day."		
TSF – upgrade of deposition rate and expansion	1.83 Mt deposition	Activity 6 Listing Notice 2	"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."	Category B: Activity 10- "The construction of a facility for a waste management activity listed in Category B of this Schedule." Activity 11 - "The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right,	Section 21 g
		Activity 34 Listing Notice 1	"The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial		

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			legislation governing the release of emissions, effluent, or pollution, excluding- (i) where the facility, infrastructure, process, or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water, or sewage where the capacity will be increased by less than 15,000 cubic meters per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day."	exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)."	
Upgraded TSF pipeline	200 m length pipe	Activity 10 Listing Notice 1	"The development and related operation of infrastructure exceeding 1,000 meters in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge, or slimes- (i) with an internal diameter of 0.36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where-	None	None

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			(a) such infrastructure is for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area"		
DMS plant, crushing and screening at the shaft	Shaft areas complete footprint - DMS plants are replacing old DMS on shaft footprint: Clewer and Morgenzon – 4.5 ha Dukes – 10 ha Beta North – 10 ha Frankfort - 6 ha	Activity 17 Listing Notice 2	"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 Listing Notice 2 applies."	None	None
Beta to plant and back pipelines: Dewatering water pipelines from underground	1km in road reserve	Activity 10 Listing Notice 1	"The development and related operation of infrastructure exceeding 1,000 meters in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge, or slimes-	None	Section 21 c and i

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Return water pipelines			(i) with an internal diameter of 0.36 meters or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area"		
Raw water pipeline from plant to Beta crossing Blyde in road reserve	1km in road reserve	N/A	Throughput is below the thresholds. The Pipeline will cross the Blyde on the road and have been included there.		Section 21 c and i
Haul road and stormwater culvert - stream crossing upgrades	Crossing upgrade from Blyde to Beta North expanding more than 100 m² Duke existing diversions grading only Road to Frankfort grading only	Activity 23 Listing notice 3	"The expansion of- (i) dams or weirs where the dam or weir is expanded by 10 square meters or more; or (ii) infrastructure or structures where the physical footprint is expanded by 10 square meters or more; where such expansion occurs - (a) within a watercourse; (b) in front of a development setback adopted in the prescribed manner; or		Section 21 c and i

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			(c) if no development setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse; excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour."		
		Activity 48 Listing notice 1	"The expansion of- (i) infrastructure or structures where the physical footprint is expanded by 100 square meters or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square meters or more; where such expansion occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 meters of a watercourse, measured from the edge of a watercourse; excluding- (aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such expansion activities are related to the development of a port or		

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 23 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such expansion occurs within an urban area; or (ee) where such expansion occurs within existing roads, road reserves or railway line reserves".		
		Activity 19 Listing notice 1	"The infilling or depositing of any material of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic meters 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		

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			case activity 26 in Listing Notice 2 of 2014 applies"		
Conveyor from Beta North to Plant to cross Blyde River	Approx. 900 m	Activity 14 Listing notice 3	"The development of- (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square meters; or (ii) infrastructure or structures with a physical footprint of 10 square meters or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 meters 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. **f. Mpumalanga** i. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in	None	Section 21 c and i

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas identified in terms of an international convention; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Core areas in biosphere reserves; or (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation; or ii. Inside urban areas: (aa) Areas zoned for use as public open space; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose."		
Diesel generators on Shaft sites	Each site has maximum 4 MW generation capacity smaller than 1 ha size generators.	Activity 2 Listing Notice 1	"The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where- (i) the electricity output is more than 10 megawatts but less than 20 megawatts; or	None	None

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
	Shaft areas: Clewer and Morgenzon – 4 MW Dukes – 4 MW Beta North – 4 MW Frankfort – 4 MW Combined capacity over all sites is more than 10 MW		(ii) the output is 10 megawatts or less, but the total extent of the facility covers an area in excess of 1 hectare."		
Dangerous good storage – expansion of current approval tanks at shafts and plant area	Frankfort combined capacity: 80 m^3 Dukes combined capacity: 80 m^3 Morgenzon combined capacity: 80 m^3 Frankfort combined capacity: 80 m^3 Plant area combined capacity 200 m^3	Activity 22 Listing notice 3	"The expansion and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage facilities or infrastructure will be expanded by 30 cubic meters or more but no more than 80 cubic meters. **f. Mpumalanga** i. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;	None	None

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			(dd) Sites or areas identified in terms of an international convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation; or (hh) Areas within a watercourse or wetland, or within 100 meters of a watercourse or wetland."		
		Activity 14 of Listing notice 1	"The expansion and related operation of facilities for the storage, or storage and handling, of a dangerous good, where the capacity of such storage facility will be expanded by more than 80 cubic meters".	None	None
Establishment of shaft areas on previously disturbed areas- limited disturbance outside of these	Full shaft footprint on previously disturbed areas Clewer and Morgenzon – 4.5 ha Dukes – 10 ha Beta North – 10 ha	Activity 12 Listing Notice 3	"The clearance of an area of 300 square meters 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. **f. Mpumalanga**	None	Section 21 c and i

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
footprints might take place	Frankfort - 6 ha		i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; or iii. 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 or proclamation in terms of NEMPAA."		
Establishment of Residue deposits (WRD) at 3 mine areas. Reclamation of old WRD. Beta dump to be reclaimed prior to building shaft. Other remaining Dumps to be removed to allow rehabilitation outside shaft areas.	Clewer and Morgenzon – 0.6 ha Dukes – North 0.2 ha South 0.25 ha Beta North – 0.2 ha Frankfort - 0.3 ha	Activity 12 Listing Notice 3	"The clearance of an area of 300 square meters 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. **f. Mpumalanga** i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; or	Category B: Activity 10- "The construction of a facility for a waste management activity listed in Category B of this Schedule." Activity 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)."	Section 21 g per dump

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			iii. 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 or proclamation in terms of NEMPAA."		
		Activity 21F Listing Notice 1	'Any activity including the operation of that activity required tor the reclamation of a residue stockpile or a residue deposit as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required for the reclamation of a residue stockpile or a residue deposit. [Activity 21F will be applicable from a date yet to be published] '		
		Activity 6 Listing Notice 2	"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."		
RoM Pad and DMS separation pads	Previous disturbed areas: Frankfort Ore tipper area 2,500 m² and DMS pads 800 m² Dukes RoM pad 3,800 m² DMS pads 800 m²	Activity 6 Listing Notice 2	"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."	None	Section 21 g
Pollution control dams, silt traps		Activity 6	"The development of facilities or infrastructure for any process or activity which requires a permit or	None	Section 21 g

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
and culverts at shafts	Frankfort PCD and silt trap: 0.5 ha- capacity 4,633m^3 Morgenzon PCD and Silt trap 0.2 ha capacity 1,900 m^3 Dukes North PCD 0.3 ha capacity 3,400 m^3 Dukes North PCD 0.2 ha capacity 1,000 m^3 Beta North PCD 0.4 ha Capacity 5,050 m^3	Listing Notice 2	licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.”		
		Activity 9 Listing notice 1	“The development of infrastructure exceeding 1,000 meters in length for the bulk transportation of water or stormwater- (i) with an internal diameter of 0.36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or stormwater or stormwater drainage inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area”		
		Activity 10 Listing notice 1	“The development and related operation of infrastructure exceeding 1,000 meters in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes- (i) with an internal diameter of 0.36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where-		

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			(a) such infrastructure is for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area"		
		Activity 12 Listing Notice 3	"The clearance of an area of 300 square meters 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. **f. Mpumalanga** i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; or iii. 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 or proclamation in terms of NEMPAA."		

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Salvage yard within shaft areas	To be determined (TBD)	None	None	Category C: Activity 1- "The storage of general waste at a facility that has the capacity to store in excess of 100 m^3 of general waste at any one time, excluding the storage of waste in lagoons or temporary storage of such waste." Activity 2- "The storage of hazardous waste at a facility that has the capacity to store in excess of 80 m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste."	
Reservoirs at the shafts	Capacity of the tanks at the shafts: Frankfort 1,000 m^3 Morgenzon- 1,000 m^3 Dukes – 1,000 m^3 Beta- 1,000 m^3	Activity 2 Listing notice 3	"The development of reservoirs, excluding dams, with a capacity of more than 250 cubic meters. **f. Mpumalanga** i. In a protected area identified in terms of NEMPAA, excluding conservancies; ii. Outside urban areas: (aa) National Protected Area Expansion Strategy Focus areas; (bb) Sensitive areas as identified in an environmental management framework	None	Section 21 b

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			as contemplated in chapter 5 of the Act and as adopted by the competent authority; (cc) Sites or areas identified in terms of an international convention; (dd) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ee) Core areas in biosphere reserves; or (ff) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation; or iii. Inside urban areas: (aa) Areas zoned for use as public open space; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.”		

4.2 HISTORICAL MINING AND MINING RIGHTS

The Sabie-Pilgrims Rest goldfield is the oldest gold mining district in Mpumalanga, with historical production estimated at 200 tonnes of gold (7 million ounces), making it the third-largest producer in South Africa. Of the total historical production of 200 tonnes, TGME contributed 124 tonnes (4 million ounces) between 1885 and 1971, at an average recovered grade of 10.35 grams gold (Au) per tonne (g/t).

The Transvaal Gold Exploration Company was formed in 1883, but following a name change and a merger, the company was reconstituted as TGME on 16 May 1895. Mining in the area commenced in the late 19th century and continued into the mid-20th century and intermittently thereafter, with operations finally ceasing in 1971 at Beta Mine. In the late 1880's, a complex of small mining operations developed in the Central Area.

Historically, the central mines have produced 9 million tonnes of ore at an average head grade of 10 g/t Au. The Rho reef alone has produced 2,700,000 tonnes at a head grade of 7.7 g/t of Au. The Theta and Beta mines were the biggest producers in the district, but many of the smaller mines operated successfully until the 1950's.

Production from the Sabie area was principally from Glynn's Lydenburg, Elandsdrift Blows and Rietfontein Mines. In the Northern area, mining continued periodically until the 1950's with Vaalhoek, Hermansburg and Bourke's Luck mines being the main producers.

More recently, intermittent mining occurred at locations such as CDM and Frankfort Mines from the 1990's to 2008. Simmer and Jack operated as the owner of TGME until a share sale to Theta Gold Mines Limited (previously Stonewall Resources) in 2010. TGME started mining again in 2010 until it shut down the operations due to a prolonged illegal strike in 2014.

TGME is now held by Theta Gold Mines Limited, listed on the Australian Stock Exchange, with Chinese, German and American investors. Over the last two years, R58 million has been invested in exploration, environmental authorisations, community upliftment programs, and continuous Mine infrastructure maintenance. The re- development of the historical underground mines will provide TGME with the revenue to continue with this investment.

TGME currently holds a mining right, bearing Department of Mineral Resources and Energy (DMRE) reference number MP30/5/1/2/2/83MR (83 MR), which was granted in terms of the MPRDA on 28 February 2008, and which became effective on 16 October 2013. The 83 MR mining area comprises Portions 1, 2, 3, 4, 5 and the Remaining Extent of the farm Frankfort 509KT, the farm Krugers Hoop 527KT, Portion 1 and the Remaining Extent of the farm Van Der Merwes Reef 526KT, Portions 1, 2 and the Remaining Extent of Portions of the farm Morgenzon 525KT, the farm Peach Tree 544KT, and Portions 18, 42, 43, 44 and the Remaining Extent of the farm Ponieskrans 543KT (mining area).

The existing TGME Plant is situated on a portion of the farm Grootfontein 562KT. Although this property is not included in 83 MR, it forms part of the "mining area" of 83 MR in terms of the definitions in the MPRDA ("in relation to any environmental matter and any residual, latent or other impact thereto, including any land or surface adjacent or non-adjacent to the area but upon which related or incidental operations are being undertaken").

TGME proposes to re-develop its historical underground mines within the 83 MR mining area which includes Clewer, Dukes and Morgenzon (CDM), Frankfort, and Beta North underground mines.

The proposed project will require additional surface infrastructure to support the underground working, the expansion of the current TSF and a retrofit and upgrade of the old TGME process and beneficiation

plant. The TGME process plant located on the farm Grootfontein 562 KT. The area involved in the new disturbance outside the exiting historical footprint in total is less than 2 Ha.

To mitigate the risk of loss of Critical Biodiversity Areas (CBAs), sensitive floral communities, threatened ecosystems and floral Species of Conservation Concern (SCCs), a biodiversity verification and pre-feasibility assessment was conducted in May 2021 to identify environmental buffer zones. The assessment informed the engineering concept designs to ensure that the surface infrastructure layout is limited to previously disturbed areas where possible.

4.3 DESCRIPTION OF THE CURRENT AND PROPOSED ACTIVITIES TO BE UNDERTAKEN

The project areas consist of historical underground mining sections on the above-mentioned farms (**Table 2**), as well as an old TGME process and beneficiation plant located on the farm Grootfontein 562KT.

In order to establish the underground mining projects, additional infrastructure will have to be established to augment the existing surface infrastructure. The engineering work for this will mainly consist of the establishment of the surface infrastructure and the mining sites, and the re-establishment of the underground workings. The site can be accessed by the tarred R533 regional main access road between Pilgrim's Rest and Ohrigstad.

4.3.1 PROCESSING PLANT AND TSF AREA - CURRENT

The following existing infrastructure is located at the mineral processing plant, as per the approved EMPr:

- Processing plant;
- Smelting plant;
- TSF with return water dams (RWD);
- Stores;
- Ore handling and ore feed infrastructure;
- Run of Mine (RoM) stockpile area;
- Heap Leach Pad;
- Stormwater management channels and dams;
- Administration offices;
- Engineering workshops;
- Two water reservoirs;
- Old water supply pumping system (drawing from Blyde River);
- Changehouse facility at the process plant;
- Stores and laydown yard;
- 6.6 kV line supplying power to the operation from the existing Eskom consumer substation;
- Site distribution substation;
- Power distribution transformers;
- Processing plant motor control centers;
- Processing plant pollution control dam (PCD);
- Fuel storage tanks;
- Salvage and reclamation yard; and
- Access control fencing (mainly at the administration offices and old processing plant).

The plant will be upgraded (replacement of old outdated infrastructure) and the capacity increased to 80,000 tons per month, in line with the proposed underground mining activities. In general, the requirements for the operation at the plant will be:

- Upgrading of the process plant to the newest technology;
- Upgrading of smelting plant;
- Trackless mobile machinery (TMM) workshops;
- Mining and engineering stores;
- First aid station;
- Control room;
- Mining waste sorting/management and salvage yard;
- A new treatment plant and sewage reticulation system;
- Clean/Dirty change houses;
- Additional power supply and distribution infrastructure;
- RoM ore haul roads plus upgrades to the road access around Pilgrims Rest;
- Site security and access control;
- Upgrading of the stormwater management system to comply with the requirements of the *Regulation on use of water for Mining and related activities aimed at the protection of water resources* published under Government Notice (GN) 704 of 4 June 1999 in terms of the National Water Act, 1998 (Act 36 of 1998) (GN 704) including:
    - Silt traps;
    - Two PCD dams;
    - Plant make-up dam (stormwater and pollution control);
    - Clean and dirty water channels.
- Potable water treatment plant;
- Re-instated Helipad;
- Mine residue facility (WRD) on the old Heap Leach Pad area (to be rehabilitated as part of the upgrade);
- Upgraded RoM area;
- Diesel storage;
- Oil storage area;
- Proto Room; and
- Central dense medium separation (DMS) plant.

For detail on the metallurgical plant processes, please refer to Section 4.3.2. It should be noted that all activities will take place in the previously disturbed footprint area of the approved plant.

4.3.2 PROCESSING PLANT AND TSF AREA - PROPOSED

The orebody is highly variable across the mining concession and therefore the proposed upgrades to the processing facility will be designed and installed to process each ore type appropriately. The majority of the ore-types are free-milling ores[8] requiring simple crushing and milling, followed by a CIL process to recover the gold. However, some of the ores consist of highly sulphidic, preg-robbing[9]

[8] Free milling ores encompass all ores that readily yield their gold by cyanidation, with no factors that complicate or reduce extraction efficiency.

[9] Preg-robbing ores contain material capable of absorbing gold-cyanide complexes during leaching, This material tends to be carbonaceous matter, in this instance carbonaceous shale.

constituents, which are not suitable for gold recovery via the carbon-in-leach (CIL) process. The plant will process the different ores through different circuits, which will join up at the smelting room.

Provision to include crushing/screening and dense medium separation at each underground shaft allows for appropriate separation of naturally occurring fines, which contain the bulk of the carbonaceous shale (preg-robber). The oversize will be separated into a sulphide-rich constituent and a waste gangue constituent (which is essentially the host rock). This waste product could potentially be sold or used as a source of road-fill, aggregate or TSF rock cladding material.

Run of Mine ore (RoM) will be crushed in a 2-stage crushing facility with screened fines (<3mm) stockpiled on a concrete pad for transport to the plant. Similarly, the DMS sink fraction (sulphides) will be transported to the plant. Each DMS facility will be enclosed with appropriate bunded and bermed perimeter protection to ensure total containment of all processed material and water. Process water used in this operation will be recycled, with top-up used to replace water associated with moisture losses in the products transported to the processing plant.

RoM ore will be delivered from the various mining areas and deposited onto designated stockpiles allowing for specific processing requirements aligned with the ore type. The crushed fines and DMS sink material will be milled in separate milling facilities. Both streams will be then processed through a carbon flotation circuit to remove the naturally occurring carbonaceous shale, which will be leached in a dedicated CIL circuit for gold recovery. The carbon flotation tails will then be processed in a sulphide flotation circuit. The sulphide flotation concentrate will be oxidised using high-shear reactors and liquid oxygen injection in order to liberate the occluded gold. This process will also oxidise the associated sulphides, with the objective of reducing reagent consumption in the downstream CIL process. The sulphide concentrate, post oxidation, will then be treated in an intensive CIL. The tails will be pumped to a larger, conventional CIL stream.

Provision has been made to include a gravity recovery circuit for future ore types which will include coarse free gold, which is advantageous to recover during the milling process rather than via a CIL circuit. This facility will be operated when appropriate and aligned to ore types received from the mining operations. The circuit will include a primary centrifugal concentrator and a shaking table situated in the smelthouse, with the product being directly smelted and the tails returned to the mills.

Free milling/oxide ore types will be milled in a separate milling facility with the milled product (80% -75 micron) being thickened in a high-rate thickener and pumped directly to the large second stage CIL circuit for dissolution and adsorption onto activated carbon.

The activated carbon from all the CIL circuits will be eluted in 2 parallel elution circuits, with the eluate recovered by conventional electrowinning and smelted. All bullion produced will be despatched to Rand Refinery by helicopter on an appropriate schedule, but most likely once a week.

The entire plant perimeter will be enclosed with adequate perimeter protection fencing, security lighting and a comprehensive camera surveillance system monitored in a central control room facility.

To achieve this, the following major process equipment will be utilised in the processing facility:

- Mobile crushers and screens;
- Mobile conveyor systems;
- Concrete containment paddocks and lay-down areas;
- Dense medium separation plants;
- 5 Mills (2 oxide/free milling ore mills, DMS sinks mill, screened fines mill, sulphide concentrate mill);
- 4 Thickeners;

- 3 CIL circuits (Carbon float concentrate, intensive CIL and conventional CIL);
- Gravity recovery circuit;
- Carbon flotation circuit;
- Sulphide flotation circuit;
- 3 Oxidation vessels;
- High-shear reactors;
- Elution circuit (2 elution columns);
- Carbon regeneration kiln;
- Woodchip/trash removal screens; and
- Smelting facility (shaking table, furnace, calciner).

The processing plant will be on the current TGME plant site footprint. The plant will be compressed and optimised into the current footprint although the intention is to process a larger throughput than was processed historically. This will be facilitated by the modern technology to be employed.

Reagents used will be as follows:

- Ferrosilicon for DMS operation;
- Frother for both carbon and sulphide flotation;
- Collector and conditioner for sulphide flotation;
- Liquid oxygen for sulphide oxidation, leaching kinetics and reduction of cyanide consumption;
- Sodium cyanide for gold dissolution;
- Lime for protective alkalinity;
- Caustic soda for elution;
- Fluxes for gold smelting;
- Hydrochloric acid for calcium removal from activated carbon;
- Activated carbon; and
- Cyanide detoxification reagents – Sodium metabisulphite, copper sulphate and oxygen.

The Process Flow Diagram of the plant is shown below in **Figure 3** and Conceptual layout is shown in **Figure 4.**

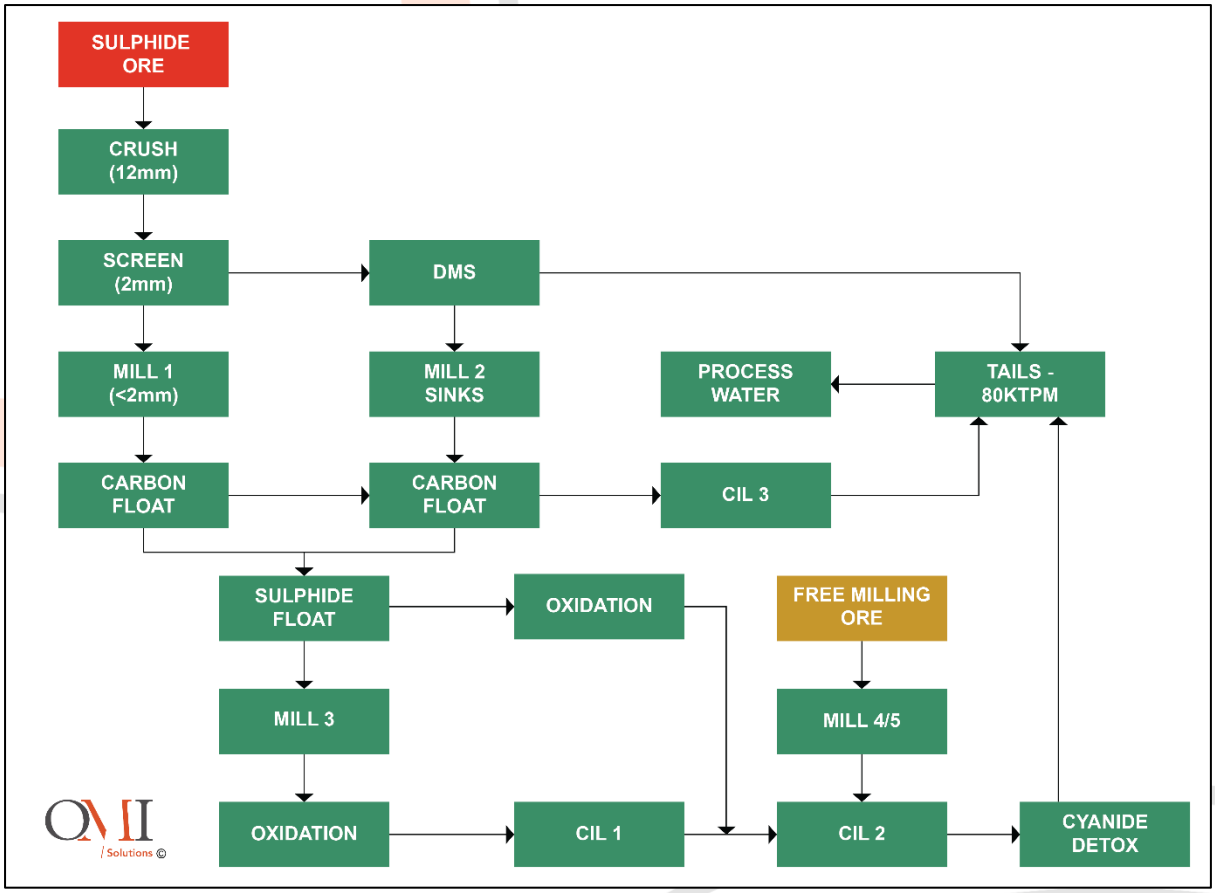

Figure 3: Typical Gold Processing to be Undertaken

The plant will require an Atmospheric Emissions Licence for operation under the following listed activities (to be confirmed with District Municipality) under the NEMAQA:

- Subcategory 4.1: Drying and calcining
- Subcategory 4.16: Smelting and Converting of Sulphide Ores
- Subcategory 4.17: Precious and Base Metal Production and Refining

4.3.3 TAILINGS STORAGE FACILITY

It is anticipated that a total of 1.83 Mt will be deposited onto the TSF over a period of eight (8) years. To meet the deposition requirements of the Phase I mining development, the extension of the TSF will be undertaken in two stages. The first stage (Stage I) will consist of the vertical extension of the existing TSF up to the final design height. The second stage (Stage II) will entail extending the footprint to the open area, to the east of the existing TSF. The total capacity of the planned extensions will be approximately 2.09 Mt. The Stage 1 extension will have an approximate capacity of 0.79 Mt and the Stage II extension a capacity of 1.3 Mt (Refer to **Figure 5**).

The tailings from the CIL circuits will be processed in a cyanide detoxification circuit, consisting of three mechanically agitated tanks. Sodium metabisulphite, copper sulphate and oxygen will be added to react with the cyanide and render it non-toxic. After detoxification, the tailings material will be pumped to the TSF for deposition, using cyclones to manage deposition areas and thus maintain TSF stability. Excessive water on the TSF will be decanted to a RWD using a penstock system, prior to being pumped back to the plant.

Figure 4: Proposed Layout Map of the Infrastructure – Processing Plant (EcoElementum, 2021)

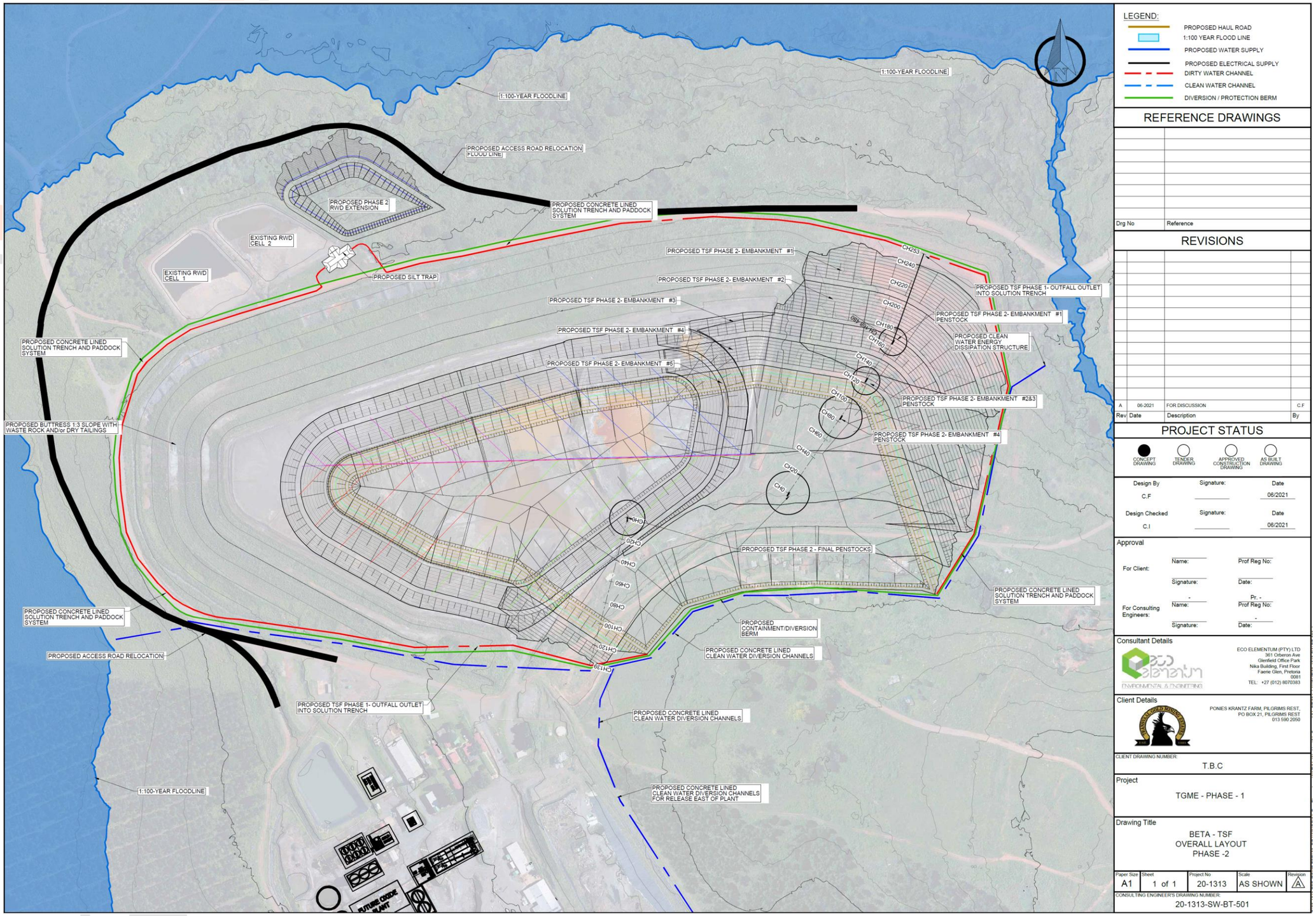

Figure 5: Proposed Layout Map of the Infrastructure – Tailings Phase 1 and 2 Layout (EcoElementum, 2021)

4.3.4 BETA NORTH SHAFT AREA

Available/existing infrastructure at the Beta North Underground Project area includes:

- Low level river crossings (Towards Beta North from the plant); and
- Various portals and developments providing access to the Beta complex underground workings.

In order to effectively establish the underground mining operation, a number of infrastructure items will be required at the Beta North project. The required infrastructure will include:

- TMM workshops;
- Fuel storage facilities;
- Oil storage facilities;
- Mining and engineering stores;
- First aid station;
- Mining waste sorting/management and salvage yard;
- Sewage handling facilities;
- Diesel generator sets;
- Power distribution transformers;
- Water supply and distribution infrastructure;
- Reservoir and water tanks;
- Surface water management infrastructure;
- Upgrading of river crossings and rehabilitation of Peach Tree stream;
- Site security and access control;
- Mining settling and collection dam (stormwater and pollution control);
- Emulsion storage tanks;
- Underground infrastructure;
    - Power supply by generator at the shaft;
    - Water supply from the Blyde (current approved permit);
    - Ore handling infrastructure (ore passes, conveyors, incline winder with required shaft equipment); and
    - Dewatering system.
- Offices – mobile/prefabricated offices;
- Surface ore handling and load-out facilities;
- DMS plant;
- Mine residue facility (WRD);
- RoM stockpile area;
- Conveyor from Beta North to the plant;
- Single drum winder;
- Steel rope haulage system.

Refer to **Figure 6** for the conceptual layout of the Beta North Shaft.

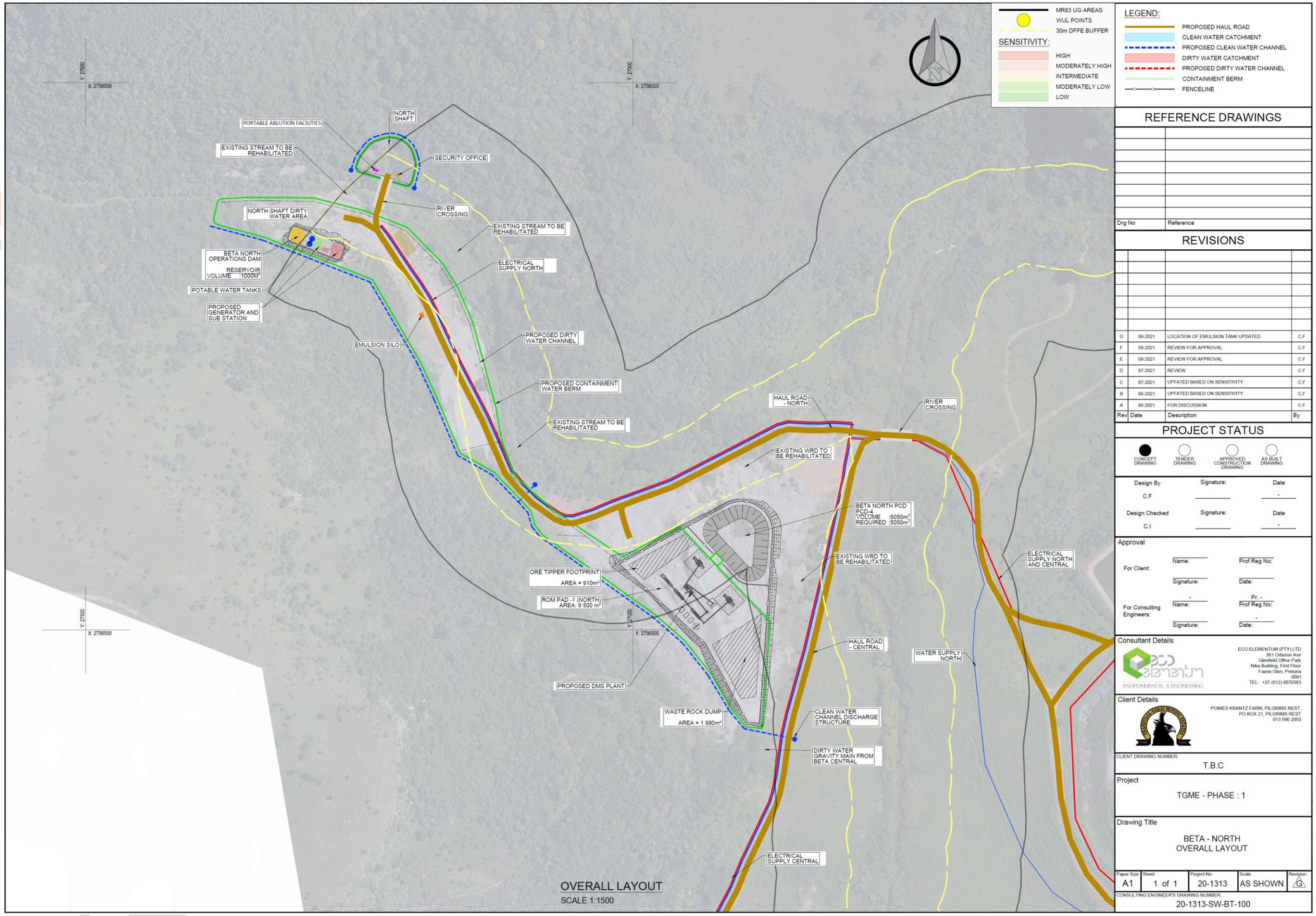

Figure 6: Proposed Layout Map of the Infrastructure – Beta North Shaft (EcoElementum, 2021)

4.3.5 CLEWER, DUKES AND MORGENZON SHAFT AREA

Available/existing infrastructure at the CDM Underground Project area includes: -

- Tarred R533 regional main access road leading to Pilgrims Rest;
- Gravel site access road;
- Old DMS process plant site – all equipment and infrastructure removed/demolished;
- Old Office area;
- Portal to underground operation;
- Mine residue facilities (waste rock);
- Stream diversions – Dukes Upper and Lower;
- Crossing of drainage at Morgenzon.

In order to effectively establish the CDM underground mining operation, several infrastructure items will be required. The required infrastructure will include, but is not limited to: -

- Offices – mobile/prefabricated offices;
- TMM workshops;
- Fuel storage facilities;
- Oil storage facilities;
- Mining and engineering stores;
- First aid station;
- Mining waste sorting /management and salvage yard;
- Portable Sewage handling facilities;
- Diesel generator sets;
- Power distribution transformers;
- Water supply and distribution infrastructure;
- Reservoirs and water tanks;
- Surface water management infrastructure;
- Upgrading of drainage crossings;
- Site security and access control;
- Mining settling and collection dam (stormwater and pollution control);
- Emulsion storage tanks;
- Underground infrastructure;
    - power supply;
    - water supply;
    - ore handling infrastructure (Ore passes, rails and conveyors); and
    - dewatering system.
- DMS Plants (at Dukes);
- Surface ore handling and load-out infrastructure;
- Mine residue facilities (waste rock).

Refer to **Figure 7** for the conceptual layout of the CDM Shaft area.

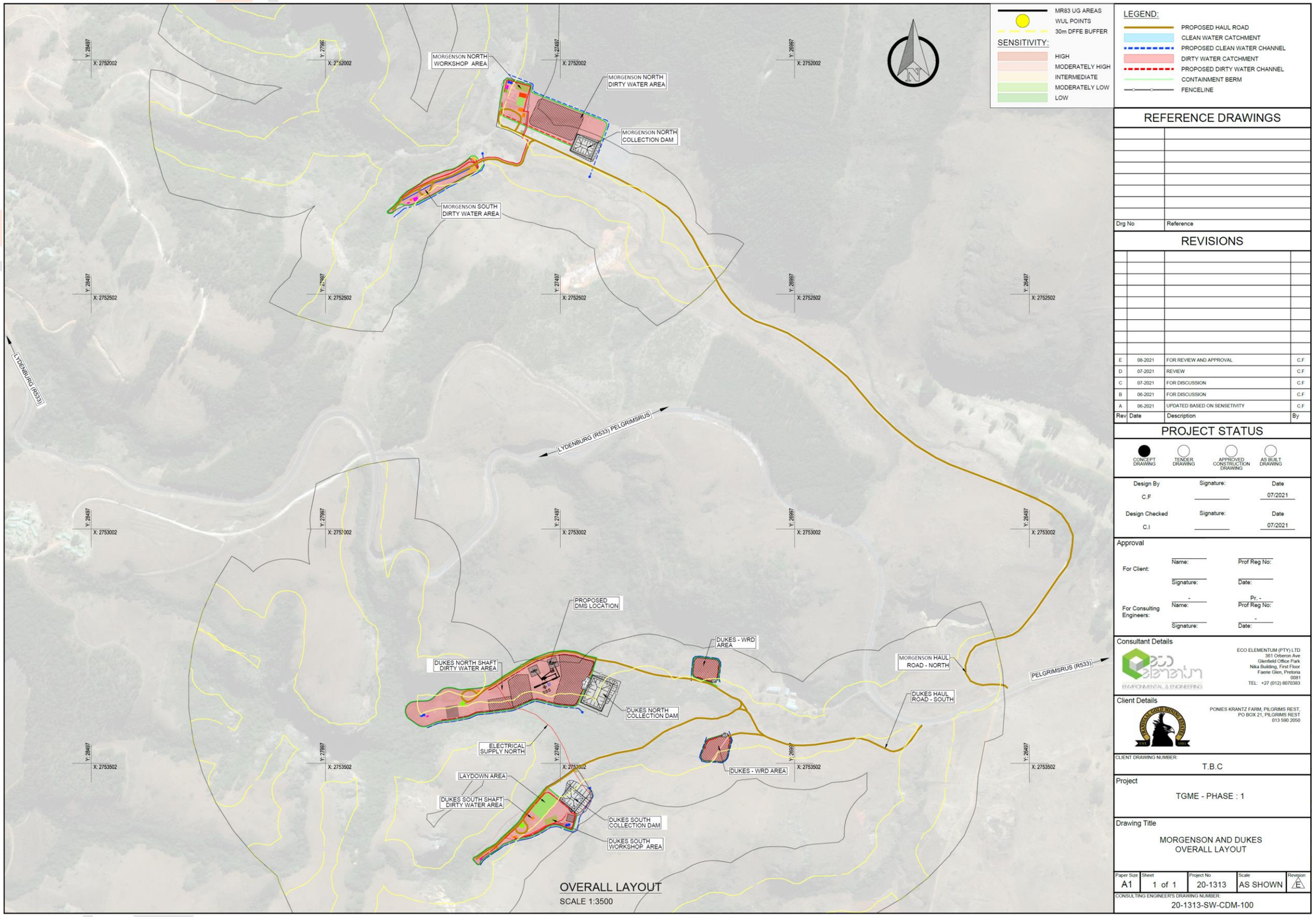

Figure 7: Proposed Layout Map of the Infrastructure – CDM Shafts (EcoElementum, 2021)

4.3.6 FRANKFORT SHAFT AREA

Available/existing infrastructure at the Frankfort Underground Project area includes: -

- Tarred R533 regional main access road leading to Pilgrims rest;
- Gravel site access road;
- Old DMS process plant site – all equipment and infrastructure removed/demolished;
- Old sand/slimes dam area- removed;
- Settling dams;
- Portal to underground historical underground workings;
- Mine residue facilities (WRD).

In order to effectively establish the Frankfort underground mining operation, several infrastructure items will be required. The required infrastructure will include, but is not limited to: -

- New DMS plant;
- Small office area for DMS operator;
- TMM workshops;
- Fuel storage facilities;
- Oil storage facilities;
- Mining and engineering stores;
- First aid station;
- Mining waste sorting /management and salvage yard;
- Portable Sewage handling facilities;
- Diesel generator sets;
- Water supply and distribution infrastructure;
- Reservoir and water tanks;
- Surface water management infrastructure;
- Site security and access control;
- Mining settling and collection dam (stormwater and pollution control);
- Emulsion storage tanks;
- Underground infrastructure:
    - power supply;
    - water supply;
    - ore handling infrastructure (Ore passes and conveyors); and
    - dewatering system.
- Surface ore handling and load-out infrastructure;
- Mine residue facilities (WRD).

Refer to **Figure 8** and **Figure 9** for the conceptual layout of the Frankfort Shaft area.

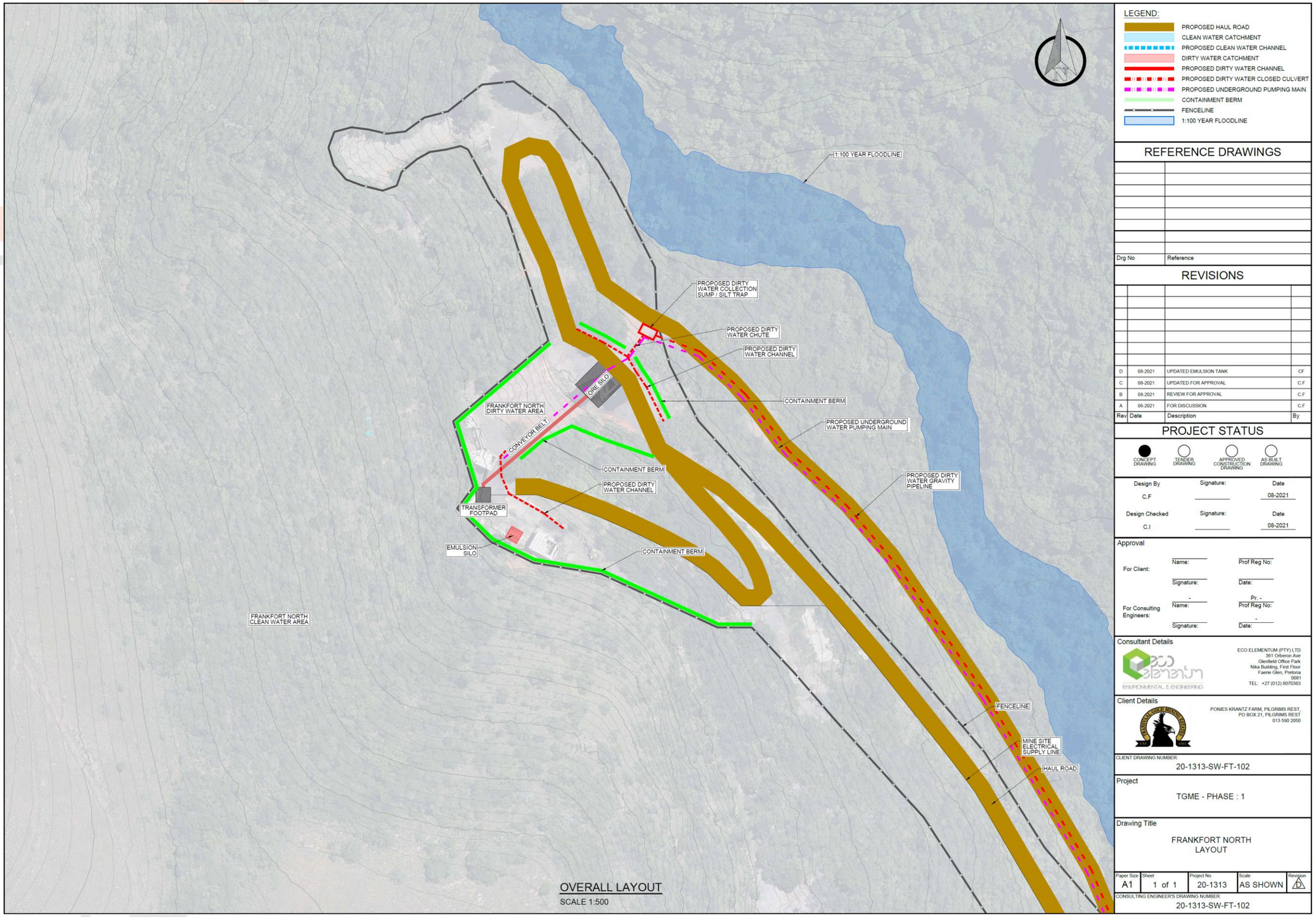

Figure 8: Proposed Layout Map of the Infrastructure – Frankfort Shaft – Adit area (EcoElementum, 2021)

Figure 9: Proposed Layout Map of the Infrastructure – Frankfort Shaft – DMS area (EcoElementum, 2021)

4.3.7 ACCESS AND ROADS

The mining areas are located close to Pilgrims Rest, Mpumalanga. The Beta underground mine is closest to the TGME processing plant, which is located just southwest of the town of Pilgrims Rest. CDM is located approximately 2.3 km west of the town and the Frankfort operation lies 9.3 km northwest of the town. The R533 serves as the main access route to all three mining operations. An additional provincial gravel road leads from the R553 to the Frankfort operation.

The Beta Project is located 1 km southwest of the TGME process plant. The Beta underground works will be accessed via the Beta North decline. The road to the site crosses the Blyde River. For the transporting of the Beta ore and waste, the haul road and crossing over the Blyde river will be upgraded. The haul road has been designed to service the ore, waste, people, and material logistics of Beta underground mining operations.

The Frankfort mine is located 26 km north of the plant area and is accessed via a dirt road off the R533. The dirt road crosses the Blyde River on several occasions. For the transporting of the Frankfort ore and waste, provision has been made in the capital for haul road construction and river crossings. The haul road has been designed to service the ore, waste, people, and material logistics of Frankfort underground mining operations.

CDM Project is located 3 km north of the plant area and is accessed via a dirt road. The CDM Project area is close to the R533 and does not require the construction of a haul road, as the existing dirt road (and the R533) has been deemed sufficient for the transporting of the CDM ore and waste.

4.3.8 POWER SUPPLY

An Eskom consumer substation located near the operations supplies 6.6 kV electricity via a single overhead line to the TGME plant. The current supply capacity to the operation is 2.5 MVA, which is supplied by a 2.5 MVA 22 kV/6.6 kV transformer; a second 2.5 MVA 22 kV/6.6 kV transformer is installed as a standby unit. The planned mining operations will necessitate an upgrade to the current supply. This would require an application for an upgrade to Eskom's supply capacity, which would necessitate the installation of larger transformers at the Eskom consumer substation.

The existing grid supply will initially service only the process plant area. Diesel generators will be required to supply power to the Beta project until the grid power supply infrastructure has been upgraded and expanded. Once complete, overhead power lines will be installed to supply grid power to the Beta project. This will form part of a separate authorisation process in consultation with Eskom.

The Frankfort and CDM projects currently have no access to grid power. These two operations will also require the use of diesel generators until the grid power supply infrastructure has been upgraded and expanded to these Mines.

4.3.9 WATER SUPPLY

Water supply is an essential service as various steps in the process plant and underground mining operations are heavily reliant on the usage of water. Apart from the mining and process requirements, water will also be required for use as potable water.

4.3.9.1 BETA WATER SUPPLY

Service Water sources available to the Beta Underground Mining area consist mainly of water sourced from the underground workings, surface water (dirty run-off rainwater) collected as part of the project

water management activities, and abstraction of water from the Blyde River under an approved authorisation.

Potable water will be treated by a potable water treatment plant and distributed to the process plant, underground workings, and surface facilities such as the offices and changing facilities.

The water supply requirements for the project are based on the following parameters:

- potable water for 257 people at 120 l/person/day;
- process make-up water – 0.9 m³/t of treated ore;
- dust suppression of roads;
- mining service water required for the following:
    - 2 x development drill rigs per mining section;
    - 2 x long hole drill rigs per mining section;
    - 2 x roof bolters per mining section; and
    - 5 x water jets (stope cleaning) per mining section.

4.3.9.2 FRANKFORT WATER SUPPLY

Service Water sources available to the Frankfort underground mining area consist mainly of water sourced from the underground workings and surface water (dirty run-off rainwater) collected as part of the project water management activities. The Frankfort mine currently has an existing licenced allocation for water from the Molototsi River.

Potable water will be treated in a potable water treatment plant and distributed to the process plant, underground workings, and surface facilities such as the offices and changing facilities.

The water supply requirements for the project should be based on the following parameters:

- potable water for 150 people at 120 l/person/day;
- process make-up water – 0.9 m³t of treated ore;
- dust suppression of roads;
- mining service water required for the following:
    - 2 x development drill rigs;
    - 2 x long-hole drill rigs;
    - 2 x roof bolters per mining section; and
    - 5 x water jets (stope cleaning) per mining section.

4.3.9.3 CDM WATER SUPPLY

Service water sources available to the CDM Underground Project consist mainly of water sourced from the underground workings, surface water collected (dirty run-off rainwater) as part of the project water management activities, and boreholes.

Potable water will be treated by a potable water treatment plant and distributed to the process plant, underground workings, and surface facilities such as the offices and changing facilities.

The water supply requirements for the project should be based on the following parameters:

- potable water for 150 people at 120 l/person/day;
- process make up water – 0.9 m³/t of treated ore;

- dust suppression of roads;
- mining service water required for the following:
    - 2 x development drill;
    - 2 x long-hole drill rigs;
    - 2 x roof bolters per mining section; and
    - 5 x water jets (Stope cleaning) per mining section.

4.3.10 WATER MANAGEMENT

The site is situated in a freshwater sensitive area and therefore compliance to GN 704 for the separation and containment of dirty and clean water is of utmost importance. All dirty rainfall run-off, process plant discharge, treated sewage and grey water should be collected, stored, and recycled as far as possible. Should an excess of water exist in the operational areas, all effluent from the sites should be suitably treated and tested to ensure compliance to acceptable standards before being released into the environment. Collection and diversion trenches should be utilised to separately collect and divert dirty and clean run-off water. All clean rainfall run-off should be diverted away from dirty and contaminated areas to minimise the risk of environmental and water pollution.

Surface collection dams should be constructed at all underground operations. These will serve as storage facilities for water pumped from underground, run-off water collected, and the main service water supply for the underground operations.

Water management at all the underground operations will be an important function of the operation. Water management will include:

- dewatering of underground workings;
- run-off water management;
- surface dams (storage); and
- sewage handling and management.

Pumping systems, clean water diversion trenches and dams forming part of the water management infrastructure will be designed based on the expected underground dewatering volumes and expected volumes of surface run-off water. This will be further discussed in the EIA level report.

4.3.11 WASTE MANAGEMENT

Waste envisioned to be generated from the operations will include domestic, industrial, and hazardous waste.

- Domestic waste will consist of all waste material generated by the day to day running of offices, change houses and canteens. This will include food, paper, cardboard, plastic wrappers, tin cans, and plastic bottles.
- Industrial waste will consist of material discarded during operation of workshops, mining machinery and process plant. This will include scrap metal, wood, tyres, metal and plastic drums, rubber materials and plastic components from engineering and mining equipment.
- Hazardous waste will include all discarded fuels, oils, lubricants, paints solvents and other chemicals. It will not be possible to dispose of these items on site, and thus these will have to be managed according to the norms and standards of storage of waste.
- Medical waste will be generated by the mine's first aid/medical stabilisation facility. Medical waste will include contaminated materials such as used syringes, surgical gloves and cotton wool, and empty medicine containers.

- Mine residue will consist of tailings from the plant to be deposited on the existing TSF and expansions presented for approval. The waste rock from underground will be stored on various WRDs around the shaft and plant areas

5 POLICY AND LEGISLATIVE CONTEXT [10]

The following legislation, policies and guidelines were considered during the compilation of this Scoping Report (SR) and will be heeded throughout the EIA process and specialist studies conducted:

Applicable Legislation And Guidelines Used To Compile The Report	Reference Where Applied
Constitution of the Republic of South Africa, 1996	The report was accordingly prepared, submitted and considered within the constitutional framework set by *inter alia* sections 24, 32 and 33 of the Constitution.
Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) and Mineral and Petroleum Resources Development Regulations (GN R527 of 2004, as amended)[11]	The Scoping and EIA report and Section 102 of the MPRDA Regulation application for this project are based on the MPRDA and Regulations.
National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) • Environmental Impact Assessment (EIA) Regulations, 2014 (GN R982 of 2014, as amended in June 2021)[12] • EIA Regulations Listing Notice 1 of 2014 (GN R983 of 2014, as amended)[13] • EIA Regulations Listing Notice 2 of 2014 (GN R984 of 2014, as amended)[14] • EIA Regulations Listing Notice 3 of 2014 (GN R985 of 2014, as amended)[15] • Financial Provisioning Regulations, 2015 (GN R1147 of 2015 as amended)[16] • DEA (2017), Guideline on Need and Desirability, Department of Environmental Affairs	The Environmental Impact Assessment (EIA) process was undertaken in respect of the authorisation process of the proposed mining operations, and is in compliance with the MPRDA, as well as the NEMA and NEMWA read with the Environmental Impact Assessment Regulations of 2014, as amended. The proposed development involves 'listed activities', as identified in terms of the NEMA. In terms of section 24(1) of the NEMA, the potential consequences for or impacts on the environment of inter alia listed activities must be considered, investigated, assessed and reported on to the Minister responsible for mineral resources, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of the NEMA. An application for Environmental Authorisation in line with the provisions contained in GNR

[10] Required as per the EIA regulations Appendix 2 (e) a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;

[11] GN 527 in GG 26275 of 23 April 2004 as amended by GN R 1288 in GG 26942 of 29 October 2004; GN R 1203 in GG 29431 of 30 November 2006; GN R349 in GG 34225 of 18 April 2011; GN R466 in GG 38855 of 3 June 2015; and GN R420 in GG 43172 of 27 March 2020.

[12] GN R982 of 4 December 2014 as amended by GN R326 of 7 April 2017, GN 706 of 13 July 2018, GN 599 of 29 May 2020 and GN 517 of 11 June 2021.

[13] GN R983 in GG 38282 of 4 December 2014 as amended by GN R327 in GG 40772 of 7 April 2017, GN 706 in GG 41766 of 13 July 2018 and GN 517 in GG 44701 of 11 June 2021.

[14] GN R984 in GG 38282 of 4 December 2014, as amended by GN R325 in 40772 of 7 April 2017 and GN 517 in GG 44701 of 11 June 2021.

[15] GN R985 in GG 38282 of 4 December 2014, as amended by GN R324 in 40772 of 7 April 2017, GN 706 in GG 41766 of 13 July 2018 and GN 517 in GG 44701 of 11 June 2021.

[16] The Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations published in GN R1147 in GG 39425 of 20 November 2015 as amended by GN 1314 in GG 40371 of 26 October 2016; GN R452 in GG 41584 of 20 April 2018; GN 991 in GG 41921 of 21 September 2018; GN 24 in GG 42956 of 17 January 2020; GN 495 in GG 44698 of 11 June 2021.

	982 (as amended) was submitted to the Department of Mineral Resources and Energy: Limpopo Region (DMRE), in terms of section 24 of the NEMA for consideration (Application submitted to DMRE on 26 July 2019). The activities specified in Table 3 of the Scoping were identified as being applicable to the proposed mining operations. The Financial provision for the project will comply to the Financial Provisioning Regulations. Need and desirability of the project is addressed in Section 6.
Department of Environmental Affairs, Pretoria, South Africa. • Department of Environmental Affairs (2017), Public Participation guideline in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa.	The public participation is conducted according to NEMA and the Public Participation guideline.
National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) • Listed Activities and Associated Minimum Emission Standards Identified in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (GN R893 of 2013, as amended)[17] • National Dust Control Regulations, 2013 (R827 of 2013)[18] • National Atmospheric Emission Reporting Regulations, 2015 (GN R283 of 2015)[19] • National Greenhouse Gas Emission Reporting Regulations (GN 275 of 2017 as amended)[20]	The plant will require an Atmospheric Emissions License (AEL). The Air Quality study listed activities and AEL will be guided by the act and regulations.
National Environmental Management: Biodiversity Act, 2004 (Act 39 of 2004) • Threatened or Protected Species Regulations, 2007 (GN R152 of 2007)[21] • Alien and Invasive Species Regulations (GN R1020 of 2020)[22] • Alien and Invasive Species Lists, 2020 (GN 1003 of 2020)[23] National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)	The Terrestrial and Aquatic specialist assessments will be guided by this act and regulations.

[17] GN R893 in GG 37054 of 22 November 2013, as amended by GN 551 in GG 38863 of 12 June 2015; GN 1207 in GG 42013 of 31 October 2018; GG 687 in GG 42472 of 22 May 2019; GN 421 in GG 43174 of 27 March 2020.
[18] R827 in GG 36974 of 1 November 2013.
[19] GN R283 in GG 38633 of 2 April 2015.
[20] GN R275 in GG 40762 of 3 April 2017 as amended by GN R994 in GG 43712 of 11 September 2020.
[21] GN R152 in GG 29657 on 23 February 2007.
[22] GN R1020 in GG 43735 of 25 September 2020.
[23] GN 1003 in GG 43726 of 18 September 2020. Notice replaced the previous Alien and Invasive Species Lists (GN 864 in GG 40166 of 29 July 2016).

National Environmental Management: Waste Act, 2008 (Act 59 of 2008) • List of waste management activities that have, or are likely to have, a detrimental effect on the environment (GN 921 of 2013, as amended)[24] • National Waste Information Regulations, 2012 (GN R625 of 2012)[25] • Regulations regarding the planning and management of residue stockpiles and residue deposits, 2015 (GN R632 of 2015, as amended)[26] • Waste Classification and Management Regulations, 2013 (GN R634 of 2012)[27]. • National Norms and Standards for the Assessment of Waste for Landfill Disposal (R635 of 2012)[28] • National Norms and Standards for the Disposal of Waste to Landfill (R636 of 2012)[29] • National Norms and Standards for the Storage of Waste (GN 926 of 2013)[30]	The Environmental Impact Assessment (EIA) process was undertaken in respect of the authorisation process of the proposed mining operations, and is in compliance with the MPRDA, as well as the NEMA and NEMWA read with the list of waste management activities that have, or are likely to have, a detrimental effect on the environment, as amended. All residue designs will comply with the regulations and norms and standards.
National Forest Act, 1998 (Act 84 of 1998) • Regulations under the National Forests Act 84 of 1998 (GN R466 of 2009)[31]	The legislation will be heeded throughout the proposed mining operations and was considered in the Ecological Impact Assessment. Permits will be applied for where required.
National Heritage Resources Act, 1999 (Act 25 of 1999) The World Heritage Convention Act, 1999 (Act 49 of 1999)	An Archaeological Impact Assessment and Palaeontological Impact Assessment were conducted for the project.

[24] GN 921 in GG 37083 of 29 November 2013 as amended by GN 332 in GG 37604 of 2 May 2014; GN R633 in GG 39020 of 24 July 2015; and GN 1094 in GG 41175 of 11 October 2017.
[25] GN R625 in GG 35583 of 13 August 2012.
[26] GN R632 in GG 39020 of 24 July 2015 as amended by the Planning and Management of Residue Stockpiles and Residue Deposits Amendment Regulations, 2018 published under GN 990 in GG 41920 of 21 September 2018.
[27] GN R634 in GG 36784 of 23 August 2012.
[28] R635 in GG 36784 of 23 August 2012.
[29] R636 in GG 36784 of 23 August 2012.
[30] GN 926 in GG 37088 of 29 November 2013.
[31] GN R466 in GG 32185 of 29 April 2009.

National Water Act, 1998 (Act 36 of 1998) Regulations on use of water for mining and related activities aimed at the protection of water resources (GN 704 of 1999)[32] Water Use Licence Application and Appeals Regulations, 2017 (GN R267 of 2017)[33] Regulations regarding the safety of dams in terms of section 123(1) of the National Water Act, 1998 (GN R139 of 2012)[34] Regulations in terms of section 26 read in conjunction with section 12A for the erection, enlargement, operation and registration of water care works (GN R 2834 of 1985)[35] **General Authorisations** ○ General Authorisation: 21(c) and (i) water uses for the purpose of rehabilitating a wetland for conservation purposes (GN 1198 of 2009)[36] ○ General Authorisation: 21(c) and (i) water uses (GN 509 of 2016)[37] ○ Revision of General Authorisation for the Taking and Storing of Water (GN 538 of 2016)[38] ○ Revision of General Authorisation in terms of section 39 of the National Water Act 36 of 1998 (GN 665 of 2013)[39]	Insofar as the undertaking of section 21 water uses is concerned, an application for a water use licence for the mining development will be submitted to the Department of Water and Sanitation (DWS) following the submission of the Final EIA & EMPr Report and the finalisation of the detail design, as per GNR 267 of 2017. The requirements of regulation GN704 will be adhered to. All clean and dirty water management structures will be designed in accordance with section 6 of GN704.
The Nuclear Energy Act, 1999 (Act 46 of 1999)	The legislation will be heeded throughout the proposed mining operations
Environment Conservation Act, 1989 (Act 73 of 1989) • Noise Control Regulation (GN R154 of 1992)[40]	The legislation will be heeded throughout the proposed mining operations and has been addressed in the Noise impact assessment
Explosives Act, 1956 (Act 26 of 1956)	The legislation will be heeded throughout the proposed mining operations
Mine Health and Safety Act, 1996 (Act 29 of 1996) • Mine Health and Safety Regulations (GN R93 of 1997, as amended)[41] • Mines and Works Regulations (GN R992 of 1970, as amended)[42]	The legislation will be heeded throughout the proposed mining operations

[32] GN 704 in GG 20119 of 4 June 1999.
[33] GN R267 in GG 40713 of 24 March 2017.
[34] GN R139 in GG 35062 of 24 February 2012.
[35] The regulations were published in GN R 2834 in GG 10048 of 27 December 1985 under the Water Act 54 of 1956 and are still applicable until such time as new regulations are promulgated under section 26 of the NWA.
[36] GN 1198 in GG 32805 of 18 December 2009.
[37] GN 509 in GG 40229 of 26 August 2016.
[38] GN 538 in GG 40243 of 2 September 2016.
[39] GN 665 in GG 36820 of 6 September 2013.
[40] GN R154 of January 1992.
[41] GN R93 in GG 17725 of 15 January 1997.
[42] GN R992 in GG 2741 of 26 June 1970, was published under the Mines and Works Act, but remain in force in terms of Schedule 4 of the MHSA.

Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)	The legislation will be heeded throughout the proposed mining operations and was considered in the Soil and Ecological Impact Assessments.
Hazardous Substances Act, 1973 (Act 15 of 1973)	The legislation will be heeded throughout the proposed mining operations
Spatial Planning and Land Use Management Act 2013 (Act 16 of 2013)	The legislation will be heeded throughout the proposed mining operations

6 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES[43]

International conventions, national plans and programmes, as well as the relevant Integrated Development Plans (IDP) were taken into account in assessing the proposed development in a spatial context. Trends in the South African and international gold and associated minerals markets have also been taken into consideration in this assessment of the need and desirability of the project.

The project is aligned with the objectives of the MPRDA:

- To promote economic growth and mineral development in South Africa;
- To promote employment and advance the social and economic welfare of all South Africans;
- To ensure that the nation's mineral resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and
- To ensure that holders of mining rights contribute towards the social-economic development of the area in which they are operating.

The main benefits of the re-development of the underground mining sections are:

- Direct economic benefits will be derived from wages, taxes and profits;
- Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees;
- Increased job security for employees;
- The project will result in economic mining of a known resource and existing surface and underground infrastructure will be utilised for future re-development.
- About 1500 direct jobs, and four times that in indirect jobs. 70% of labour will be sourced from local community.
- Theta will contribute directly to the national fiscus by way of taxes and royalties paid, enabling government to provide social infrastructure and services. Indirect contribution through the payment by employees of personal income tax and of municipal rates and taxes.
- Local procurement opportunities: 30% skilled labour from mining industry

The Department of Forestry, Fisheries and the Environment (DFFE)[44] published an updated Guideline on Need and Desirability (2017) in terms of the EIA Regulations (2014) (as amended). The key components are listed and discussed below and will be discussed in detail in the EIA/EMPR document:

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

[43] Required as per the EIA regulations Appendix 2: (f) 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.
[44] At the time of publication, the Department of Environmental Affairs (DEA).

TGME is confident that the project will have a positive impact on the lives of their host communities by creating much needed jobs and downstream economic development, thereby assisting in accelerating the South African government's post-COVID economic recovery plan. Further, TGME's corporate presence in the region will result in a net positive benefit to the Blyde River catchment, safety and security of the host community and local tourism revenues; which would otherwise continue to deteriorate at the mercy of alien invasive vegetation and illegal miners.

7 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

Environmental authorisation requested for a period of 10 years this will allow for construction and 7 years' mining.

8 DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED SITE[45]

The DFFE[46] guidelines for an Integrated Environmental Management (IEM) procedure requires that an environmental investigation considers feasible alternatives for any proposed development. Furthermore, the EIA Regulations (2014) (as amended)require that a number of alternatives for accomplishing the same objectives should be considered.

Various alternatives have been assessed for the project at scoping level, and workshopped during specialist, applicant, and engineering team interactions. The alternatives were also influenced by the existing baseline environmental data and specialist inputs, and by discussions with authorities and with I&APs.

Alternatives relevant to this development can be categorized into the following:

- Site location alternatives;
- Layout alternatives;
    - Frankfort layout;
- Technology alternatives;
    - Electrical supply;
    - Renewable Energy
    - Mining method;
- The "no-go" alternative.

8.1 SITE LOCATION ALTERNATIVES

The sites are all previous underground mining areas, approved as part of the EMPR for the 83Mining right area. As the cut-off grade required by modern processing technology is much lower than what was historically viable, the re-development and mining of these areas is now economically viable and can be done with minimal additional impact.

To mitigate the risk of loss of CBAs, sensitive floral communities, threatened ecosystems and floral Species of Conservation Concern (SCCs) a biodiversity verification and pre-feasibility assessment was conducted in May 2021 to identify environmental buffer zones. These assessments then informed the

[45] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including (i) details of all the alternatives considered.
[46] At the time the Department of Environmental Affairs and Tourism (DEAT).

engineering concept designs to ensure that the surface infrastructure layout is limited to previously disturbed areas where possible. No other sites where therefore evaluated.

8.2 LAYOUT ALTERNATIVES

Frankfort shaft area initially included two additional sections, namely Frankfort Central and Frankfort South 2. These areas were mainly required for additional stormwater management; however, due to the confinement of dirty areas to Frankfort North and Frankfort South 1, these options are no longer required. The proposed additional areas that have been cancelled are shown in **Figure 10** below.

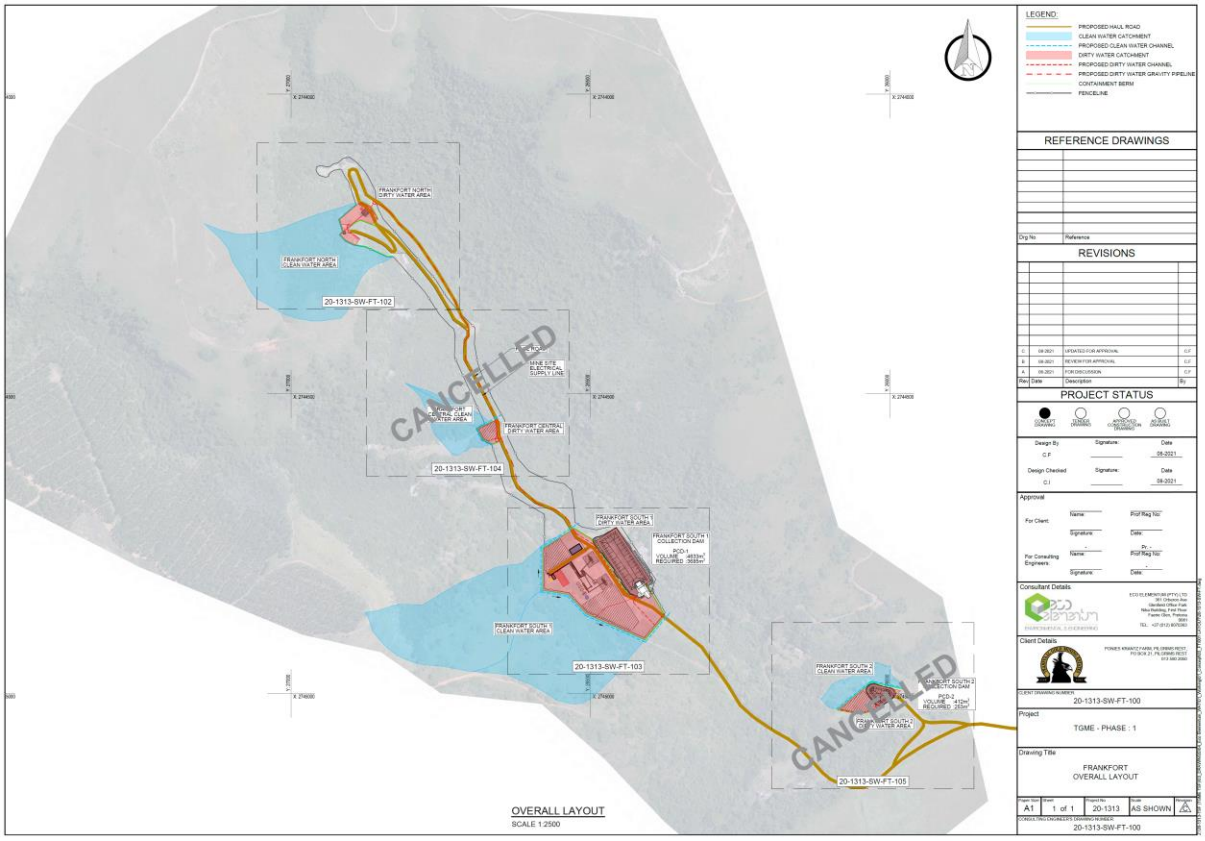

Figure 10: Frankfort Alternative Layout Assessment Drawing (EcoElementum, 2021)

The engineers will refine the layouts for the EIA phase, to allow for final construction designs. Aspects that will be taken into account include heritage and palaeontological findings, and the summer terrestrial and aquatic surveys.

8.3 TECHNOLOGY ALTERNATIVES

8.3.1 ELECTRICITY SUPPLY OPTIONS TO FRANKFORT SHAFT

Various options for electricity have been weighed up during the planning and discussed with Eskom. However, due to the location of the shafts it was decided that diesel-powered generators will initially be used instead of powerlines to various shaft areas. This will, however, change in future if electricity lines and supply capacity become available to the area.

8.3.2 RENEWABLE ENERGY IN THE FORM OF SOLAR VS ESKOM ELECTRICITY AND/OR DIESEL GENERATORS.

The option of using renewable energy was investigated as part of the prefeasibility studies. The following disadvantages however rendered the option unfeasible:

- Large areas will be required for sufficient generation capacity for each shaft and for the plant area: this would lead to additional footprints in a critical biodiversity area to be disturbed. At the plant, Eskom electricity and generators are already readily available.
- The area is known for fog and rain, which means fewer days of sun for optimal solar generation capacity
- Theft: Several of the shaft areas are remote and, without proper security, there is a substantial risk of theft of the solar panels. This might result in periods of little or no electricity supply to the site, which could result in production down-time.

From an environmental perspective, the benefit of using renewable energy would be a reduced carbon footprint for the project. However, due to the sensitive nature of the biodiversity around the site areas it was decided to keep the footprint areas to a minimum (i.e. within previously disturbed areas), which would not provide the space required for a large enough solar panel farm to satisfy the operation's electricity requirements.

8.3.3 MINING METHOD: ALTERNATIVES CONSIDERED

Alternative mining methods were evaluated, including conventional, mechanised and hybrid methods. The shape and extent of the orebody is a key determinator in the choice of mining method.

In this case, open pit mining was eliminated as an option, as the ore body stretches into the mountains. One area where opencast mining would work due to the proximity of the reef to the side of the hill was eliminated from the scope due to the potential environmental impact this would have.

Mechanised mining involves using diesel-powered drill-rigs for drilling and laud-haul dumpers (LHDs) for lashing the broken rock. The LHDs then dump the broken rock into an ore pass which leads to a conveyor belt. Whilst fully mechanised mining could be employed on a vein-type deposit, the dip must be below 12 degrees for the equipment to function properly.

Stoping is practiced in underground mining when the surrounding rock is strong enough to permit the drilling, blasting, and removal of ore without caving. Additional support may be required to prevent the hanging wall and/or side walls from collapsing.

Resue mining is a method of stoping employed on narrow veins, which yields cleaner ore than when wall and ore are broken together. The ore is broken down first and then the waste or vice versa; usually the one which breaks easier is blasted first. The broken waste is left in the stope as back-fill, and the ore is broken down on flooring laid on the fill to prevent ore and waste mixing. Resuing is applicable where the ore will easily separate from the walls, and is most effective when the hardness of the ore and of the wall (waste) rocks differ considerably.

Long hole drilling involves, in simple terms, drilling deeper holes into the reef using a mechanised drilling machine. This is also known as production drilling, and the typical hole depth varies from 10 meters to 40 meters in extreme cases. The holes are charged with explosives and blasted as required. The drills use flushing - mainly with water - to get rid of the cuttings and other particles that accumulate in the hole during drilling.

TGME's underground mines will all be mining narrow reef orebodies. The mining method selected is mechanised long hole drilling, which requires pre-development of a mining block in preparation for stoping operations. Resue mining will be applied to the development ends allowing separate extraction of the reef and waste cuts.

The feasibility study identified the following advantages to this method:

- Maximum grade with reduced dilution can be achieved;
- Less waste will be produced which in turns also leads to smaller WRD footprints;
- This modern mining method can lead to optimised productivity.

This method therefore is preferred from both an environmental and an economic perspective.

8.4 NO-GO ALTERNATIVE

The assessment of this option requires a comparison between the options of proceeding with the proposed project with that of not proceeding with the proposed project. Proceeding with the proposed project attracts potential economic and social benefits and potential negative environmental impacts.

Not proceeding with the proposed project leaves the status quo of no additional negative social or environmental impacts than what is currently experienced. Similarly, none of the possible positive impacts from the project would realise.

Not proceeding with the project is, however, expected to create further negative sentiment against investment into the area and particularly into mining investment opportunities in South Africa.

It will also allow the illegal mining trade in the area to continue growing, as one of the only ways to keep the illegal mining at bay is by actively mining in the old adits. The impacts of illegal mining on the Blyde River system would continue accumulating and potentially impact on the ecology of the whole catchment as well as negative social impact on the host communities. Please refer to section 10.1.

Another negative effect of the project not proceeding would be the continued proliferation of Alien Invasive Plant species (AIPs) in the area. If AIPs are left uncontrolled, the problem will double within 15 years. The current state of AIPs within the area poses a very high risk to the local biodiversity, which includes the riparian zone of the Blyde River and immediate surrounding habitat. AIPs consume a vast amount of water; reduce the ability to farm; intensify flooding and fires; cause erosion; cause destruction of rivers and may cause a mass extinction of indigenous plants (indigenous forests) and animals.

With the intervention of mining in the area, funds can be made available to eradicate AIPs and secure the Strategic Water Source (SWSA) by facilitating the establishment of native grasslands and forests, ecological connectivity and optimising the hydrological functioning of the Blyde catchment.

The no-go alternative will further be investigated in the EIA Phase through each of the specialist input fields.

9 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED[47]

This section describes the public participation process (PPP) is undertaken in line with Chapter 6 of the EIA Regulations (2014) (as amended). The process will be undertaken to ensure compliance with the requirements in terms of the MPRDA (as amended), EIA Regulations (2014) (as amended), as well as the Integrated Water Use Licence Application (IWULA) requirements in terms of the NWA

[47] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs.

The PPP as required by the environmental laws and regulations specified therein will be followed as best practice.

The PPP will be undertaken in line with the statutory requirements for public participation. The following legislation will be considered when developing and implementing the PPP:

- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)
- Public Participation guideline in terms of NEMA;
- The Environmental Impact Assessment (EIA) Regulations, 2014 (as amended);
- The Constitution of the Republic of South Africa, 1996;
- Protection of Personal Protection Act, 2013 (Act No. 4 of 2013) (POPIA);
- Promotion of Access to Information Act, 2000 (Act No. 2 of 2000) (PAIA); and
- International good-practice guidelines for public participation and the Core Values of the International Association for Public Participation.

The PPP is facilitated by Kongiwe Environmental (Pty) Ltd (Kongiwe) an independent contractor.

9.1 LANDOWNER CONSENT

The following meetings have been held with landowners to discuss the proposed project, obtain preliminary comments and to request landowner consent for the affected properties:

- Mpumalanga Department of Public Works, Roads and Transport (MDPWRT): on the 1st of October 2021 via virtual meeting
- South African Forestry Company SOC Limited (SAFCOL) on the 1st of October 2021 via virtual meeting
- York Timbers on the 21st of October 2021 in person at the York Timbers Offices in Sabie.
- Maorabjang Community Property Association (CPA) on 2 October 2021. Landowner consent was signed on the 8th of October 2021.

9.2 APPROACH AND METHODOLOGY

Kongiwe Environmental as the Public participation specialist on the project compiled the following methodology to be followed for the PPP.

- WinDeed searches for the directly affected and adjacent farms;
- Desktop and online research;
- Developing a list of relevant community authorities;
- Identifying the relevant ward councilors for the affected wards;
- Consulting landowners and land occupiers;
- Land claimants (if there are any);
- Consulting government departments relevant to the project;
- Stakeholders who respond to the publication of newspaper advertisements;
- Stakeholders who respond to the distribution of project documentation; and
- Updating the stakeholder database from attendance registers from meetings.

A stakeholder database has been compiled and is attached as ANNEXURE E. This database will be updated throughout the environmental regulatory process. .

9.2.1 LAND CLAIMS ENQUIRY

A formal Letter of enquiry was compiled and sent to the Land Claims Commission, Mpumalanga Department: Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) Office of the Regional Land Claims Commissioner: Mpumalanga Province on 28 September 2021. The letter contained a list of all the directly affected properties for the project. Should (DARDLEA) confirm that there are land claims on the affected project areas, our project team will consult with the relevant parties. A follow up email was sent to DARDLEA on Tuesday, 23 November 2021, to date no response has been received.

9.2.2 COMMUNICATION AND ENGAGEMENT

All stakeholders will be provided with sufficient and accurate project information. Project information will be made accessible as follows:

- Presented in a language and style that stakeholders can understand, with simple explanations of complex concepts;
- Presented both in writing (letters, information sheets, non-technical summaries of the environmental reports, poster displays) and verbally (telephonic discussions, on-line engagements).
- Easily obtainable, i.e. discussion documents will be mailed or emailed to individuals, and available on Kongiwe' s website and OMI Solutions website.

The project team envisages that a number of methods to publish communication materials, including distribution of hard copy documents (Background information document, notification letters, fact sheets).

Table 4 below provides an overview of communication and engagement tools that will support the implementation of this public participation for the project. .

Table 4: Communication and Engagement Tools used (Kongiwe, 2021)

Engagement tool	Description
Background Information Document (BID)	The BID (Annexure E3) provided important information regarding the following: • A project description of the proposed 83 MR project. • The Scoping and EIA and the PPP to be undertaken in support of the relevant environmental authorisations/permits and the contact details of the Environmental Assessment Practitioner (EAP) and the stakeholder engagement consultants. • Details about how stakeholders can register as an Interested and Affected Party (I&AP) and be kept informed about the project developments. • The public review and comment period for environmental reports; and • Invitation to attend an open day. • The BIDs were emailed on Tuesday, 30 November 2021, and hand delivered to project stakeholders registered in the stakeholder database (Appendix E6). The BID is available on the following websites: • Kongiwe's website: http://www.kongiwe.co.za/publications-view/public-documents/

Engagement tool	Description
	• OMI Solutions' website: https://omisolutions.co.za/public-review-projects/ Comment and Registration Form: An I&AP registration form was sent out to stakeholders to register formally and/or to submit comments (Annexure E3)..
Newspaper advertisements	A newspaper advert (Annexure E4) was placed in The Steelburger, on Thursday, 2 December 2021 and The Lowvelder, on Thursday, 2 December 2021. The advert included the following details: • Brief project description. • Legal framework, the competent authorities. • How stakeholders can access the Draft Scoping report for public review and comment. • The details of the open day. • Registration as stakeholders. • The contact details of the EAP and the stakeholder engagement consultants..
Site Notices	The site notice provides an overview of the project and highlights the applicable legislation, environmental authorisation/ permits applicable to the project. It also outlined the stakeholder engagement process to be followed and where relevant information could be obtained from. A locality map of the project site was included in the site notice. Details of the open day and how stakeholders can register as I&APS were included in the Site Notice. Pictures and co-ordinates of where the site notices were placed were also recorded in the site notice report and a site notice map was developed (Annexure E5)
Notification Letter with a Comment and Registration Form	An email was sent to stakeholders to inform them about the proposed 83 MR project. The email also shared details of the open day and invited the greater public to formally register as I&APs. A Comment and Registration Form was also provided for stakeholders to use for formal registration and to submit their comments or concerns (Annexure E3)..
Telephonic discussions	Stakeholders are also consulted by means of telephonic discussions. These discussions facilitate the process of inviting stakeholders to stakeholder meetings and provide stakeholders with a platform to raise issues of concern and suggestions regarding the proposed 83 MR Project. Comments and/or concerns raised through telephonic discussions are recorded and addressed by the project team (EAP and the relevant specialists).
Online engagement sessions	Online meetings will be held with key stakeholders via virtual platforms such as Microsoft Teams and Zoom. These meetings will be seen as formal consultation. This will be done by means of a PowerPoint Presentation which will be shared and discussed online.
Site Visit	The purpose of the site visit was to share the impacts of the primary threats to the receiving environment including the Blyde River, in the context of the proposed promulgation of an extension of the Morgenzon Forest Nature Reserve over certain of TGME's 83 MR mining right areas; and to receive input from relevant stakeholders. After the site

Engagement tool	Description
	visits, minutes were developed, and the stakeholder database was updated. (Annexure E8).
Landowner Meetings	Consultation meetings were held with directly affected landowners on a one-on-one basis. An overview of the Proposed Project, land tenure and locality plans were presented. Landowners were provided with an opportunity to raise issues of concern and comments/suggestions regarding the Proposed Project. Refer to (Annexure E8) for a list of meetings and consultations that was undertaken. Outcomes from these meetings are recorded in the landowner/ land occupier engagement reports (Annexure E8)
Authority Meetings	Authority meetings were held with various Organs of State, the purpose of the meetings was to discuss the 83 MR project and obtain initial comments which informed specialist studies and project planning. The project team presented an overview of the proposed 83 MR project, locality, infrastructure and land tenure maps were distributed as part of the meeting. Refer to (Annexure E8) for a list of meetings and consultations that were undertaken.
Open day	Stakeholders are invited to participate through virtual and non-virtual engagements. One-on-one consultation meetings will be held via on-line forums such as Microsoft Teams, or telephonically. On-line engagement activities will be available during the public review period. Additionally, an Open Day will be held at the Town Hall, Main Street, Pilgrims Rest on Saturday, 15 January 2022 from 10H00-14H00
Delivery of notices	Consultation with the relevant Ward Councillors and seek advice on the best and practicable way to distribute notices in their wards to inform representatives of the communities of the proposed project.

9.3 PRE-SCOPING CONSULTATION

Details of the various pre-scoping consultation stakeholder engagement meetings have been held prior to the application being initiated with the DMRE are described below. These included meetings with the landowners as well as other stakeholders of importance including Ehlanzeni District Municipality, Sabie Chamber of Commerce and Tourism and Sabie Rate Payers Association.

Site visit meetings have been held with Department of Forestry, Fisheries and Environment (DFFE), Department of Water and Sanitation (DWS), DMRE, Mpumalanga Parks and Tourism Agency (MPTA), Kruger to Canyons, SANParks, etc.

These meetings with key stakeholders have been held and was aimed at providing stakeholders with an overview of the proposed project and to obtain initial comments which will inform specialist studies and project planning. This was done by means of a PowerPoint Presentation and a map showing the properties and project area (Kongiwe, 2021). Furthermore to the landowner meetings mentioned in Section 9.1, the following meetings have been held to date:

- Site Visit with competent and commenting authorities and other key stakeholders was held on 19 October 2021.
- Site Visit and meeting with DWS held on the 29th of October 2021.
- Ehlanzeni District Municipality on the 20th of October 2021 in person and municipal offices in Nelspruit.

- Sabie Chamber of Commerce and Tourism and Sabie Rate Payers Association at the Sabie Golf Club on the 21st of October 2021.

9.4 DRAFT SCOPING REPORT FOR REVIEW

Copies of the Draft Scoping Report (DSR) will be made available for public review and comment from Monday, 06 December 2021- Thursday, 27 January 2022 on the following websites:

- Kongiwe's website: http://www.kongiwe.co.za/publications-view/public-documents/
- OMI Solutions' website: https://omisolutions.co.za/public-review-projects/

A non-technical summary of the report will be compiled and distributed to stakeholders. A non-technical summary of the report will be compiled and distributed to stakeholders with no access to the internet. Hard copies of the non-technical summary will be distributed through the relevant community representatives. If required, an electronic copy of the reports can be made available upon a request directed to the stakeholder engagement team.

Key Commenting Authorities received and email with a website link to where they can download the DSR. Please see list of Authorities who have received the DSR:

- DMRE;
- Ehlanzeni District Municipality;
- Thaba Chweu Local Municipality;
- Department of Water and Sanitation (DWS);
- National Nuclear Regulator (NNR);
- Department of Forestry, Fisheries and the Environment (DFFE);
- Mpumalanga Department of Public Works, Roads and Transport (MDPWRT);
- Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA);
- Mpumalanga Tourism and Parks Agency (MTPA); and
- South African Forestry Company SOC Limited (SAFCOL).

9.5 PROTECTION OF PERSONAL INFORMATION ACT 4 OF 2013

In compliance with the Protection of Personal Information Act, 2013 (Act No. 4 of 26 November 2013) (POPIA), any personal information provided to OMI and Kongiwe will be exclusively used as part of the public participation process and will therefore not be utilised for any other purpose, other than that for which it was provided. No additional copies will be made of documents containing personal information unless consent has been obtained from the owner of said information. Records of personal information will be retained no longer than reasonably required for lawful purposes. OMI's privacy statement is available to view on www.omisolutions.co.za.

9.6 SUMMARY OF ISSUES RAISED BY I&APS[48]

(Complete the table summarising comments and issues raised, and reaction to those responses)

Table 5: Comments and Response Table[49]

STAKEHOLDER	CONSULTATION METHOD	DATE OF COMMENTS RECEIVED	ISSUES RAISED	RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION REFERENCE IN THE DRAFT SCOPING REPORT	STAKEHOLDER	CONSULTATION METHOD
Please refer to Annexure E1							

[48] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site, and location of the development footprint within the site, including (iii) 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

[49] Please note that the table will be completed after the public review of the report.

10 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITES[50][51]

10.1 OVERVIEW OF THE CURRENT STATE OF THREATS TO THE MINING RIGHT ENVIRONMENT

The area over which the existing TGME mining right is located is currently facing two major threats causing deterioration to the area. It should be noted that TGME is not currently actively mining on the mining right areas. The following threats are currently noted in the mining area:

- Illegal mining leading to the following issues (**Figure 11** and **Figure 12**):
  - Physical disturbance of vegetated areas;
  - Diversions of streams;
  - Contamination and sedimentation of the Blyde River, drainages, and streams;
  - Social disruptions in the communities (crime, child labour etc.);
  - AIPs proliferated in the area (**Figure 13**).

Figure 11: Impacts of Illegal Mining on the Banks of the Blyde River and Other Streams

Figure 12: Diversions and Impedances caused by the Illegal Mining Activities

[50] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.

[51] Please note that the baseline environment as described is being presented to the communities and their input requested in the notification letters and during the focus group meetings and open days held to date and to be held. The draft SR with the description of the baseline environment is made available to I&APs for review and comment as per section 9 of this report. In addition, the specialists will also consult with the community to confirm certain aspects of the environment such as heritage sites, features, land use, etc. as required.

Figure 13: AIP Proliferation Around the Larger Mining Right Area

10.2 CLIMATE

The climatic conditions for this region are typical of the eastern Mpumalanga region, consisting of very hot summers and cool to cold winters. Rainfall occurs during summer thunderstorms, which are accompanied by lightning and occasional hail. Morning fog is common in summer but usually clears up by midday (Glynn's Lydenburg EMP, 2009).

10.2.1 RAINFALL AND EVAPORATION

The Mean Annual Precipitation (MAP) for the region varies between 2,000 mm on the escarpment to around 600 mm in the Lowveld (Glynn's Lydenburg EMP, 2009). Most of the rainfall occurs between November and March, in the form of tropical storms. The highest annual rainfall recorded occurred in the hydrological year 1987/88 where a depth of 1,283.3 mm was recorded. The lowest annual rainfall recorded occurred during the hydrological year 1991/92 where a depth of 560.5 mm was recorded.

The closest rainfall stations to the project with long-term rainfall data are the Pilgrims Rest and Morgenzon stations. Monthly patched rainfall was downloaded from the WR2012 study website, which has rainfall data up to September 2010. The Pilgrims Rest station has been decommissioned. However, rainfall from the Morgenzon station, which is still in operation, was purchased from the South African Weather Service (SAWS) for the period of October 2010 to September 2019.

The project is located in a high rainfall area, with a MAP of 948 mm. Rainfall is highest over the summer months of October to March, with January and February being the wettest months. Rainfall is lowest over the months of April to September, with June and July being the driest months. The average monthly rainfall for the region is summarised in **Table 6**.

Table 6: Average Monthly Rainfall (October 2010 to September 2019)

Month	Average Monthly Rainfall (mm)
January	184
February	162
March	115

Month	Average Monthly Rainfall (mm)
April	58
May	20
June	10
July	10
August	12
September	27
October	71
November	130
December	149
Annual Total	**948**

Monthly Symon's Pan (S-Pan) evaporation was obtained from the WR2012 study for quaternary catchment B60A. S-Pan evaporation measurements are not a true reflection of evaporation from natural open water bodies, as the water temperatures in the S-Pan are higher, resulting in higher evaporation rates. In order to convert S-Pan measurements to open water evaporation, monthly open water evaporation conversion factors were used, which were obtained from the WR2012 study. Evaporation is highest over the months of October to March, and lowest over the cooler months of May to August.

Evaporation exceeds the rainfall in the region and average 1,179 mm/annum, compared to the average rainfall of 948 mm/annum. The adopted monthly evaporation for the project is presented in **Table 7** (Pirie, 2020).

Table 7: Monthly Evaporation (Pirie, 2020)

Month	Symon's Pan Evaporation (mm)	Open Water Evaporation Factor	Open Water Evaporation (mm)
January	158	0.84	133
February	135	0.88	119
March	133	0.88	117
April	101	0.88	89
May	88	0.87	77
June	72	0.85	61
July	78	0.83	65
August	99	0.81	80
September	120	0.81	97
October	133	0.81	108
November	133	0.82	109
December	151	0.83	125
Total	**1 401**	**N/A**	**1 179**

10.2.2 WIND

The wind speed and location for the area was sourced from the Airshed Planning Professionals' (Airshed) scoping level air quality baseline report (Airshed, 2021).

In the absence of on-site meteorological data (which is required for atmospheric dispersion modelling), use was made of South African Weather Service (SAWS) meteorological data for Graskop for the period 2016-2018. The SAWS Graskop station is located approximately 9.5 km to the east of Plant area.

During the 2016 to 2018 period, the wind field was dominated by winds from the north and east with less frequent winds from the northwest, northeast and southeast and very little from the southwest. An average wind speed of 2.14 m/s was measured over the period, with a maximum of 9.2 m/s recorded (**Figure 14**). During the daytime (06:00 to 18:00) there was a decrease in winds from the north and an increase in winds from the east, with an average wind speed of 2.44 m/s. An increase in dominant winds from the north occurred at night (18:00 to 06:00).

Seasonal wind fields do not vary significantly – during spring and summer the most dominant winds are from the east with a second major component from the north, whereas the autumn and winter seasons are dominated by northerly winds with a reduced easterly component.

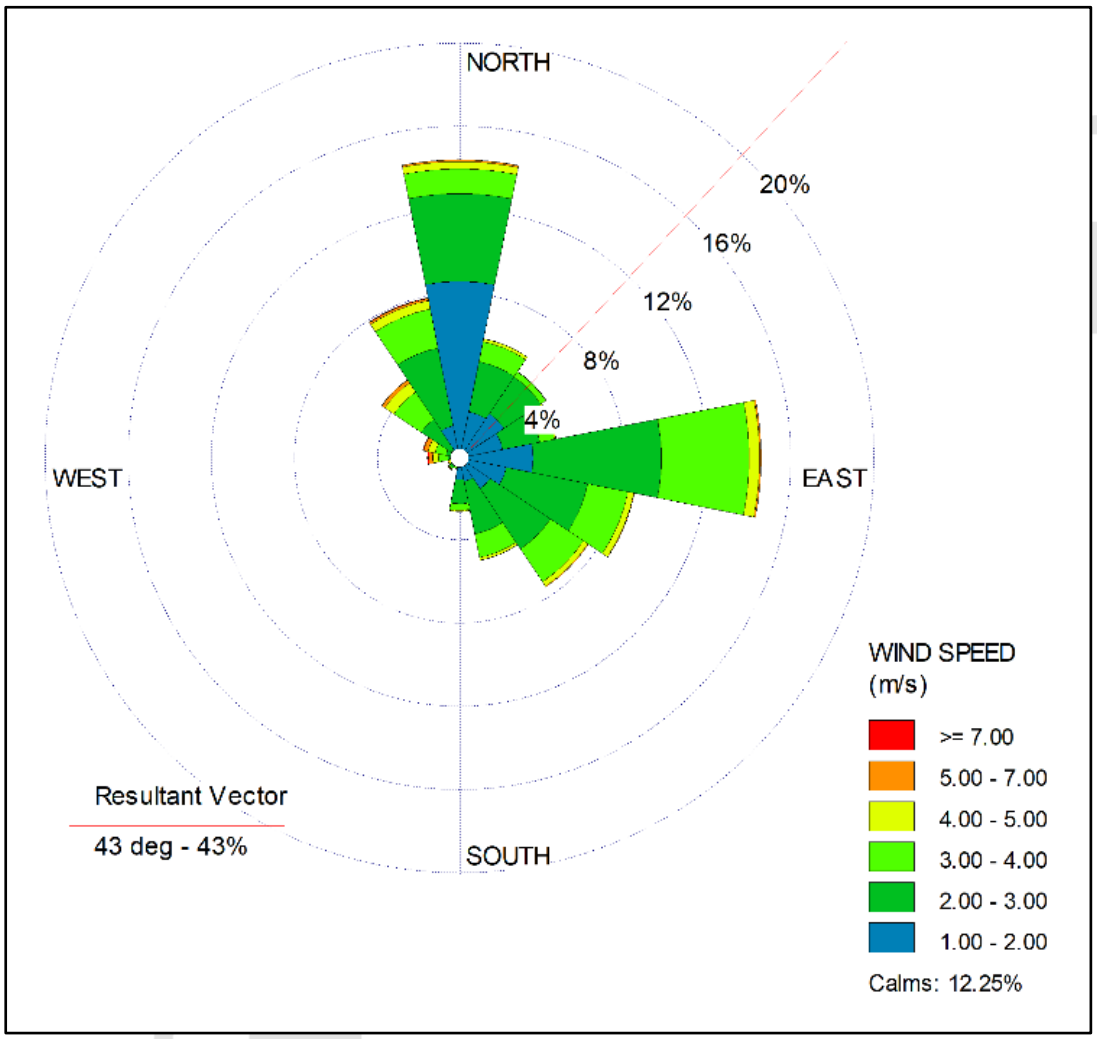

Figure 14: Period Average Wind Rose for Graskop (SAWS data, 2016 to 2018) (Airshed, 2021)

10.3 AIR QUALITY

The air quality baseline assessment was done by Airshed and is summarised below. The study is attached as ANNEXURE F.

10.3.1 EXISTING SOURCES OF ATMOSPHERIC EMISSIONS IN THE AREA

Mining and agriculture are the predominant land uses in the region. There are several historical underground and surface gold mining deposits, with disturbed areas as a remnant from these activities. Forestry is the main agricultural activity surrounding the three Project areas (WSP, 2019).

The main pollutant of concern would be particulate matter (TSP, PM10 and PM2.5) resulting from vehicle entrainment on the roads (paved, unpaved, and treated surfaces), windblown dust as well as mining and exploration activities. Gaseous pollutants such as sulphur dioxide (SO2), oxides of nitrogen (NOx), carbon monoxide (CO) and carbon dioxide (CO_2) would result from vehicles and combustion sources, but these are expected to be at low concentrations as there are few combustion sources in the region.

10.3.2 ROAD EMISSIONS

The national road connecting the TGME Project areas, namely the R533, is a paved road. Aside from light duty vehicles the road is also likely to be used by forestry trucks (heavy-duty vehicles) transporting wood.

Dust emissions from paved and unpaved roads varies linearly with the volume of traffic. In addition, a number of parameters influence the surface condition of a particular road, such as average vehicle speed, mean vehicle weight, silt content of road material, and road surface moisture, and these will thus impact on dust emissions (U.S. EPA, 2006).

Vehicle tailpipe exhaust gases are a significant source of CO, NOx, total organic compounds (TOC), non-methane total organic compounds (NMTOC), benzene, lead, acetaldehyde, formaldehyde and 1.3 butadiene emissions. The significance of vehicle emissions in terms of their contribution to air pollutant concentrations and health risks is directly related to the level at which the emissions occur, and the proximity of such releases to high exposure areas. Vehicle emissions also tend to peak in the early morning and evenings, at which time atmospheric dispersion potentials are reduced.

10.3.3 WINDBLOWN DUST

Windblown particulates from natural exposed surfaces, mine waste facilities, and product stockpiles can result in significant dust emissions with high particulate concentrations near the source locations, potentially affecting both the environment and human health.

Wind erosion is a complex process, including three different phases of particle entrainment, transport, and deposition. For wind erosion to occur, the wind speed needs to exceed a certain threshold, called the friction velocity. This relates to gravity and the inter-particle cohesion that resists removal. Surface properties such as soil texture, soil moisture and vegetation cover influence the removal potential.

Windblown dust is likely to result from old mined-out areas and disturbed land surfaces, as well as old stockpiles and dumps.

10.3.4 MINES AND EXPLORATION OPERATIONS

Pollutants typically emitted from mining and quarrying activities are particulates, with smaller quantities associated with vehicle exhaust emissions. Mining and quarrying activities, especially open-cast mining methods, as well as exploration activities, emit pollutants near ground-level over (potentially) large areas. Source activities resulting in significant dust emissions include:

- drilling and blasting;
- materials handling (loading, unloading, and tipping);
- crushing and screening;
- windblown dust (from the sources as described above);
- access roads; and

- plant stack emissions.

There are no known active mines in proximity to the proposed TGME Project; only historical mining remnants are visible in the area.

10.3.5 AGRICULTURAL ACTIVITIES

Particulate matter from agricultural activities is the main pollutant of concern, as particulate emissions derive from windblown dust, crop burning residue, and dust entrainment as a result of vehicles travelling along dirt roads. In addition, pollen grains, mould spores and plant and insect parts from agricultural activities all contribute to the particulate load. Chemicals associated with crop spraying and odiferous emissions resulting from manure, fertilizer and crop residue have been identified as a main concern. Spray drift due to aerial crop spraying can distribute organo-chemicals in the nearby vicinity or even further afield (WCP, 2010). Crop residue burning and burning for frost prevention are additional sources of particulate emissions and other toxins.

The agricultural activity surrounding the TGME Project areas is mostly forestry.

10.3.6 SAWMILL AND TIMBER TREATMENT

Pollutants of concern include PM (PM_{10} and $PM_{2.5}$) from wood dust and VOCs from boilers and treatment of wood. Treatment often includes heat and the application of chemicals.

The closest sawmill is located near Graskop, approximately 9 km east of the Beta Project area, and thus unlikely to influence the air quality at the TGME sites.

10.3.7 BIOMASS BURNING

Crop-residue burning, and general wildfires (veld fires) represent significant sources of combustion-related emissions associated with agricultural areas.

The concern with biomass burning is the high potential of secondary anthropogenic $PM_{2.5}$ formation due to incomplete combustion of organic matter. It is expected that the amount of PM_{10} and $PM_{2.5}$ resulting from biomass burning is underestimated and hence so is the potential health risk associated with it. This also directly relates to the underestimation of the effect on atmospheric chemistry such as photochemistry. Aerosols, black carbon, and hydrocarbons are also associated with biomass burning. Furthermore, it is a significant source of greenhouse gases, especially CO_2, black carbon, and photochemical gases (NOx, CO, and hydrocarbons), which lead to the production of tropospheric ozone (O_3).

10.3.8 REGIONAL TRANSPORTATION OF POLLUTANTS

Another source of air pollution is aerosols originating from regional-scale transport of mineral dust and ozone (due to vegetation burning). Biomass burning is an incomplete combustion process (Cachier, 1992), with CO, methane and NOx gasses being emitted. Approximately 40% of the nitrogen in biomass is emitted as nitrogen, 10% is left in the ashes, and it may be assumed that 20% of the nitrogen is emitted as higher molecular weight nitrogen compounds (Held, et al., 1996). The visibility of the smoke plumes is attributed to the aerosol (particulate matter) content.

10.3.9 EXISTING AMBIENT AIR POLLUTANT CONCENTRATIONS IN THE PROJECT AREA

There is a dust fall monitoring network in place at the TSF, located at the Plant area. No ambient PM (PM10 and PM2.5) monitoring data exist. The location of the dust fall out monitoring is shown in **Figure 15**.

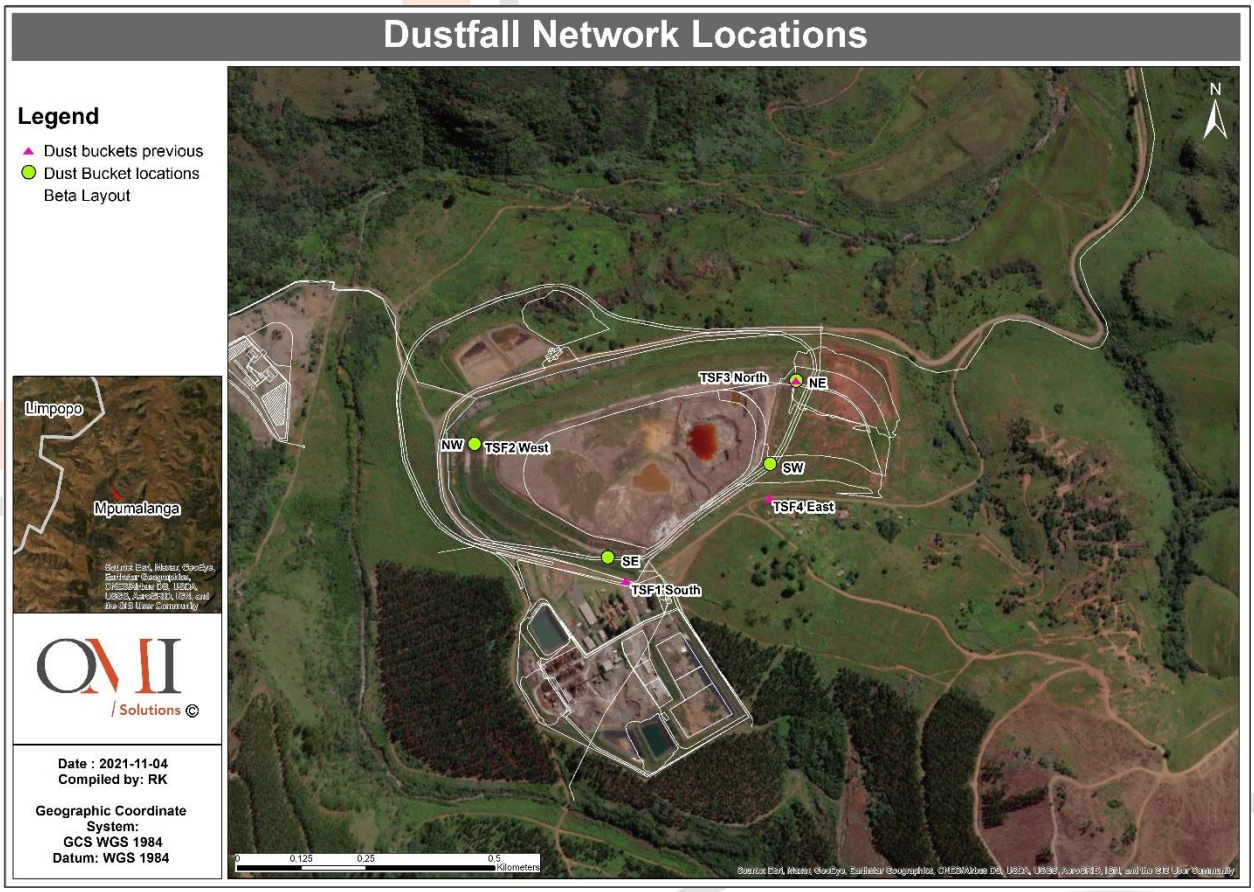

Figure 15: Dust Fall Monitoring Network (Compiled with Data from Airshed, 2021)

Dust fall deposition rates from the TGME monitoring network for the period end January to end September 2021 are presented in **Table 8**.

Dust fall rates were low for the sampling period February to June 2021 at all four locations and well within the dust fall limit of 600 mg/m²/day (adopted limit for residential areas) and 1 200 mg/m²/day (adopted limit for non-residential areas). From July to September 2021 dust fall rates increased significantly at three of the four sites, exceeding the NDCR for non-residential areas (1 200 mg/m²/day). The increase in dust fall rates at TSF 1 South, TSF 3 North and TSF 4 East are not clear and could be due to activities at and around the TSF (Airshed, 2021).

Table 8: Record of Dust Fall Rates at TGME Project Monitoring (Airshed, 2021)

Site	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21
Dust fall Rates (mg/m²/day)								
TSF 1 South	46	170	107	163	168	2,989	2,730	1,225
TSF 2 West	58	240	90	115	128	212	328	180
TSF 3 North	38	164	139	124	172	2,900	196	246
TSF 4 East	58	131	107	114	118	7,659	4,630	142
Indicator			Exceeds NDC limit for residential areas			Exceeds NDC limit for non-residential areas		

10.4 GEOLOGY

The Project Areas are situated within the Sabie-Pilgrim's Rest Goldfield, approximately 300 km northeast of the Witwatersrand Basin. This metallogenic province extends for approximately 140 km in a north-north-

easterly direction, over a maximum width of 30 km along the Great Escarpment of southern Africa. Gold mineralisation occurs within shear zones located within the sedimentary host rocks of the Transvaal Supergroup. The orebodies considered for the underground operations may be described a thin, sheet-like near horizontal deposits. The reefs considered for extraction through the underground operations, namely the Beta Reef (Beta Mine), Bevetts Reef (Frankfort Mine) and Rho Reef (CDM) are all concordant reefs which dip shallowly westwards between 3°and 12°.

Numerous dykes and sills, principally of pre- and post-Bushveld Igneous Complex (BIC) age have intruded into the Transvaal Supergroup. Some dykes that pre-date the Bushveld Complex were recognized, related to gold mineralisation. The BIC and the Transvaal Supergroup do not outcrop in the Pilgrim's Rest area.

Epigenetic gold mineralisation is present in three main types of ore body. Stratiform quartz-sulphide gold veins, termed flat reefs, are the dominant, most productive style of mineralisation in this goldfield. Steeply eastward-dipping, transgressive vertical reefs and smaller, sub-vertical to inclined lensoidal leader reefs are also present. The former originates in the Archaean granitoid basement beneath the shallowly dipping Transvaal Sequence and may pierce the overlying sedimentary pile. The latter frequently branches off flat reef lodes and is exclusively developed in the Transvaal sedimentary rocks.

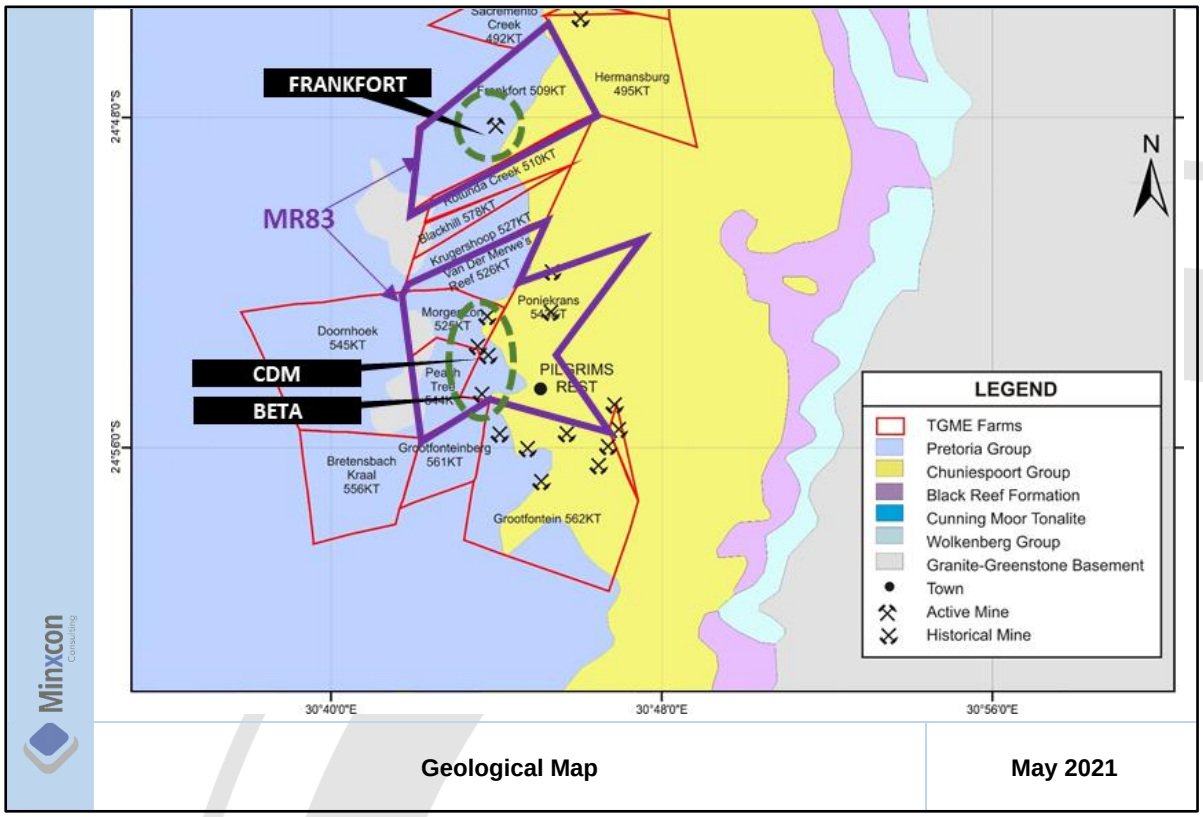

Figure 16: Geological Map of the Area (Minxcon, 2021)

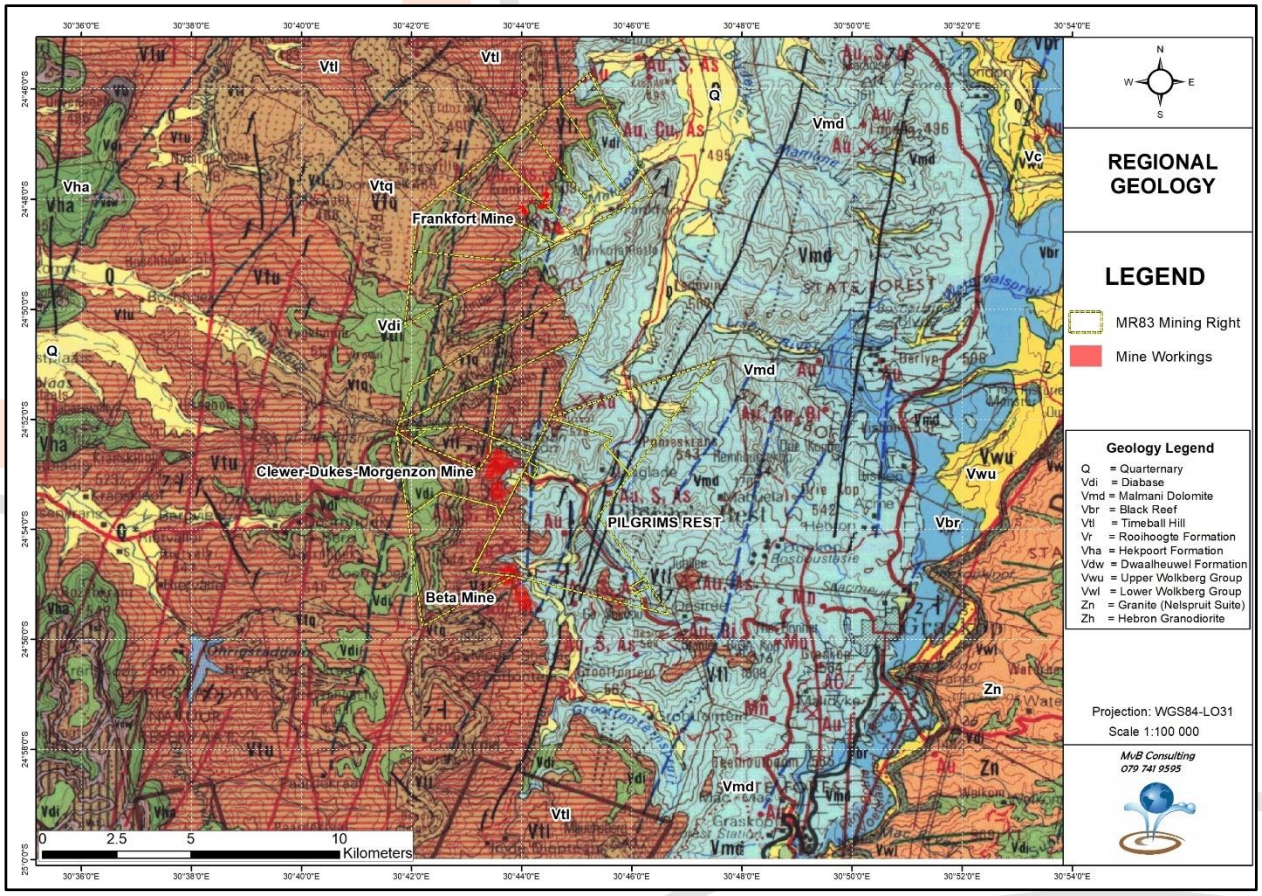

Figure 17: Regional Surface Geology – Pilgrims Rest Region (MvB Consulting, 2021)

10.5 TOPOGRAPHY AND DRAINAGE

The project area is located in the midst of the Drakensberg mountain range, with Pilgrims Rest at an elevation of 1,300 m above sea level and the Lowveld stretching eastwards from the Great Escarpment with an elevation of under 750 metres above mean sea level (mamsl). The project area is dissected by river erosion, with the Blyde River Canyon reaching a depth of over 770 m (GCS, 2005).

Figure 18 shows the regional topography, as well as the drainage system within the study area and environs. The Blyde River is the primary drainage feature in the study area.

The project is located in the upper Blyde River catchment, within quaternary catchments B60A (Plant, TSF, Beta North and CDM), and B60B (Frankfort) in the Olifants WMA (**Figure 19**). The project area is drained by a number of non-perennial drainage lines, which are tributaries of the Blyde River. The Blyde River has its source approximately 20 km south-west of the project and flows into the Blyderivierpoort Dam 40 km to the north-east of the project. From the Blyderivierpoort Dam, the Blyde River continues in northerly direction for approximately 45 km, until its confluence with the Olifants River, near the town of Hoedspruit (Hydrospatial, 2020).

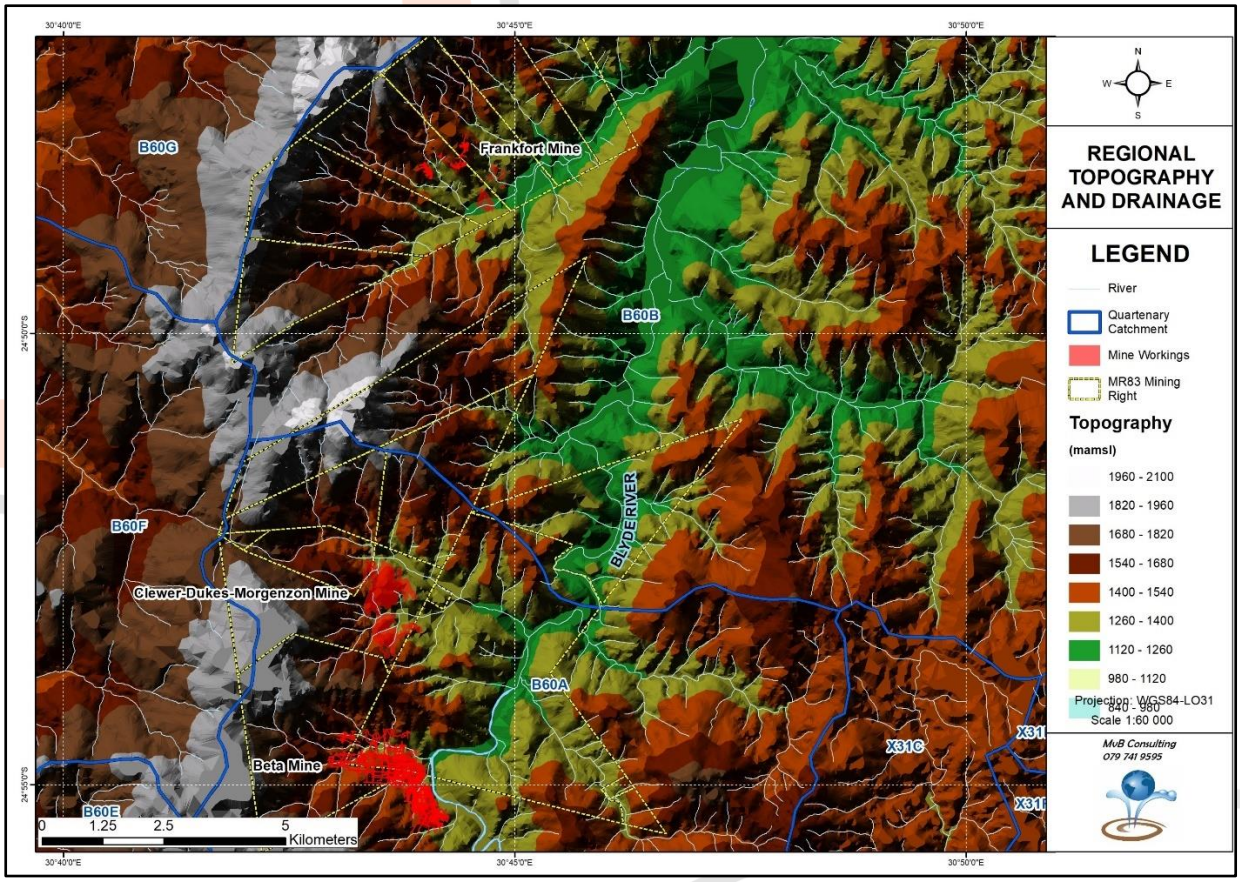

Figure 18: Regional Topography and Drainage (MvB, 2021)

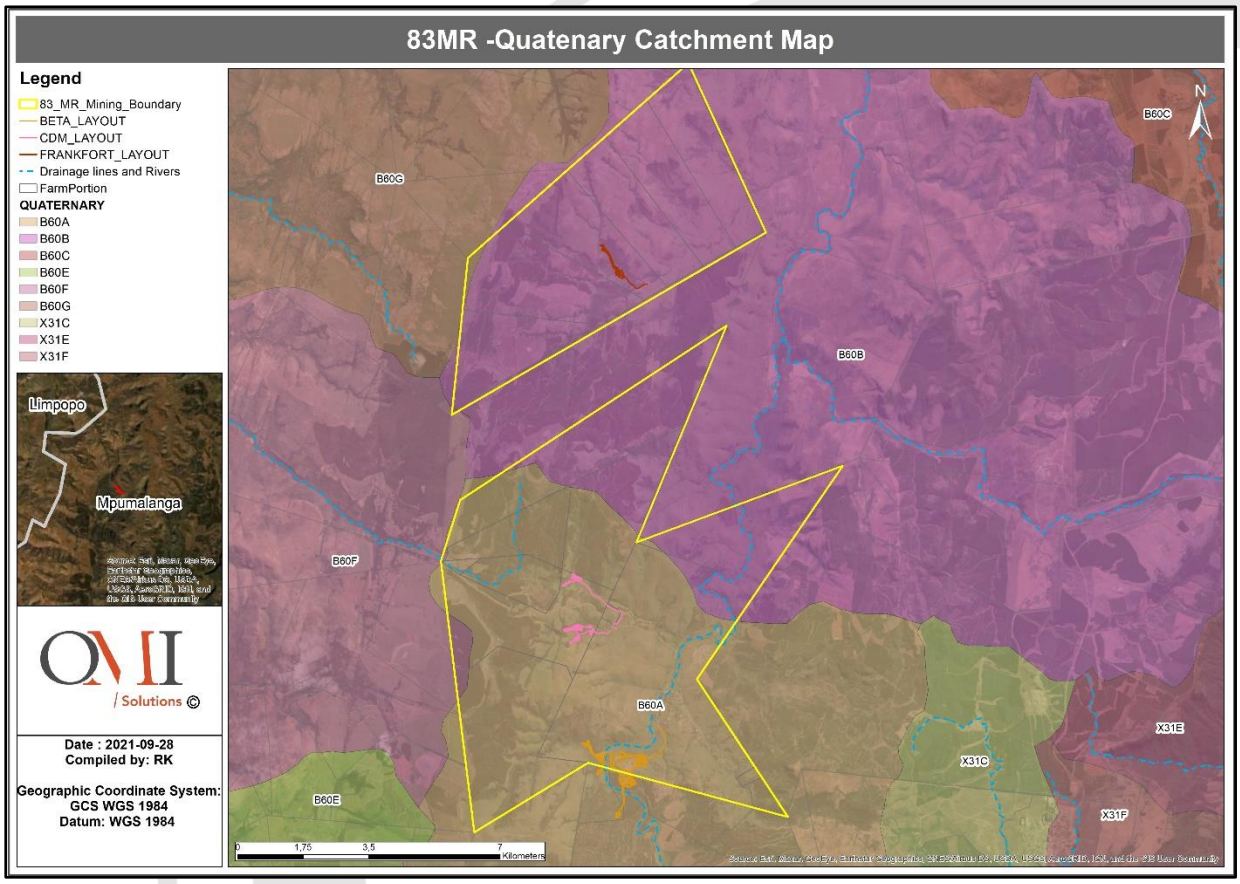

Figure 19: Quaternary Catchment Map

10.6 SOIL AND LANDUSE CAPABILITY

Scientific Aquatic Services (SAS) was commissioned to undertake a soil, land use and land capability verification and pre-feasibility assessment as part of the scoping and pre-feasibility studies to identify risks to the proposed project and to guide the development of a project layout for further assessment of risk. The baseline report is attached as **ANNEXURE G** of this report.

A high-level site visit was undertaken from 19 to 22 April 2021, to verify the pre-determined soil, land use and land capability during the desktop phase; the results of which are presented in this report.

Current land use activities associated with the investigation area and surrounding areas are mainly wilderness, forestry, and historic mining infrastructure. No large-scale commercial agricultural activities were observed (SAS, 2021 (a)).

In South Africa, agricultural land capability is usually restricted by climatic conditions, especially water availability (rainfall). Even within similar climatic zones, different soil types typically have different land use capabilities attributed to their inherent characteristics. High-potential agricultural land is defined as having the soil and terrain quality, growing season and adequate available moisture supply needed to produce sustained economically high crops yields when treated and managed according to best possible farming practices (Scotney et al., 1987). For this assessment, land capability was inferred in consideration of observed limitations to land use due to physical soil properties and prevailing climatic conditions. Climate Capability (measured on a scale of 1 to 8) was therefore considered in the agricultural potential classification.

The investigation area falls into Climate Capability Class 2, with local climate that is suitable for good yield for a wide range of adapted crops throughout the year. The identified soils were classified into land capability classes using the Scotney et. al. Land Capability Classification system (Scotney et al., 1987). **Table 9** presents the dominant soil forms and their respective diagnostic horizon sequence which is illustrated in **Figure 20**.

It is evident from **Figure 20** that around the footprint areas the dominant land capability is Grazing VII, associated with the Mispah and Glenrosa soil forms. The identified Mispah/Glenrosa soil forms are of poor (Class VII) land capability and are not suitable for arable agricultural land use. Theses soils are, at best, suitable for natural pastures for light grazing. Therefore, these soils are not considered to make a substantial contribution to extensive subsistence farming on a local scale.

Areas along drainages and rivers are classified as Grazing V, associated with Alluvial soils. The footprint areas of the sites are classified as Wildlife Class VIII – Witbank soils - as these soils are associated with previous disturbance. These identified Witbank soils have very poor (class VIII) land capability attributed to forestry and mining activities. In addition, some of these soils have been subjected to long term compaction and erosion.

This land capability class also includes areas where the original soil has been buried and/or extensively modified by anthropogenic activities. These soils are not considered to make a significant contribution to agricultural productivity even on a local scale (SAS, 2021 (a)).

Table 9: Land Capability Classes for Soils within the Investigation Area (SAS, 2021 (a))

Soil Form	Land Capability
Alluvial Soil (Dundee)	Grazing (Class V)
Mispah	Grazing (Class VII)
Glenrosa	
Witbank	Wildlife (Class VIII)

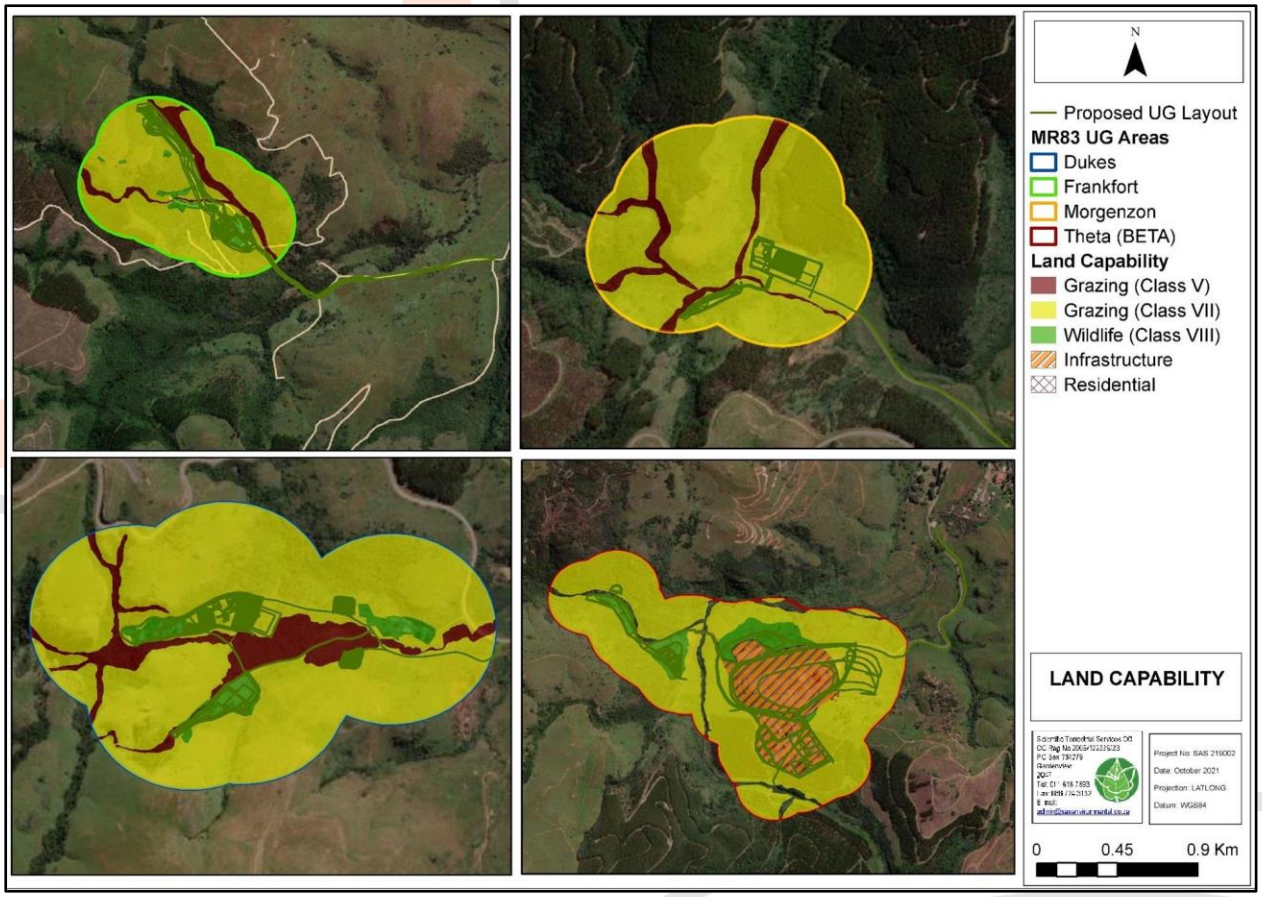

Figure 20: Map of Land Capability Classes of Soils within the Investigation Area (SAS, 2021 (a))

10.7 SURFACE WATER BASELINE

This section describes the surface water quality baseline as assessed by OMI (2021). The report is attached as **ANNEXURE H**, and outlines the surface water conditions across the project area, based on sampling results from May 2020 to September 2021. A detailed sampling campaign, during which samples were analysed in a SANAS-accredited laboratory for an extensive range of variables, was conducted by OMI from May to September 2020.

Subsequent sampling was conducted by TGME in accordance with the approved Water Use Licence (WUL), for 83MR. Monthly samples were analysed using a hand-held probe, whilst quarterly samples were sent to a SANAS-accredited laboratory for detailed analysis.

As none of the sites are currently operational and access to some areas is often prohibited by illegal miners, the data sets are not complete. The available data is, however, sufficient for assessing the baseline conditions, and for drawing conclusions as to the current status of the area's surface water.

10.7.1 BASELINE QUALITY AROUND METALLURGICAL PLANT AREA

Sampling points are located above and below the plant in the Blyde River, and above and below Beta North adit in Peach Tree stream and the Blyde River. The sampling points are indicated in **Figure 26**.

Analysis of the samples upstream of the plant generally show a neutral pH, low salt load, and low concentrations of iron, manganese, and sulphates. These results indicate that the Blyde upstream of the TGME footprint is unimpacted by TGME's activities.

It is, however, known that illegal mining activities take place in the area, and illegal miners have often been seen washing ore in the Blyde upstream of the plant. The June 2020 results show a spike in TDS, Sulphates,

Magnesium, Sodium and Calcium, and a substantial drop in pH; this most likely resulted from artisanal mining, given that it is upstream of TGME.

Comparing upstream to downstream (relative to the plant), the downstream results do not show the same spikes in values in June 2020. This suggests that the activities causing the variations were localised around point S3, and not propagated downstream towards S5. This supports the notion that the water quality was affected by illegal mining activities above S3.

The high concentrations of Nitrates indicate illegal blasting is taking place upstream of TGME's footprint. It could also indicate organic material and sewage entering the stream; however, there was no evidence of sewage generating sources between these points. The cause could also be organic matter although there was little to no evidence of major cow grazing at this point. Looking at the other variables, the spikes all indicate possible mining activity – which aligns to the visible sites of illegal mining activity observed.

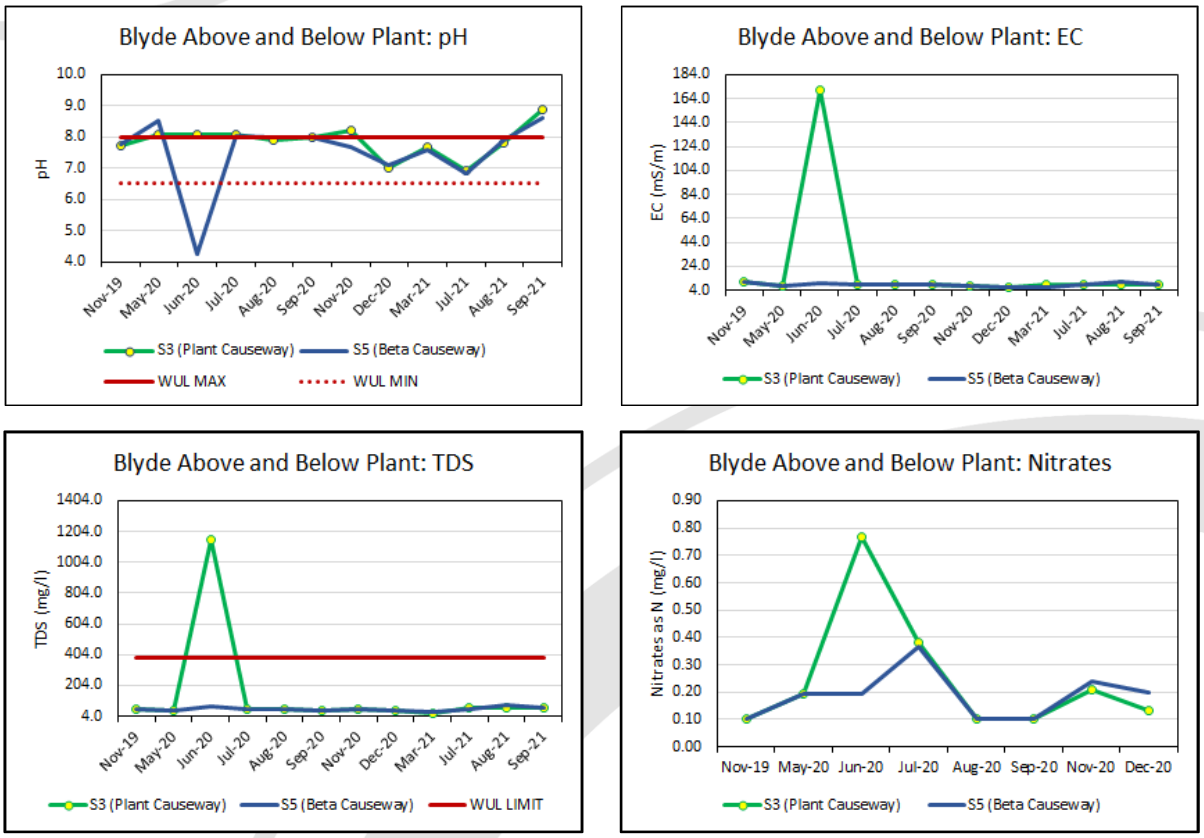

Figure 21: Blyde River Quality Upstream and Downstream of Metallurgical Plant

10.7.2 BASELINE QUALITY AROUND BETA AND TSF

Samples were taken in Peach Tree stream upstream and downstream of the visible illegal mining activities, upstream and downstream of the inflow from Beta North adit's decant, and in the Blyde River at the Peach Tree confluence and beyond (**Figure 26**).

It is important to note that there is confirmed illegal mining activity at Beta North. These operations source gold bearing ore from multiple locations and do crushing and washing for gold recovery in Peach Tree stream. The products of the liberation process include acidity, sulphates, and oxidised metals. The volumes of ore being processed by these illegal activities varies but the effects have been seen downstream in the Blyde river and will accumulate over time. **Figure 22** shows a washing station in Peach Tree and visible residue in the Blyde River at the river crossing behind the caravan park.

Figure 22: Effects of Illegal Mining Activity in Peach Tree Stream & Blyde River October 2021

Slow upward trends in the TDS values were observed at all the points upstream and downstream of the Beta adit. Although there is limited data for sulphates, this concentration does also appear to be steadily increasing. The pH vacillates but remains above the WUL minimum everywhere except at Peach Tree inflow - the point in Peach Tree above the visible workings. Other variables, including EC, TDS, and sulphates, also spike in June 2020 and again in July 2021, which suggests that ore washing was being done around the time the samples were taken. These spikes are mirrored at all the downstream points.

The huge variations in pH in Peach Tree stream can only be explained by the illegal mining activities; there is clear evidence of ore washing in the stream, which is due to the dump next to the stream is being steadily reworked. Tunnels are also visible under the historical mine dump.

The build-up up of Nitrates downstream in the Blyde River indicates that illegal blasting is taking place.

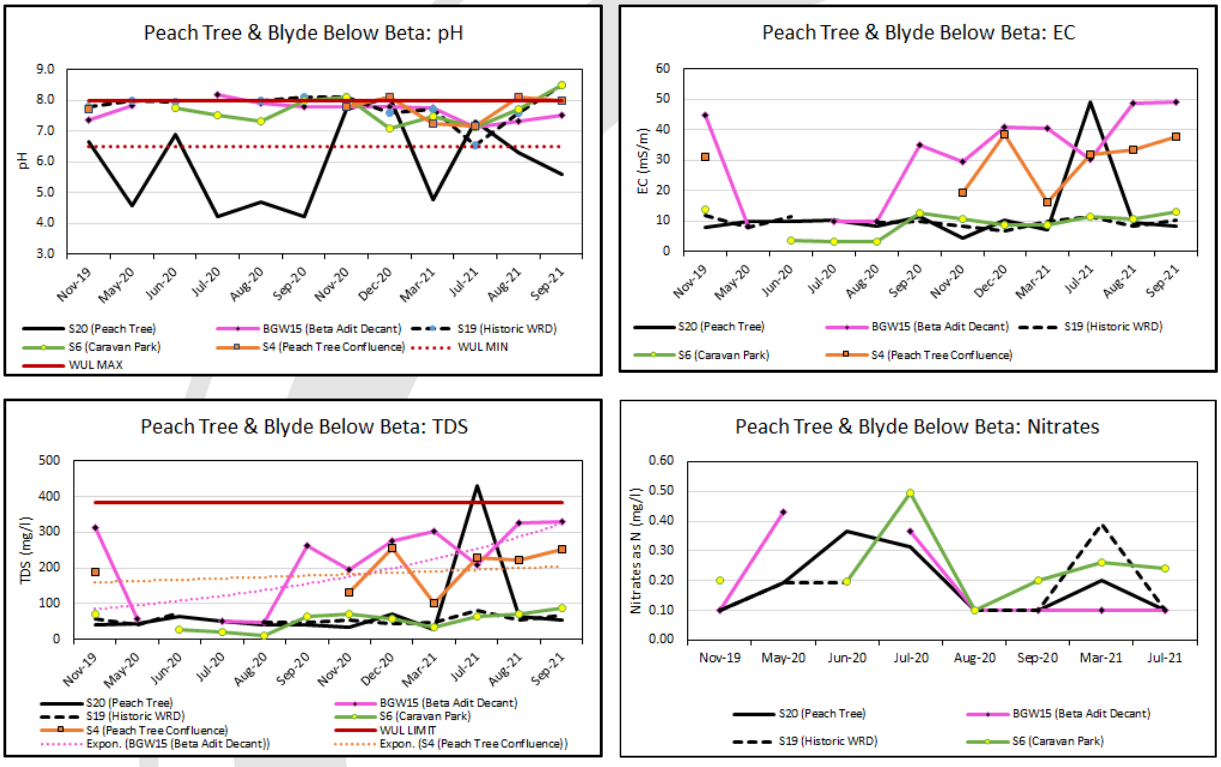

Figure 23: Water Quality: Peach Tree & Blyde River

10.7.3 BASELINE QUALITY AROUND CDM

The sampling points are shown in **Figure 27**.

The overall surface water quality in the Morgenzon Creek upstream and downstream of Morgenzon/Clewer is generally good, with parameters within the WUL limits. The water at the historically flooded Morgenzon adit shows the impact of previous mining activities, with elevated sulphates, calcium and magnesium, and thence high TDS values. Decant volumes were low when sampling was done and thus one would not expect much impact from this source on either surface or groundwater at that time. This is confirmed by analysis results at both the nearby borehole and the downstream sampling point.

Illegal miners are known to be active in this area, and the results of their activities can be seen in some of the other elements analysed. For example, the pH at all three the monitoring points is very variable. The peaks and troughs correspond to the peaks and troughs in the TDS values and in the EC values. The nitrates show similar troughs, but also show an upward trend. These results point to blasting activity as well as ore washing.

TGME is not undertaking any mining activities in this area, and therefore the current conditions do represent the baseline before mining commences according to the proposed Mining Work Programme.

It should be noted that no sampling has been possible around Dukes Upper and Dukes Lower during the period under review (December 2019 to September 2021), due to aggressive behaviour from illegal miners exploiting the area.

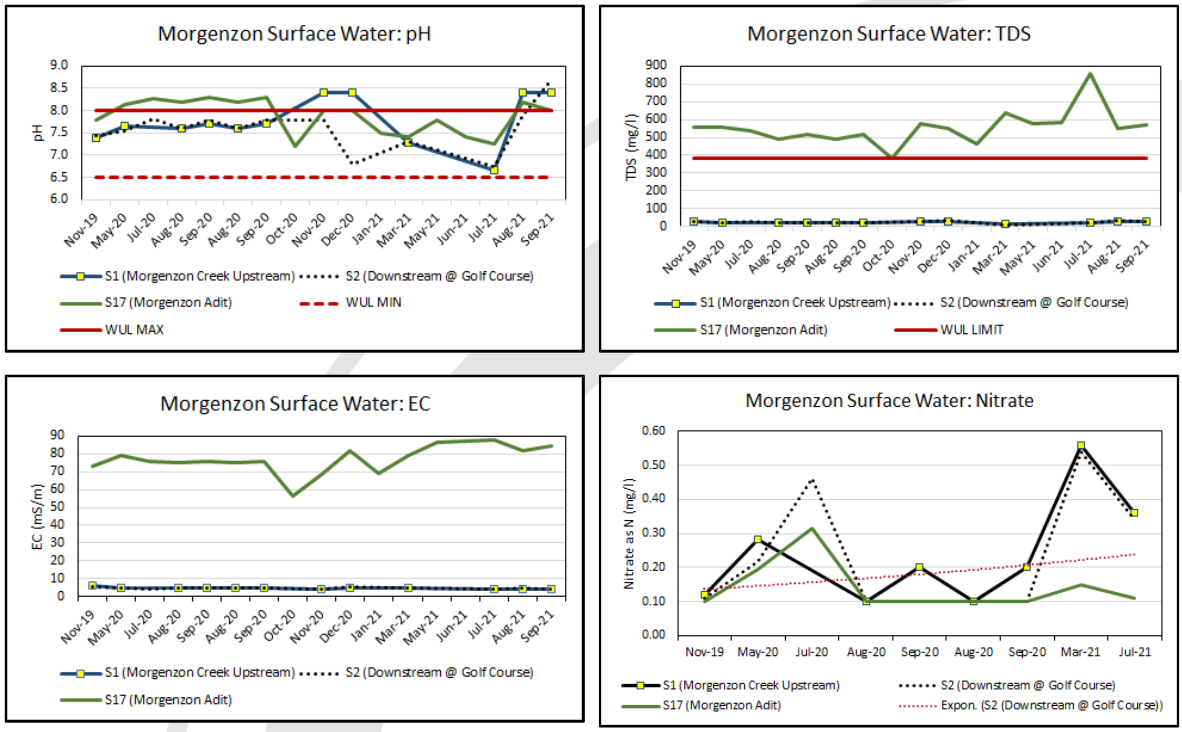

Figure 24: Surface Water Quality around Morgenzon

10.7.4 BASELINE QUALITY AROUND FRANKFORT

Surface water quality around Frankfort is generally good. The monitoring points are shown in **Figure 28**.

The EC in the water samples taken near the TGME shafts - from the waterfall, Theta stream and Bevetts stream - are consistently low. The same trends are seen in TDS and sulphates. The pH is generally below the WUL limit. These points are located in tributaries which join the Molototsi before the hostel monitoring

point, and thus are not causing the values seen in the Molototsi itself. This suggests that another tributary is causing the contamination, which manifests as increased conductivity and sulphate contamination.

The pH and the EC in the Molototsi downstream of the old Frankfort hostel and near the Vaalhoek road has been fluctuating substantially since November 2020. The reason for these fluctuations is not clear. Of interest is the Nitrates which spiked at both Bevetts stream and the hostel measuring point in June 2020, indicating blasting activities in the area. There is known illegal miner activity in the area.

As with the other sites, TGME has not conducted any mining activities here, hence the current conditions can be taken as the baseline conditions pre-TGME proposed activity.

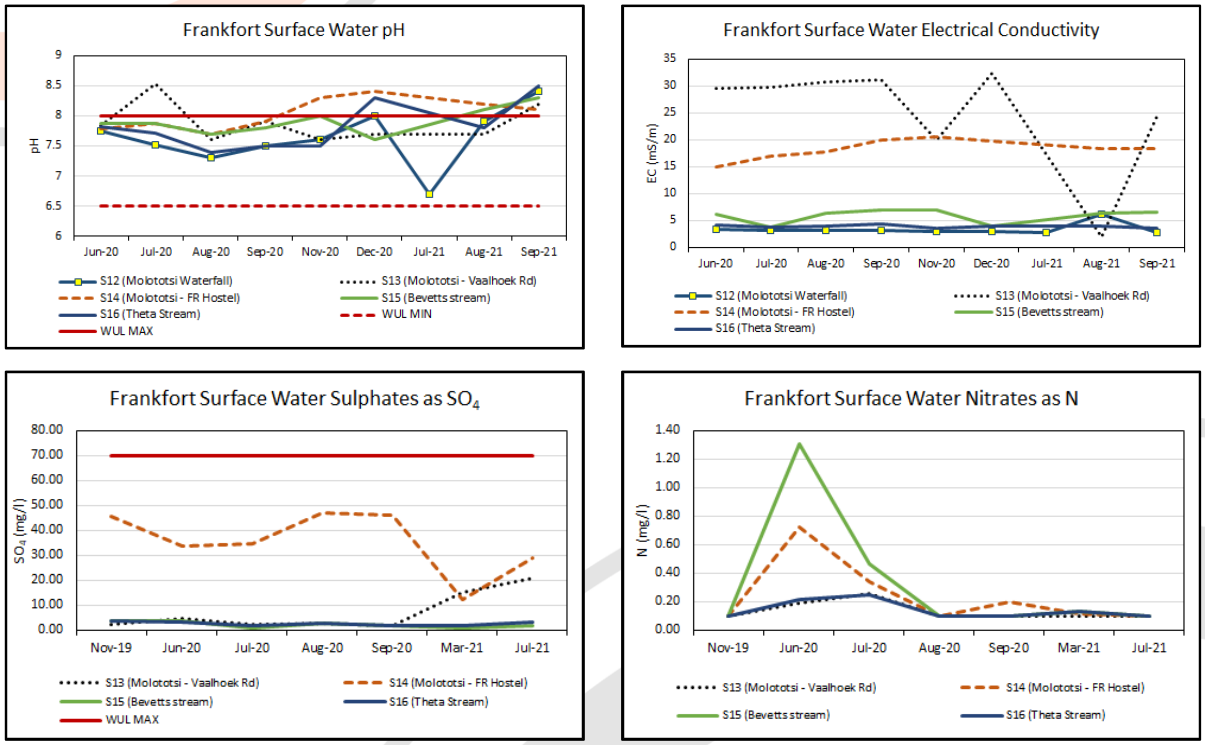

Figure 25: Surface Water Quality around Frankfort

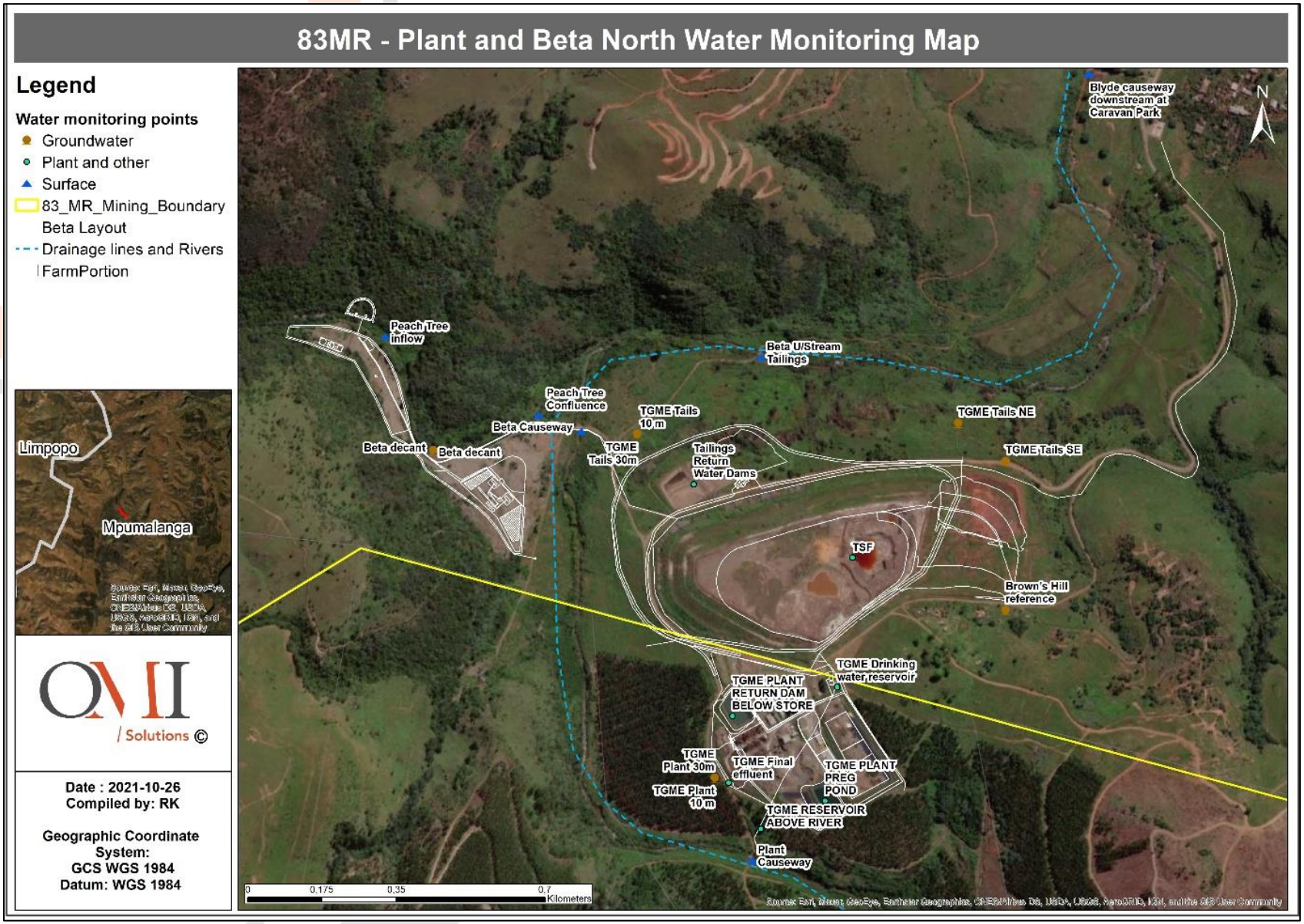

Figure 26: Water Monitoring Points: Plant Area, TSF & Beta North

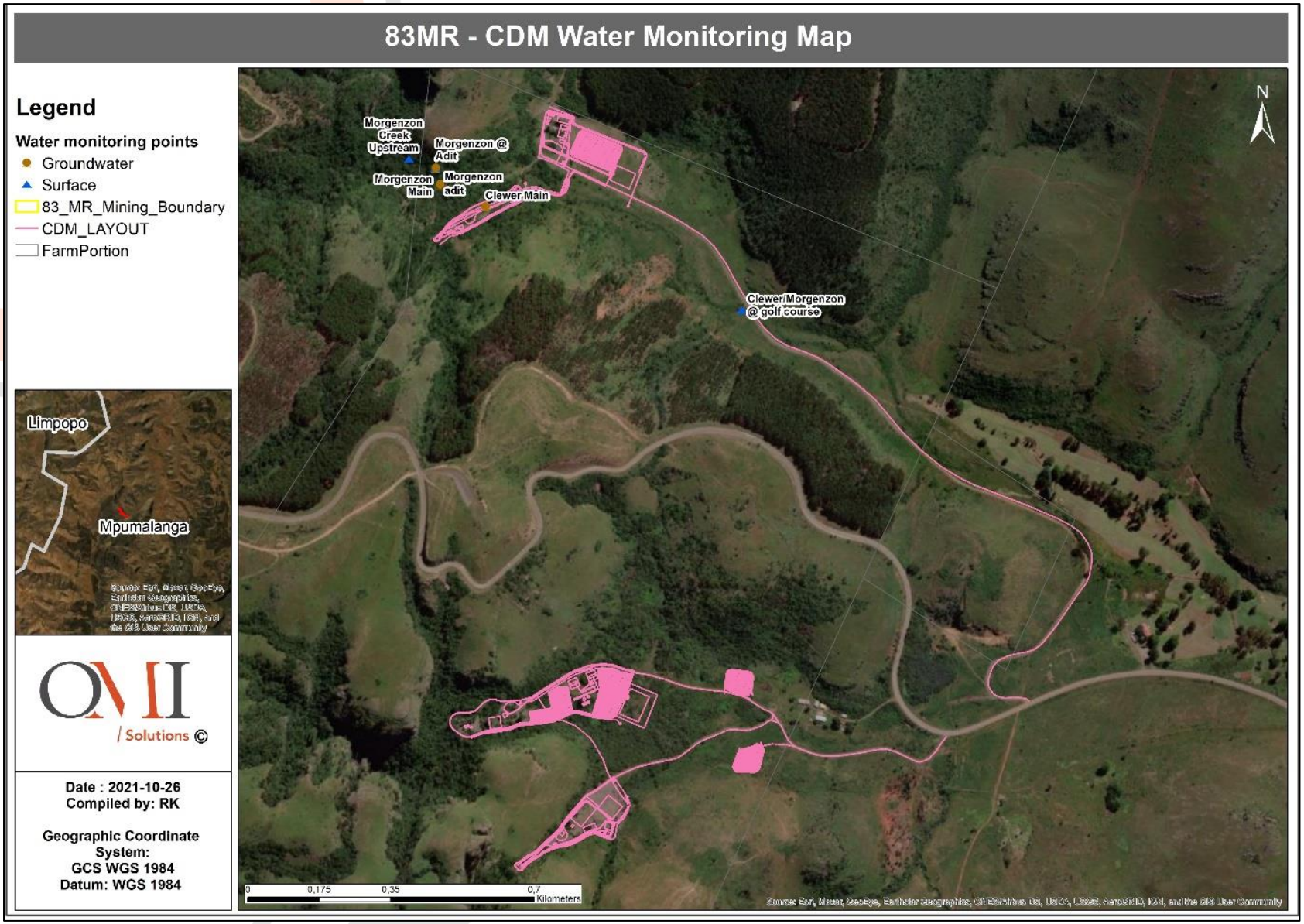

Figure 27: Water Monitoring Points: Morgenzon & Dukes

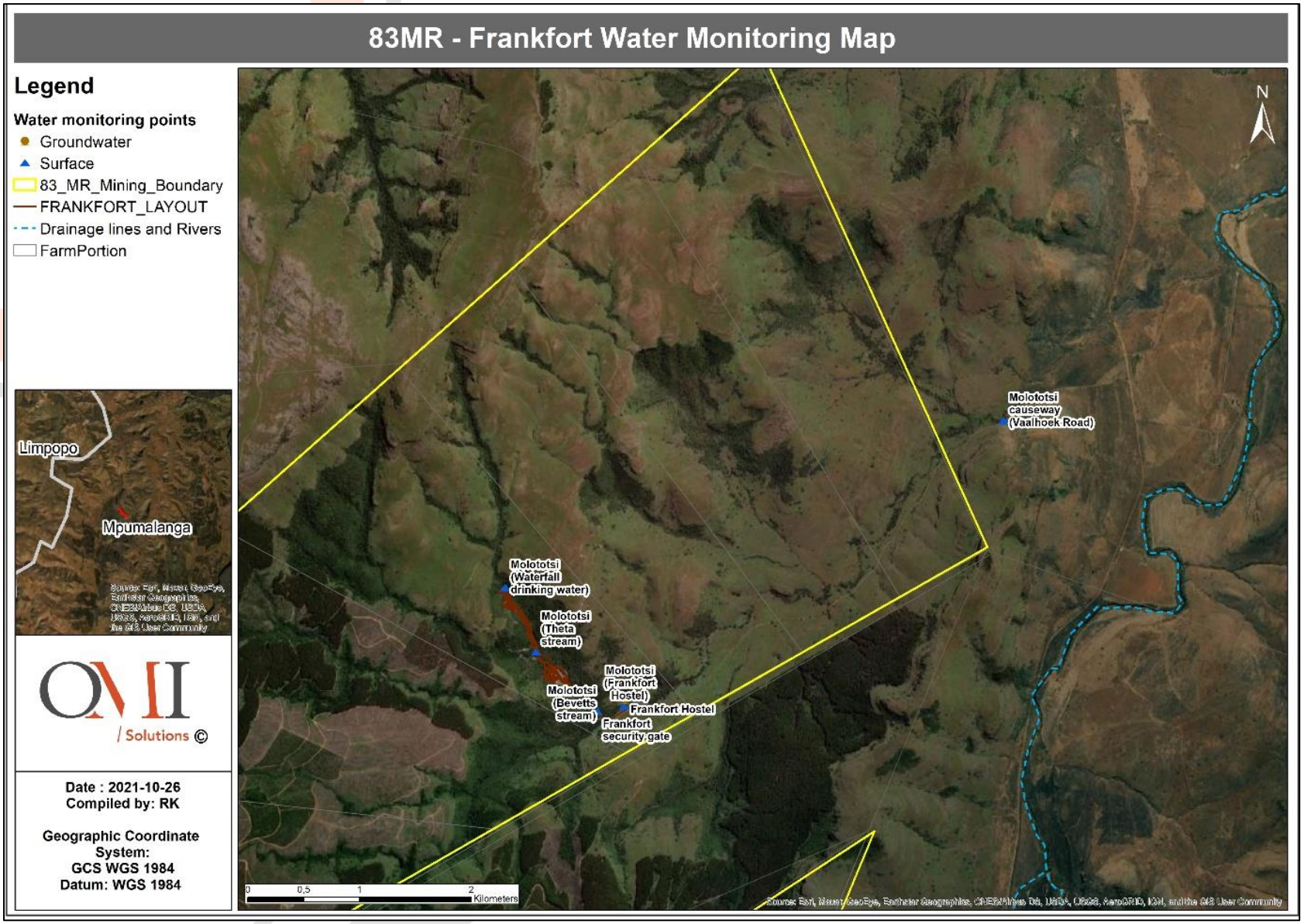

Figure 28: Water Monitoring Points: Frankfort

10.8 GEOHYDROLOGY

The following section describes the methodology and findings of the geohydrological scoping assessment done by MVB Consulting (2021). The baseline report is attached as ANNEXURE I.

10.8.1 HYDROSENSUS

Groundwater boreholes in the region are scarce and mainly restricted to scattered mine investigative/monitoring boreholes. Boreholes drilled during previous investigations were used to form an understanding of the geohydrological regime of the study area. This understanding was supplemented by information obtained from exploration boreholes in the study area (MvB Consulting, 2021).

The localities of the available boreholes are shown on **Figure 29** and the geohydrological borehole information is summarised in **Table 10**.

Table 10: Hydrosensus Borehole Information (MVB Consulting, 2021)

Borehole ID	Locality	Coordinates			Depth	Groundwater Level	
		Longitude	Latitude	Collar	(m)	(mbs)*	(mamsl)
BGW1	TGME Plant	30.7381	-24.9187	1280.00	10	Dry	Dry
BGW2	TGME Plant	30.7381	-24.9187	1280.00	Unknown	28.00	1252.00
BGW3	TGME TSF	30.7364	-24.9120	1260.00	Unknown	8.00	1252.00
BGW4	TGME TSF	30.7364	-24.9120	1260.00	Unknown	8.00	1252.00
BGW5	Brown Hill	30.7448	-24.9153	1314.57	Unknown	Dry	Dry
BGW6	TGME TST SE	30.7441	-24.9125	1279.10	Unknown	46.00	1233.10
BGW7	TGME TSF NE	30.7438	-24.9119	1268.84	38	35.00	1233.84
BGW9	Clewer Main	30.7258	-24.8749	1320.00	Unknown	5.00	1315.00
BGW10	Morgenzon Main	30.7245	-24.8747	1320.00	Unknown	5.00	1315.00
BGW16	Frankfort	30.7430	-24.8097	1260.00	Unknown	6.52	1253.48
TG2	TGME Plant	30.7401	-24.9198	1286.84	30	25.57	1261.27
TG1	TGME Plant	30.7363	-24.9124	1262.05	30	8.70	1253.35
TG1-SM	TGME Plant	30.7361	-24.9125	1260.80	10	8.85	1251.95
HMB1	Hermansburg	30.7455	-24.7750	1654.36	117	73.00	1581.36
HMB2	Hermansburg	30.7515	-24.7789	1580.00	60	Dry	Dry
HMB3	Hermansburg	30.7641	-24.7737	1480.90	133	117.00	1363.90
BH3	TGME TSF	30.7400	-24.9128	1279.95	Unknown	Dry	Dry
DG1-BH1	Trend deposits	30.7660	-24.9238	1465.51	Unknown	Dry	Dry
DG2-BH1	Trend deposits	30.7660	-24.9238	1465.51	Unknown	Dry	Dry
BH North	Bourke's Luck	30.8084	-24.6819	1152.25	Unknown	45.00	1107.25
Vaalhoek 2#	Vaalhoek Shaft	30.7681	-24.7599	1263.26	Unknown	137.00	1126.26
Frankfort BH	Frankfort	30.7432	-24.8096	1260.00	Unknown	6.52	1253.48
Fountain	Vaalhoek	30.7718	-24.7501	1307.86	Unknown	0.00	1307.86
Forestry BH	Golf Course	30.7447	-24.8856	1269.05	Unknown	Locked	Locked

**Note: mbs = metres below surface*

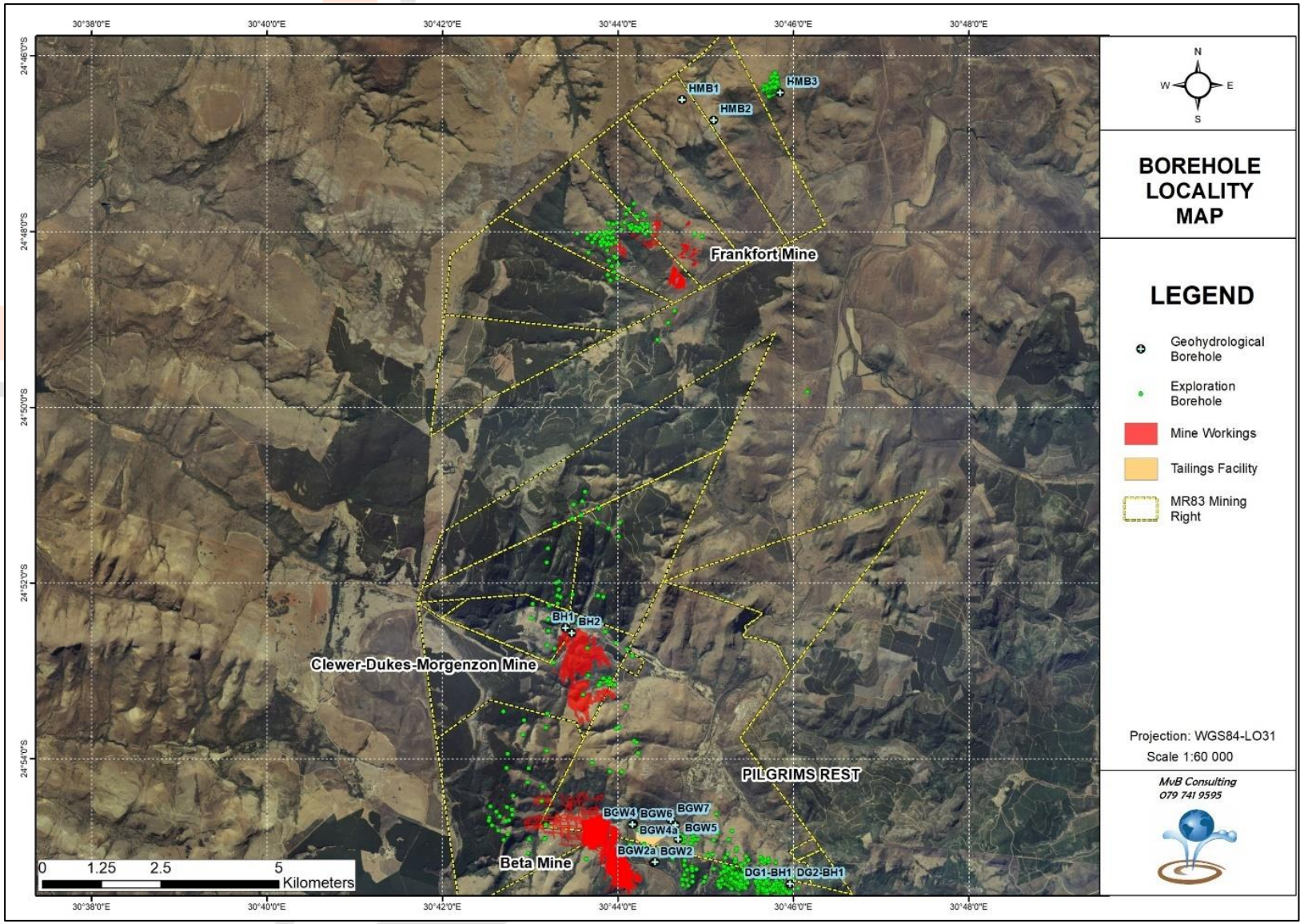

Figure 29: Regional Borehole Locality Plan (MvB Consulting, 2021)

10.8.2 AQUIFER TYPES

Groundwater occurrences in the study area are predominantly restricted to the following types of terrains.

- Primary aquifers consisting of the quaternary sediments which are restricted to the river valleys;
- Weathered and fractured rock aquifer in the Timeball Hill formations;
- Dolomitic and karst aquifers.

Weathered and Fractured Transvaal Aquifer

Groundwater occurs in the weathered sedimentary deposits (quartzite and shale) of the Timeball Hill Formation. These formations are not considered to contain economic and sustainable aquifers. However, localised high yielding boreholes may exist where significant fractures are intersected. Groundwater occurrences are mainly restricted to the weathered formations, although fractures in the underlying “fresh” bedrock may also contain water. The base of the aquifer is the non-fractured quartzite and shale formations, whereas the top of the aquifer would be the surface topography. The groundwater table is affected by seasonal and atmospheric variations and generally mimics the topography. These aquifers are classified as semi-confined.

The two aquifers (weathered and fractured) are mostly hydraulically connected, but confining layers such as clay and shale may separate the two. In the latter instance the fractured aquifer is classified as confined. The aquifer parameters, which include transmissivity and storativity, are generally low and groundwater movement through this aquifer is therefore slow.

According to GCS (2008), the deeper fractured aquifer of the Timeball Hill formation is recharged by the overlying Bevett’s conglomerate aquifer at the Beta Mine. Recharge occurs via vertical flow along fractures and fissures.

Dolomite (Karst) Aquifer

Dolomite aquifers are known to contain large quantities of groundwater and are commonly associated with sustainable groundwater abstraction. The water that poses a risk to the underground mining is primarily derived from the karst aquifer in the Malmani dolomite. This is a risk to all the mining within the Malmani dolomite as most of the reef horizons are situated with the dolomite. According to GCS (2009) a hydro-census was conducted at the Pilgrims Rest Trend Deposits where two boreholes were drilled downgradient of the existing DG sites. According to the report (GCS, 2009) DG1-BH1 intersected a prominent shale layer approximately 14 meters overlying the dolomites of the Chuniespoort Group. Dissolution cavities in the dolomites were encountered at a depth of 52 to 59 meters below ground level. The cavity was measured dry during the water level measurement and indicate that no perched of elevated water levels exist below the site.

Borehole DG2- BH1, intersected overburden of 6 meters and a dolomite thickness of 72 meters. The drilling was abandoned at a depth of 78 metres below ground level as it was measured dry which also would indicate that no perched aquifer conditions and elevated groundwater level exists below the site (GCS, 2009).

The dolomite or karst aquifer may have transmissivity values of up to 1,000 m^2/day in exceptional instances such as boreholes into cavities. The boreholes in the Pilgrims Rest region are lower but considered representative of the dolomite aquifer.

10.8.3 WASTE CLASSIFICATION

Rock samples from Beta and Frankfort mine were sent to a laboratory for processing through a miniature plant to produce material that would be representative of the waste material that would be produced via the

DMS plant as well as tailings material that would be produced by the plant. This process was completed, and the resulting water and waste were analysed and classified. Samples were also collected and analysed from the existing tailings material.

GeoDyn Systems (2021) conducted a Waste Classification of the mineral waste material from TGME. The key objectives of the geochemical assessment were to conduct a waste classification of the mineral waste material in accordance with National Norms and Standards for the Assessment of Waste for Landfill Disposal (GN R635 of 2013) and GN R632 of 2015 published under the NEMWA., and to conduct a risk assessment of the mineral waste to inform the final classification.

Table 11 provides a description of the various samples that were analysed.

Table 11: Waste Classification Samples (Geodyn Systems, 2021)

Sample Name	Description
DS01	Existing tailings material
DS02	Existing tailings material
DMS Float	DMS Float waste material
TGME New	New tailings material

The materials were evaluated according to GN R635 of 2013. The classification of mineral waste according to GNR 635 requires following the methodology in the regulations and integrating the regulatory classification with a risk assessment of the waste material. Integrating the regulatory classification and risk assessment allows recommendations for the risk type according to GN R635 of 2013, for which an engineered barrier system design is required, according to GN R635 of 2013.

Table 12: GNR 635 Stipulation of Criteria to Evaluate Waste for Landfill Disposal

Stipulated by GNR 635	Criteria	Waste Type
Compare TC and LC of the waste sample to the TCT and LCT limits	LC > LCT3, or TC > TCT2	0
	LCT2 < LC ≤ LCT3 or TCT1< TC ≤ TCT2	1
	LCT1 < LC ≤ LCT2 or TC ≤ TCT1	2
	LCT0 < LC ≤ LCT1 and TC ≤ TCT1	3
	LC≤ LCT0 and TC < TCT0	4

In Table 12, TC refers to total concentration and LC to the leachable concentration of the chemical substances in the waste. LCT refers to the leachable concentration threshold limit of the element or chemical substance in the waste. The unit of LC is mg/l, and TC is mg/kg.

Geochemical modelling has been used for decades internationally to aid in regulatory decision making, especially in relation to environmental risk determination for mine and other industry mineral waste.

Geochemical modelling uses chemical reactions and associated thermodynamic and kinetic data to model the rate at which pollutant source minerals break down and thus release contaminants into the natural environment. It also accounts for other geochemical processes, e.g. precipitation of secondary minerals, the formation of complexes in the water solutions and sorption of chemical constituents to mineral surfaces. All these factors contribute to the method in which a potential contaminant will be released into the pore

water of the mineral waste material. It also accounts for the response of the contaminants when they interact with the minerals of the waste material and the constituents dissolved in the water solution between the mineral waste pores.

The regulatory classification according to GN R635 of 2013 in combination with the assessment of the geochemical system of the mineral waste facility is used to derive recommendations for the class of waste depending on the risks it poses to the natural environment.

10.8.3.1 LEACHATE ANALYSIS

The leachate assessment data is shown in Table 13. The data indicates that none of the lowest regulatory values (LCT0) are exceeded for the TGME New tailings material. The LCT0 values are exceeded for arsenic for the DS01 and DS02 old tailings as well as the DMS float material. The LCT0 value for sulphate is exceeded for the DS01 and DS02 old tailings material.

10.8.3.2 TOTAL CONCENTRATION ANALYSIS

The total concentration assessment data is shown in Table 14. The lowest total concentration threshold values for copper and manganese are exceeded for all wastes. The TCT1 value for arsenic is exceeded for the DS01 and DS02 old tailings as well as for the DMS Float waste material. In addition, the TCT0 values for barium, lead and antimony are exceeded in the DS01 waste, while the TCT0 values for lead and antimony are exceeded for the DS02 old tailings waste. The TCT0 values for barium and antimony are also exceeded in the DMS Float waste. In addition to copper and manganese, arsenic exceeded the TCT0 value in the new tailings material – the other parameters were within the limits.

In the new WRD material, the TCT0 values for manganese and nickel are exceeded.

10.8.3.3 WASTE CLASSIFICATION RESULTS

Based on the criteria in Section 7 of GN R635, the mineral waste classifies as the following types:

- Type 3: TGME New tailings.
- Type 2: DS01 Old tailings, DS02 Old tailings, DMS float.

The mineral waste contains sulphide minerals, which are unstable once exposed to the Earth's atmosphere. Most of the LCT and TCT exceedances are contained in sulphide minerals.

10.8.3.4 PRELIMINARY RISK ASSESSMENT

A Risk assessment has been done by HydroScience CC which also showed that due to the low leachability of constituents in the new tailings, it is expected to react more like Type 4 waste than Type 3 waste and therefore the impact on the receiving environment is expected to be insignificant.

Further discussions and the risk assessment will be included in the EIA phase reports.

Table 13: Leach Concentration Threshold Assessment Results (Geodyn Consulting, 2021)

Inorganic Waste constituents	Abbreviation	R635 Leach Concentration Threshold Values				TGME Pilgrim's Rest Mineral Waste Material			
		LCT0	LCT1	LCT2	LCT3	DS01 *old tailings*	DS02 *old tailings*	DMS Float *DMS plant*	TGME New *new tailings*
		mg/L	*mg/L*	*mg/L*	*mg/L*	*mg/L*			
Metal Ions									
Arsenic	As	0.01	0.5	1	4	0.027	0.040	0.020	0.001
Boron	B	0.5	25	50	200	b.d.	b.d.	b.d.	b.d.
Barium	Ba	0.7	35	70	280	0.036	0.028	0.002	0.001
Cadmium	Cd	0.003	0.15	0.3	1.2	b.d.	b.d.	b.d.	b.d.
Cobalt	Co	0.5	25	50	200	0.007	0.005	<0.001	0.005
Chromium (Total)	Cr(Total)	0.1	5	10	40	b.d.	b.d.	b.d.	b.d.
Chromium (VI)	Cr(VI)	0.05	2.5	5	20	b.d.	b.d.	b.d.	b.d.
Copper	Cu	2.0	100	200	800	b.d.	b.d.	b.d.	b.d.
Mercury	Hg	0.006	0.3	0.6	2.4	0.002	0.001	b.d.	b.d.
Manganese	Mn	0.5	25	50	200	0.256	0.098	b.d.	b.d.
Molybdenum	Mo	0.07	3.5	7	28	0.002	0.001	0.003	b.d.
Nickel	Ni	0.07	3.5	7	28	b.d.	b.d.	b.d.	0.005
Lead	Pb	0.01	0.5	1	4	b.d.	b.d.	b.d.	b.d.
Antimony	Sb	0.02	1.0	2	8	0.001	0.009	0.006	b.d.
Selenium	Se	0.01	0.5	1	4	b.d.	b.d.	b.d.	b.d.
Vanadium	V	0.2	10	20	80	b.d.	b.d.	b.d.	b.d.
Zinc	Zn	5.0	250	500	2 000	b.d.	b.d.	b.d.	b.d.
Inorganic Anions									
Total Dissolved Solids	TDS	1 000	12 500	25 000	100 000	396	436	60	38
Chloride	Cl	300	15 000	30 000	120 000	8	6	b.d.	b.d.
Sulphate	SO_4	250	12 500	25 000	100 000	265	279	19	<2
Nitrate as Nitrogen	NO_3-N	11	550	1 100	4 400	b.d.	b.d.	b.d.	b.d.
Fluoride	F	2	75	150	600	b.d.	b.d.	b.d.	b.d.
Cyanide (Total)	CN^-(Total)	0	4	7	28	b.d.	b.d.	b.d.	b.d.

Table 14: Total Concentration Threshold Assessment Results (Geodyn Consulting, 2021)

Waste constituents	Abbreviation	R635 Total Concentration Threshold Values			TGME Pilgrim's Rest Mineral Waste Material			
		TCT0	TCT1	TCT2	DS01 *old tailings*	DS02 *old tailings*	DMS Float *DMS plant*	TGME New *new tailings*
		mg/kg	mg/kg	mg/kg	mg/kg			
Metal Ions								
Arsenic	As	5.8	500	2 000	1 528	1 808	568	31.6
Boron	B	150	15 000	60 000	b.d.	b.d.	b.d.	b.d.
Barium	Ba	62.5	6 250	25 000	223.6	59.2	169.6	1.2
Cadmium	Cd	7.5	260	1 040	0.8	0.4	b.d.	b.d.
Cobalt	Co	50	5 000	20 000	18.4	8.4	5.2	5.2
Chromium (Total)	Cr(Total)	46 000	800 000	n.a	215.2	150.4	71.2	16.8
Chromium (VI)	Cr(VI)	6.5	500	2 000	b.d.	b.d.	b.d.	b.d.
Copper	Cu	16.0	19 500	78 000	1 228	1 128	167.6	16.4
Mercury	Hg	0.93	160	640	b.d.	b.d.	b.d.	b.d.
Manganese	Mn	1 000	25 000	100 000	6 400	2 412	4 400	3 316
Molybdenum	Mo	40	1 000	4 000	2	2	4.4	b.d.
Nickel	Ni	91	10 600	42 400	81.6	38	24	14.8
Lead	Pb	20	1 900	7 600	256.4	31.2	2.8	3.2
Antimony	Sb	10	75	300	88	78	32	b.d.
Selenium	Se	10	50	200	0.4	b.d.	b.d.	b.d.
Vanadium	V	150	2 680	10 720	60.8	28.8	32.4	11.6
Zinc	Zn	240.0	160 000	640 000	171.6	106.8	30.8	18.4
Inorganic Anions								
Fluoride	F	100	10 000	40 000	b.d.	b.d.	2.96	6.03
Cyanide (Total)	CN^-(Total)	14	10 500	42 000	b.d.	b.d.	b.d.	b.d.

10.8.3.5 WASTE RISK ASSESSMENT

Geochemical modelling was used to conduct a risk assessment of the TGME Pilgrims Rest mineral waste materials. Geochemical modelling is useful in assessing the risk of leaching of contaminants from mineral waste, as it takes the rates at which contaminant source minerals break down into account. The GN R635 waste classification methodology does not consider time and thus has the potential to under assess as well as over assess the concentration of contaminants that may leach from the mineral waste material.

The mineralogy of the various mineral wastes as well as the waste classification results were used to develop the geochemical models and to identify processes related to the release of contaminants into mineral waste leachate as well as its response given the environmental conditions in which the effluent will occur. These conditions include environments in contact with the Earth's or isolated from the Earth's atmosphere and thus containing limited oxygen to react with the source minerals. The results of these models are discussed below.

TGME New Tailings

A kinetic geochemical model was developed for the TGME new tailings mineral waste material.

The geochemical model results indicate that the tailings leachate is likely to remain alkaline, mostly due to the low concentration of sulphide minerals in the material (**Table 15**). The metal and metalloid concentrations, specifically arsenic, copper, manganese and iron, in the leachate is likely to be low, i.e. lower than the LCT0 values for these elements. This implies that the risk for metal and metalloid contamination from the new tailings material is negligible. The model sulphate concentration is likely to be lower than the LCT0, implying that the risk of elevated sulphate concentrations in the natural environment due to the new tailings material is negligible.

Table 15: Geochemical Model Results of the New Tailings Material (Geodyn Systems, 2021)

Parameter	Abbreviation	*Units*	Value
pH	pH	*pH units*	8.2
Total dissolved solids	TDS	*mg/l*	105
Bicarbonate	HCO_3		59
Sulphate	SO_4		19
Aluminium	Al		0.003
Arsenic	As		<0.001
Calcium	Ca		25
Copper	Cu		<0.001
Iron	Fe		<0.001
Magnesium	Mg		1.1
Manganese	Mn		<0.001
Silicon	Si		1.2

Overall, addition of the rate at which geochemical reactions take place in the new tailings material indicates that the material is unlikely to present an environmental risk and can be classified as Type 4, i.e. inert.

Old (Historic) Tailings Material and DMS Float

A kinetic geochemical model was developed for the TGME historic tailings material and for the DMS Float waste material. The model for these material types was combined due to the similarity of the materials' chemical and mineral compositions.

The geochemical model indicates that the pH of leachate from the DMS Float and old tailings material is likely to be alkaline. This is due to the neutralisation capacity of the carbonate minerals, i.e. dolomite [$CaMg(CO_3)_2$] and calcite [$CaCO_3$], in the waste material being sufficient. The model indicates that the sulphate and TDS concentrations are likely to exceed the LCT0 regulatory value, but not the LCT1 value. Similarly, arsenic is likely to exceed the LCT0 value, but not the LCT1 value. Manganese is unlikely be present in detectable quantities due to the precipitation of pyrolusite [MnO_2], which forms when water is in contact with oxygen in the Earth's atmosphere. Copper is also likely to occur in the leachate of the DMS Float and historic tailings material in concentrations not exceeding the LCT0 value.

Table 16: Geochemical Model Results of the Old Tailings Material and DMS Float

Parameter	Abbreviation	*Units*	Value
pH	pH	*pH units*	7.6
Total dissolved solids	TDS	*mg/l*	2,299
Bicarbonate	HCO_3		29
Sulphate	SO_4		1 547
Aluminium	Al		0.001
Arsenic	As		0.17
Calcium	Ca		683
Copper	Cu		1.6
Iron	Fe		<0.001
Magnesium	Mg		32
Manganese	Mn		<0.001
Potassium	K		0.2
Silicon	Si		6.3

The geochemical model results indicate that, although the leachate concentration of arsenic and sulphate are likely to exceed the LCT0 values for these elements, they are not likely to exceed the LCT1 values. Therefore, this waste material should be classified as Type 3, i.e. low risk.

A Risk assessment has been done by HydroScience CC which also showed that due to the low leachability of constituents in the new tailings, it is expected to react more like Type 4 waste than Type 3 waste and therefore the impact on the receiving environment is expected to be insignificant.

10.8.4 ACID GENERATION CAPACITY

Sulphide minerals are formed and stable under reducing conditions (Dold, 2017). Acid mine drainage commonly occurs when sulphide minerals (pyrite, chalcopyrite, galena, covellite and sphalerite) are exposed to oxidizing conditions. The oxidizing conditions are created by exposure to moisture and oxygen. The oxidation process results in the release of dissolved Fe^{2+}, SO_4^{2-} and H^+ (ABA, 2001). The oxidation of sulphide-minerals containing iron produce net acidity via its oxidation, except for common sulphides such as molybdenite, enargite and stibnite (Dold, 2017).

The rate of pyrite oxidation depends on a number of factors, the main factors being reactive surface area of pyrite, oxygen concentration and solution pH, presence of bacteria and catalytic agents (Skousen J., Sextone A. and Ziemkiewics, 2000).

Where mine-water pumping is constant and the mine water level is stable, little pyrite oxidation occurs below the water level and few metals are leached, resulting in a relatively non-environmentally aggressive mine water. Active pyrite oxidation will, however, continue to occur in the unsaturated zone and, if pumps are turned off, the rising water level will leach out heavy metals, resulting in a highly acid and contaminating solution (Banks et al., 1996)

In some geological settings the alkaline content of surrounding lithologies could act as buffering systems, countering the acid produced from pyrite oxidation. Carbonates and Clays have proven to sufficiently neutralize acid rock drainage (Skousen J., Sextone A. and Ziemkiewics, 2000). The balance between acid-producing potential and neutralizing capacity should provide reasonable indication of the potential acidity or alkalinity that may occur from the weathering of mined material.

The geochemical model indicates that the pH of leachate from the new tailings, DMS Float and old tailings material is likely to be alkaline. This is due to sufficient neutralisation capacity of the carbonate minerals, i.e. dolomite [$CaMg(CO_3)_2$] and calcite [$CaCO_3$], in the waste material.

10.8.5 HYDROCHEMISTRY

Groundwater quality results were obtained from the OMI and Regent water quality reports. According to OMI (July 2020) the borehole water quality analysis was not conclusive due to the large number of the boreholes being dry or unable to gain samples during the three-month monitoring period in 2020. Seasonal fluctuations affect the ground water levels, so monitoring of the ground water over a longer period, such as through quarterly sampling, should give a better indication of the ground water qualities. Water qualities are therefore now monitored monthly (pH, EC, TDS, and alkalinity) and a full analysis is done quarterly.

The water chemistry is compared to the limits specified in the TGME Water Use Licence (Licence No: 24023343, 2011) as well as the SANS 241 (2015). The WUL guideline limits refer to the in-stream or resource quality limits, but in the absence of specific groundwater quality limits, these are used.

The SANS 241 Drinking Water Specification is the definitive reference on acceptable limits for drinking water quality parameters in South Africa and provides guideline levels for a range of water quality characteristics. The SANS 241 (2015) Drinking-Water Specification effectively summarises the suitability of water for drinking water purposes for lifetime consumption.

The latest full chemical analysis of the groundwater quality in the current monitoring boreholes is presented in **Table 17** (see **Figure 26** to **Figure 28** for localities of the sampling points). Concentrations that exceed the WUL guideline limits are highlighted in red. In the absence of WUL limits the parameters that exceed the SANS 241 guidelines are highlighted in blue.

With reference to Table 17 the following is observed regarding the groundwater quality:

- The groundwater quality is generally good and only a few parameters exceed the very stringent WUL limits.
- Most of the pH values are within the WUL limits and SANS 241 limits with the exception of BGW 09 and the Frankfort Security borehole.
- Boreholes BGW9 and BGW10 at Morgenzon mining area have been monitored consistently and show that the groundwater conditions are good, with metal content below detection limit. This

suggests that water emanating from the adit is not seeping into surrounding groundwater (OMI, July 2020).

- Frankfort Security Borehole exceeded the WUL limit for Ammonium and Orthophosphate (SANS limits).
- The boreholes close to the TSF (BGW06 and BGW07) shows some impact with elevated TDS (BGW06), Sulphate (BGW07), Ammonium (BGW06), Calcium, Sodium, Aluminium (BGW07) and Manganese (BGW06). Additional monitoring boreholes will be drilled to better understand the potential impact from the TSF.
- The borehole BGW04, which is down-gradient from the TSF and RWDs, shows no impact and none of the parameters exceed the guideline limits.
- Borehole BGW02, which is down-gradient from the plant, shows no impact and none of the parameters exceed the guideline limits.
- The water quality decanting from the Beta workings (BGW15) only exceeds the WUL limits for Sulphate, which indicates that water emanating from the historical mine workings does not pose a threat to the environment.

Generally, the groundwater quality is good and there are no parameters of concern in the groundwater which exceed the SANS 241 drinking water guidelines significantly.

The historical mining operations intersected some water over time. The adits where water flows from the mine workings include the following:

- Beta Adit: Estimated flow 1,350 m^3/day.
- Morgenzon Adit: Estimated flow 80 m^3/day.
- Dukes Adit: Unable to assess due to illegal mining activity.
- Frankfort Mine: No information.

The current inflow volumes have not been measured accurately, and the estimated flow from the Beta mine is considered the most accurate. The calculations in this report are largely based on the current inflow, represented by the outflow from Beta adit, into the Beta mine.

The estimated future groundwater inflow volumes into the different mines are as follows:

- Beta: Estimated flow 2,307 m^3/day;
- CDM: Estimated flow 1,378 m^3/day;
- Frankfort: Estimated flow 551 m^3/day.

The continuous inflow of groundwater into the mine may lead to an impact on the groundwater levels overlying the mine workings. The simulated groundwater level impacts (drawdown >0.1m), to account for the current inflow, however, indicated that the impacts are localised and not expected to be noticeable.

Preliminary impacts have been presented in the Geohydrological SR (ANNEXURE H), and will be elaborated on and refined during the EIA phase.

Table 17: Recent Groundwater Quality Parameters (MVB Consulting, 2021)

Sample ID	Unit	Guidelines		BGW2	BGW4	BGW6	BGW7	BGW9	BGW10	FR Security	BGW15
Determinant		WUL Limit	SANS 241	Jun 2021	Jul 2021	Jun 2021	Jul 2021	Jul 2021	Sep 2020	Mar 2021	Jul 2021
pH	pH Units	6.5-8.0	≤5 - ≥9.7	7.13	7.03	7.53	7.58	6.38	7.30	8.90	7.13
Electrical Conductivity	mS/m	NG	≤170	17	23	129	57	10	5	37	30
TDS	mg/ℓ	≤ 385	≤1200	106	172	690	362	96	24	201	210
Total Alkalinity	mg CaCO3/ℓ	NG	NG	78	103	760	200	36	20	172	233
Chloride	mg/ℓ	≤ 200	≤ 300	1.51	2.09	26.10	15.00	1.80	3.00	5.00	1.48
Sulphate	mg/ℓ	≤ 70	≤ 500	4.89	43.00	4.30	93.40	1.66	2.00	31.00	90.70
Nitrate	mg/ℓ	NG	≤ 11	0.37	1.04	4.36	0.84	0.00	0.20	0.10	<0.1
Ammonium as N	mg/ℓ	NG	≤ 1.5	0.20	0.20	109.00	1.20	0.20	0.10	8.40	0.1
Orthophosphate	mg/ℓ	≤ 0004	NG	<0.005	<0.005	<0.005	<0.005	0.21	0.10	0.10	<0.1
Fluoride	mg/ℓ	NG	≤ 1.5	0.20	0.20	0.40	0.20	0.20	0.20	0.20	0.20
Calcium	mg/ℓ	≤ 32	≤ 507	17.40	21.50	73.20	64.00	8.66	4.00	17.00	32.00
Magnesium	mg/ℓ	≤ 27	30	9.61	11.80	40.00	30.60	4.59	2.00	26.00	15.50
Sodium	mg/ℓ	≤ 6	≤ 200	1.20	1.00	12.00	10.00	1.00	1.00	4.00	2.00
Potassium	mg/ℓ	NG	50	0.33	0.91	15.00	1.24	0.34	0.80	3.10	0.53
Aluminium	mg/ℓ	NG	≤ 0.3	<0.100	0.02	0.03	0.04	<0.100	0.10	0.10	0.04
Iron	mg/ℓ	NG	≤ 2	0.07	0.05	0.11	0.06	1.72	0.05	0.74	0.04
Manganese	mg/ℓ	NG	≤ 0.4	<0.01	0.01	1.05	<0.01	0.16	0.03	0.11	0.05
Chrome	mg/ℓ	NG	≤ 0.05	-	0.03	0.03	0.03	0.03	0.03	0.03	0.025
Copper	mg/ℓ	NG	≤ 2	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nickel	mg/ℓ	NG	≤ 0.07	-	0.03	0.03	0.03	0.03	0.03	0.03	0.025

Sample ID	Unit	Guidelines		BGW2	BGW4	BGW6	BGW7	BGW9	BGW10	FR Security	BGW15
Determinant		WUL Limit	SANS 241	Jun 2021	Jul 2021	Jun 2021	Jul 2021	Jul 2021	Sep 2020	Mar 2021	Jul 2021
Zinc	mg/ℓ	NG	≤ 5	-	0.03	0.03	0.03	0.06	0.15	0.03	0.025
Lead	mg/ℓ	NG	≤ 0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.001
Total Cyanide	mg/ℓ	NG	NG	<0.07	<0.07	<0.07	<0.07	<0.07	0.07	0.07	<0.07
Free Cyanide	mg/ℓ	NG	≤ 0.2	<0.07	<0.07	<0.07	<0.07	<0.07	0.01	0.01	<0.07
Arsenic	mg/ℓ	NG	≤ 0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury	mg/ℓ	NG	≤ 0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

The calibrated numerical model was used to assess the potential impacts from the Tailings Facility (TSF) on the groundwater and the potential impact on the Blyde River. The current impact is illustrated in **Figure 30**.

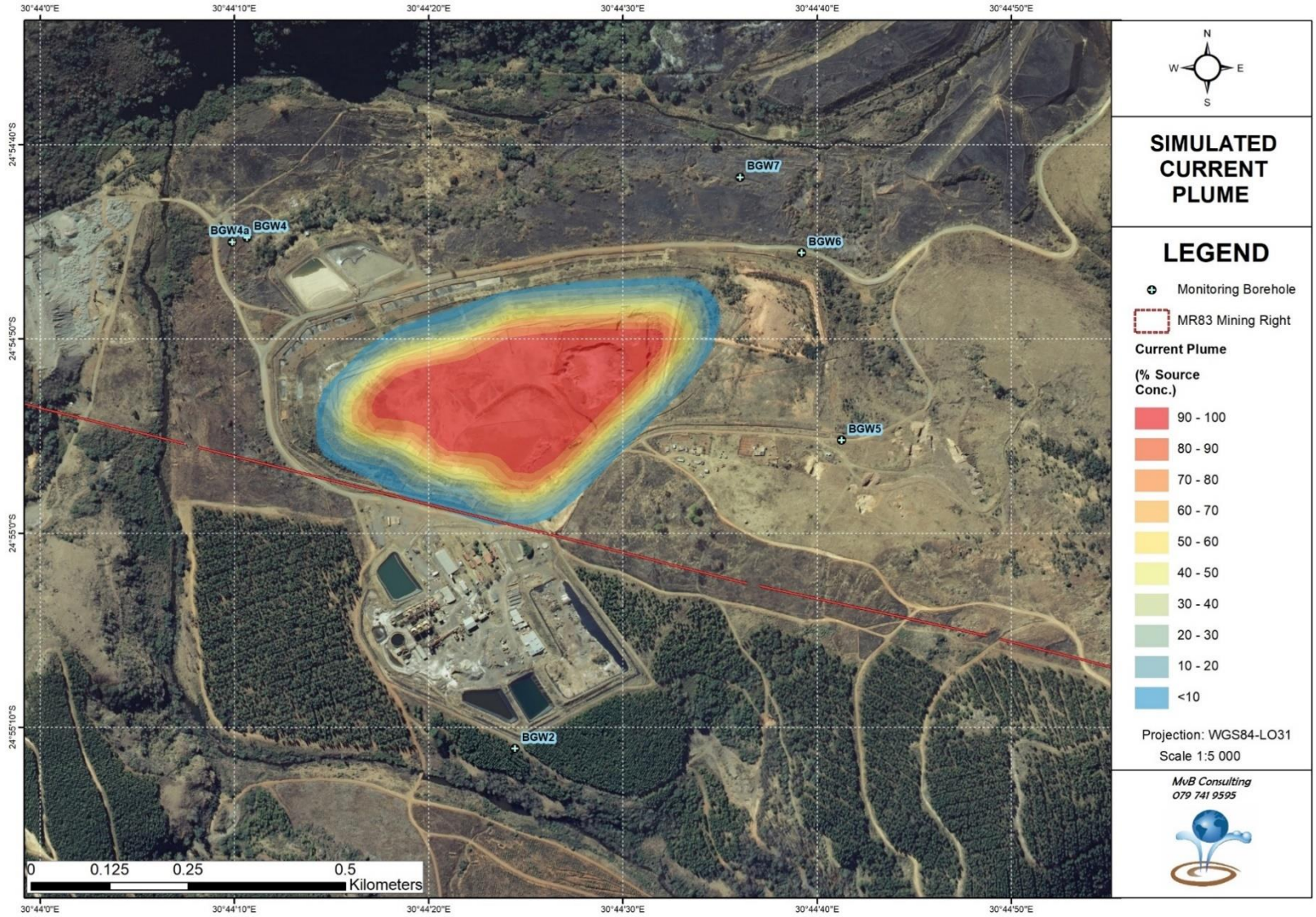

Figure 30: Simulated Current Impact from the TSF (MvB Consulting, 2021)

10.9 BIODIVERSITY

Scientific Terrestrial Services (STS) and SAS were commissioned to undertake the Terrestrial and Aquatic Ecological assessments respectively as part of the scoping and pre-feasibility studies, to identify risks to the proposed projects and to guide the development of a project layout for further assessment of risk. The baseline reports are attached to this report as ANNEXURE J and ANNEXURE K respectively.

The aim of the studies was to identify preliminary areas of increased sensitivity or importance within the development areas that could place constraints on the planned underground mining activities, and on the associated surface infrastructure required to support underground mining, so as to determine if there are any major flaws with regards to sensitive habitat and Species of Conservation Concern (SCC). The report includes a detailed desktop study highlighting the Ecological Importance and Sensitivity (EIS) of the areas based on all relevant national and provincial databases, including the Mpumalanga Biodiversity Sector Plan (2019) and all available biodiversity databases provided on the Biodiversity Geographic Information Systems (BGIS) website (STS, 2021).

The layout and sensitivity maps for the various sites are shown in Figure 31 to Figure 34.

A brief walk through (scan of the area) was undertaken from 19 to 22 April 2021 at Frankfort, Morgenzon and Beta North[52], with Dukes visited on 28 September 2021. The physical scan of these sites aimed to verify the desktop data and background research.

10.9.1 TERRESTRIAL ECOLOGY

The following section contains data accessed as part of the desktop assessment and is presented as a “dashboard” report. Taken from the STS Scoping Phase Biodiversity report (2021).

Note that the maps in this section were taken from the STS scoping phase biodiversity report (2021).

[52] Beta North is referred to as Theta in the STS and SAS reports

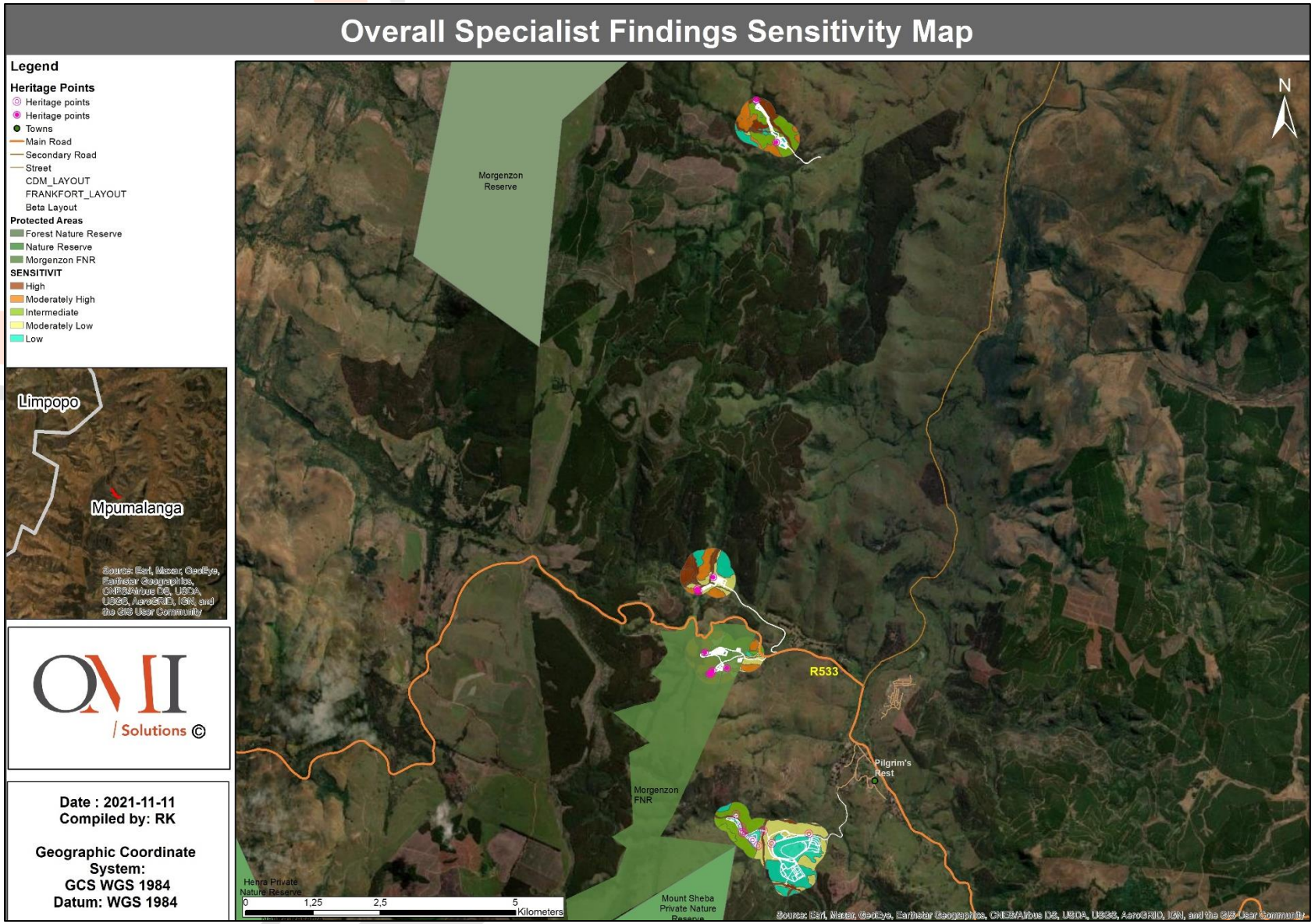

Figure 31: Overall Layout and Sensitivity Map

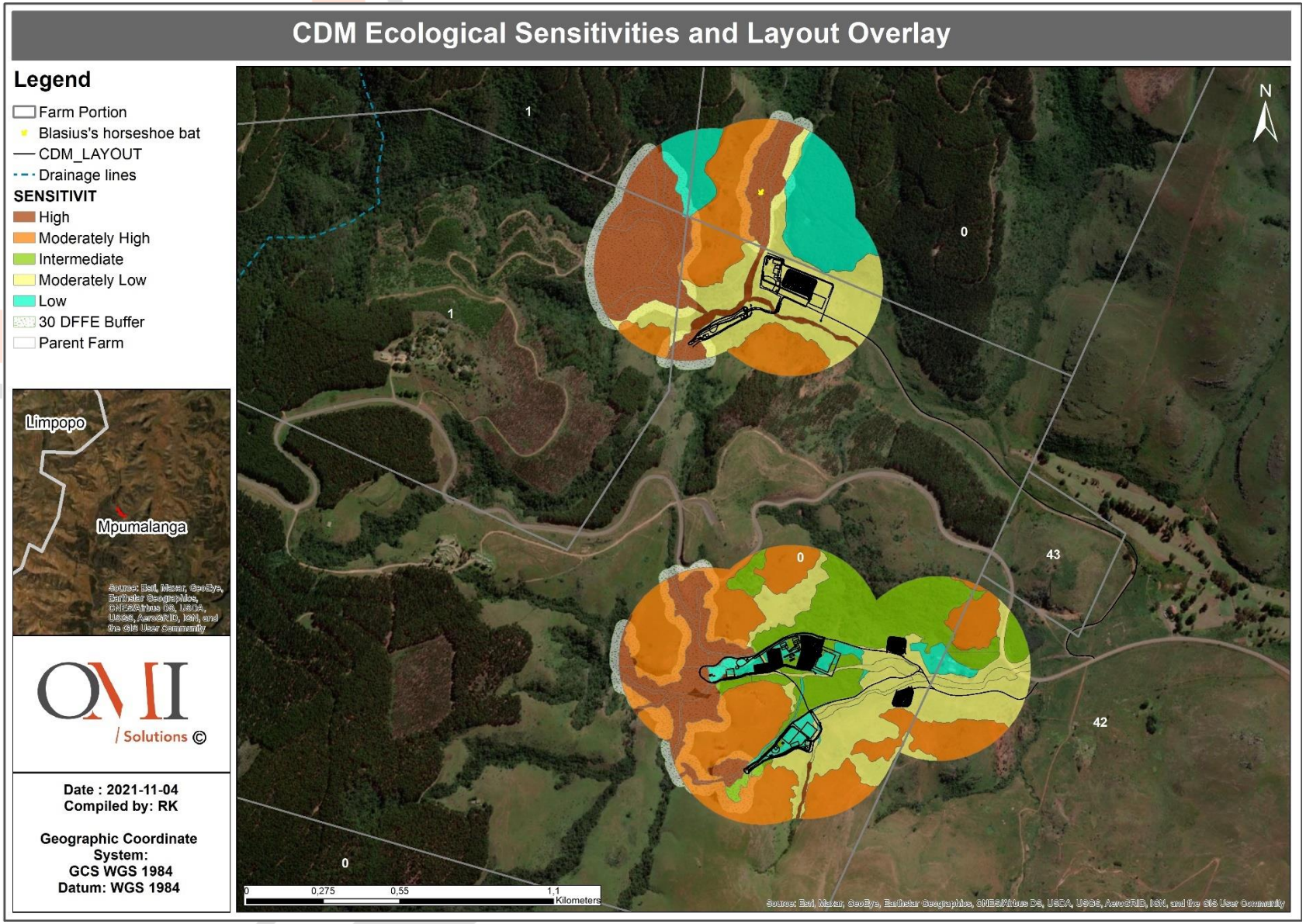

Figure 32: Layout and Sensitivity Map CDM

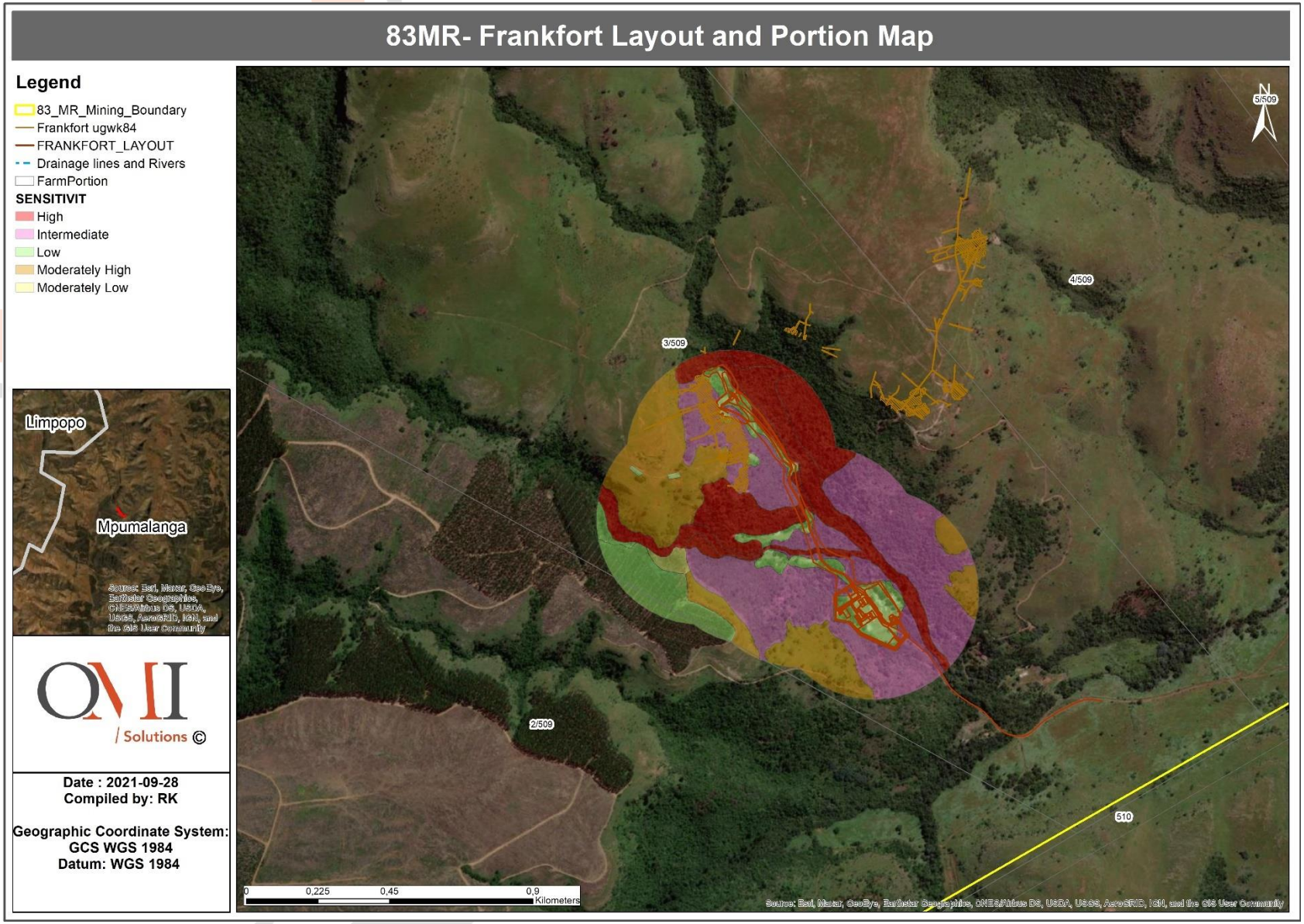

Figure 33: Layout and Sensitivity Map Frankfort

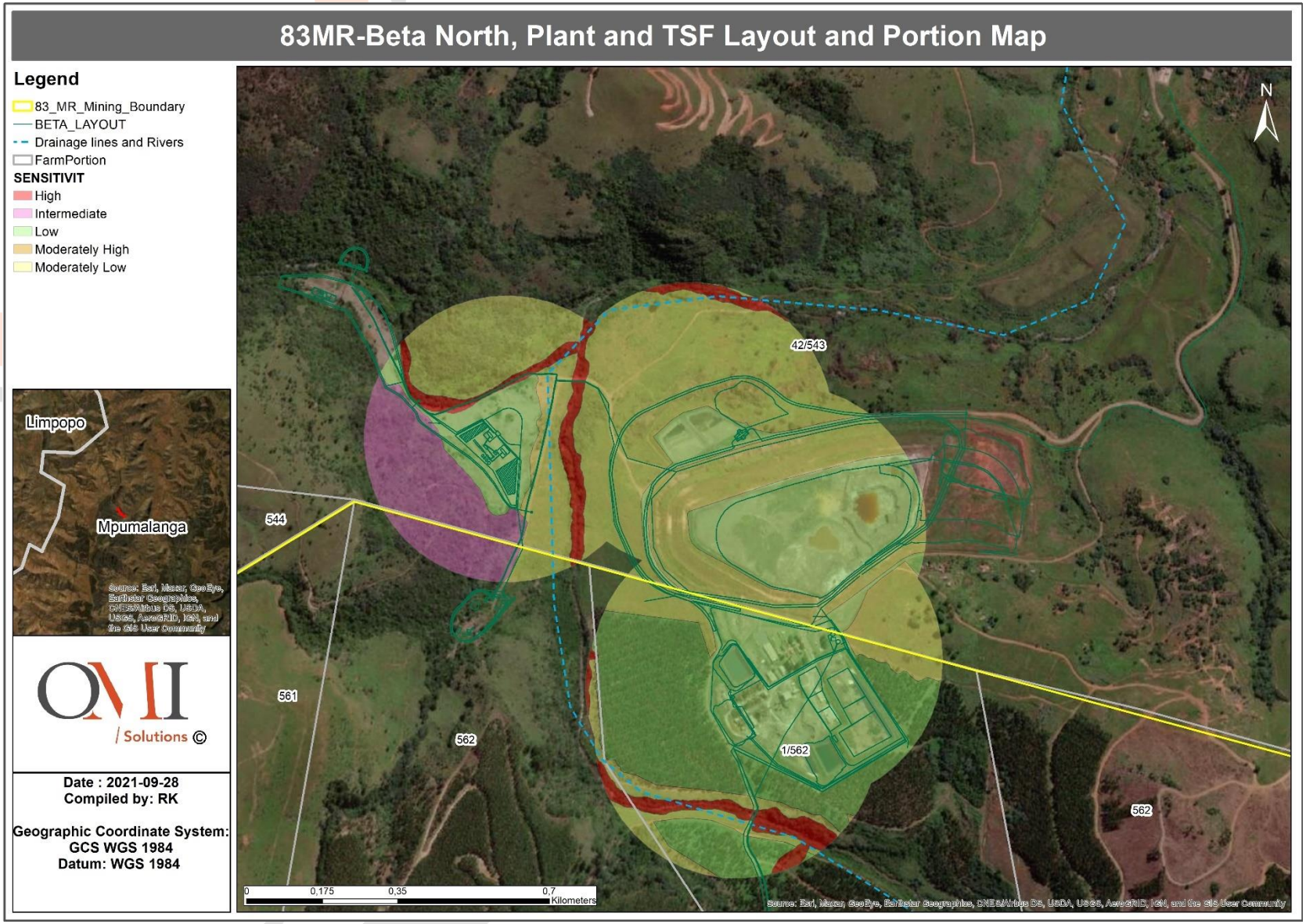

Figure 34: Layout and Sensitivity Map Beta, Plant and TSF

Table 18: Summary of the Vegetation Characteristics Associated with the 83 MR UG Areas (QDS 2430DC) [53]

DETAILS OF THE 83 MR UG AREAS IN TERMS OF MUCINA & RUTHERFORD (SANBI, 2018c)			
Biome(s) and Bioregion(s) (Figure 4)	The biome associated with the 83 MR UG areas is the Grassland Biome (corresponding with the Mesic Highveld Grassland Bioregion), with small sections of Dukes, Frankfort and Morgenzon traversed by the Forest Biome (corresponding to the Zonal and Interzonal Forests Bioregion).		
Vegetation Type(s)	Four vegetation types are associated with the 83 MR UG areas; however, the **Northern Escarpment Dolomite Grassland** and the **Long Tom Pass Montane Grassland** make up the largest of the vegetation types associated with the project. Smaller sections of Dukes, Frankfort and Morgenzon are traversed by the **Northern Mistbelt Forest** (**Figure 35**). More specifically, the following vegetation types are associated with each of the 83 MR UG areas: • Dukes: The western section of Dukes lies within both the Long Tom Pass Montane Grassland and the Northern Mistbelt Forest vegetation types, with the eastern section occurring within the Northern Escarpment Dolomite Grassland. • Frankfort: A small section in the western section falls in the Long Tom Pass Montane Grassland, with a small portion of the northern section falling in Northern Mistbelt Forest. The central and eastern sections lie in the Northern Escarpment Dolomite Grassland. • Morgenzon: The western section is classified as Northern Mistbelt Forest, with the central sections lying in the Long Tom Pass Montane Grassland, and the eastern section within the Northern Escarpment Dolomite Grassland. • Beta North: Entire extent falls within the Northern Escarpment Dolomite Grassland. The **Northern Escarpment Dolomite Grassland** and the **Long Tom Pass Montane Grassland** are endemic to South Africa, with the **Northern Mistbelt Forest** likely being endemic to South Africa, Lesotho and Eswatini.		
DESCRIPTION OF THE VEGETATION TYPE(S) RELEVANT TO THE 83 MR UG AREAS (MUCINA & RUTHERFORD 2006)			
Vegetation Type	**Gm 31 Long Tom Pass Montane Grassland**	**Gm 22 Northern Escarpment Dolomite Grassland**	**FOz 4 Northern Mistbelt Forest**
Altitude (m)	1,500 m – 1,650 m	1,000–1,620 m	1,050 to1,650 m
Distribution	Occurs along the escarpment east of Lydenburg, from Morgenzon Reserve just north of Crystal Springs Mountain Lodge,	Mpumalanga Province: From the high-lying dolomite grasslands of the Abel Erasmus Pass and Motlatse (Blyde) River (Vaalhoek) areas in the north, it extends southwards in	Limpopo and Mpumalanga as well as in Swaziland: Occurring along the Soutpansberg from Blouberg in the northwest to the Samandou Plateau in the

[53] Adapted from STS, 2021

	Pilgrim's Rest, southwards to Schoemanskloof.	a broad dolomite band along the Northern Escarpment, to as far south as the vicinity of Kaapsehoop.	northeast and further southwards (along the Northern Escarpment) from Abel Erasmus Pass (Olifants River) to the surroundings of Badplaas and Barberton.
Geology, Soils & Hydrology	The geology forms part of the Pretoria Group, which predominantly consists of shale and quartzite in the Rooihoogte, Timeball Hill and Boshoek Formations, and the distinctive volcanic elements of the Hekpoort Andesite Formations which are on the summits of the highest lying areas.	Malmani dolomites of the Chuniespoort Group (Transvaal Supergroup) which overlies the Black Reef Quartzite Formation. Soils usually have a high pH, are rich in calcium and magnesium, and with low phosphorus status. Deep Hutton and Griffin soil forms are common.	Highly weathered, clayey soils mainly of Avalon and Hutton soil forms, derived from shales (Pretoria Group), quartzite (Black Reef Formation), dolomite (Chuniespoort Group), granite (Nelspruit Basement) and diabase (Mokolian intrusives).
Conservation	Listed as Vulnerable (VU) in Mucina and Rutherford (2006) but listed as Near Threatened (NT) in the updated 2018 Final Vegetation Map of South Africa, Lesotho, and Swaziland. As much as 60.1% of this unit is still natural whilst a large proportion of it has been afforested (39%) or cultivated (0.6%). This unit is well protected and its target of 27% has been met in the current reserve network. However gold mining is still a threat as this unit contains a few current gold mines and many abandoned shafts and mine dumps.	Listed as Endangered (EN) in Mucina and Rutherford (2006) but listed as Vulnerable (VU) in the updated 2018 Final Vegetation Map of South Africa, Lesotho, and Swaziland. Conservation target 27%. Only 2% protected within the Blyde River Canyon National Park, but larger portion protected in private Driekop Caves and London heritage sites in the north and in the Mooifontein and Mondi Cycad Reserve heritage sites in the south. More than half of this unit has been transformed (52%), mainly by plantations (47%) and cultivated lands (5%). Erosion potential very low (17%), low (51%) and moderate (28%).	Least threatened (LC). Conservation target 30%. About 10% statutorily conserved in Blyde River Canyon, Lekgalameetse, Songimvelo, Makobulaan, Malalotja, Nelshoogte, Barberton, and Starvation Creek Nature Reserves. More than 25% enjoys protection in privately owned nature reserves, including for instance Wolkberg Wilderness Area, In-De-Diepte, Sudwala, Mac Mac, Buffelskloof, Mount Sheba etc. Below the escarpment between Mariepskop and Graskop, the natural forest has expanded into former grassland areas due to the protection of the timber plantations against fire.
Vegetation & landscape features	The landscape has a diverse physiography, which includes subalpine peaks, level terraces and rolling plains in the higher lying areas with steep mountain slopes. The highest point is Mount Anderson (2280 m), occurring just north of Long Tom Pass.	Very species-rich grasslands that occur along the Escarpment dolomite belt. The grasslands are characterised by a very diverse shrub layer which varies in height and density. The herbaceous component	Tall, evergreen afrotemperate mistbelt forests occurring primarily in east-facing fire refugia such as subridge scarps and moist sheltered kloofs where they form small, fragmented patches.

		becomes more dense northwards as the climate becomes drier.	

Table 19: Summary of the Terrestrial Conservation Characteristics for the 83 MR UG Areas (QDS 2430DC) (Adapted from STS, 2021)

CONSERVATION DETAILS PERTAINING TO THE 83 MR UG AREAS (VARIOUS DATABASES)			
National Biodiversity Assessment (NBA, 2018) **(Figure 36)**	Three Vegetation type remnants are associated with the 83 MR UG areas. Dukes, Frankfort and Morgenzon all lie within the remaining extents of the Long Tom Pass Montane Grassland (NT; well protected), Northern Escarpment Dolomite Grassland (VU; poorly protected), and the Northern Mistbelt Forest (LC; well protected). Beta North only lies in the remaining extent of the Northern Escarpment Dolomite Grassland. Ecosystem types are categorised as “not protected”, “poorly protected”, “moderately protected” and “well-protected” based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act, 2003 (Act No. 57 of 2003), and compared with the biodiversity target for that ecosystem type. The ecosystem protection level status is assigned using the following criteria: i. If an ecosystem type has more than 100% of its biodiversity target protected in a formal protected area either A or B, it is classified as Well Protected;	**National Threatened Ecosystems (2011) (GN 1002)** **(Figure 37)**	All three 83 MR UG areas partially occur within the **Endangered Malmani Kartslands** threatened ecosystem. The Malmani Karstlands endangered ecosystem (GN 1002 of the 9th of December 2011) is gazetted based on **Criterion F,** which identifies priority areas for meeting explicit biodiversity targets as defined by a systematic biodiversity plan. This ecosystem is associated with mountainous karstlands of the Malmanl subgroup, together with the presence of karstland endemic taxa and threatened species. Key biodiversity features associated with this ecosystem include: • **Five mammal species**, namely the Rough-haired Golden Mole, Meester's Golden Mole, Short-eared Trident Bat, Natal Long-fingered Bat and Oribi; • **Six bird species** including Blue Crane, Blue Swallow, Grey Crowned Crane, Striped Flufftail, Southern Ground Hornbill and Wattled Crane; • **Three reptile species** for example Bradypodion transvaalense and Lamprophis swazicus; • **Seven vegetation types**, namely the Northern Escarpment Dolomite Grassland, Poung Dolomite Mountain Bushveld, Ohrigstad Mountain Bushveld,

	ii. When less than 100% of the biodiversity target is met in formal A or B protected areas it is classified it as Moderately Protected; iii. If less than 50% of the biodiversity target is met, it is classified it as Poorly Protected; and iv. If less than 5% of the target, it is Hardly Protected.		Long Tom Pass Montane Grassland, Lydenburg Thornveld, Mpumalanga Afromontane Forest and Northern Escarpment Quartzite Sourveld; and • **Five plant species**, namely Aloe fouriei, Gladiolus vernus, Gladiolus macneilii, Ocotea kenyensis, Sensitive species 738.
SAPAD (2020, Q3); SACAD (2020, Q3); NPAES (2010); IBA (2015); and SWSA (2017).	The NPAES (2010)[54], SACAD[55] (2020, Q3), SAPAD [56](2020, Q3), Important Bird and Biodiversity Areas (IBA, 2015) and the Surface water Strategic Water Source Areas (SWSAs, 2017) databases indicate several protected and conservation areas within 10 km of the 83 MR UG Areas. • NPAES (2010) Formal Protected Areas (**Figure 38**): o Morgenzon Reserve; Motlatse Canyon Provincial Nature Reserve (NR), Ohrigstad Dam NR, and Tweefontein Reserve. • NPAES (2010) Informal Protected Areas (**Figure 38**): o Mount Anderson Catchment NR • NPAES (2010) Focus Areas (**Figure 39**): o Frankfort is within the **Northeast Escarpment Focus Area**, with Morgenzon within 5 km of this focus area and Dukes and Beta North within 10 km of this focus area. The Northeast Escarpment focus area is an extremely diverse area important for ecological processes and resilience to climate change. It is an important Grassland centre of endemism and includes opportunities for protecting intact river reaches with threatened river types. There are excellent opportunities for expanding the Lekgalameetse, Wolkberg and Blyde Canyon Reserves (National Protected Area Expansion Strategy document for South Africa 2008). • SAPAD (2020, Q3) Protected Areas (**Figure 38**):		

[54] Protected areas are areas of land or sea that are formally protected by law and managed mainly for biodiversity conservation. Protected areas recognised in the National Environmental Management: Protected Areas Act (Act 57 of 2003) are considered formal protected areas in the NPAES. It is important to differentiate protected areas from conservation areas. Conservation areas are areas of land not formally protected by law but informally protected by the current owners and users and managed at least partly for biodiversity conservation. Because there is no long-term security associated with conservation areas, they are not considered a strong form of protection. Conservation areas are not a major focus of the NPAES.

[55] SACAD (2020): The types of conservation areas that are currently included in the database are the following: 1. Biosphere reserves, 2. Ramsar sites, 3. Stewardship agreements (other than nature reserves and protected environments), 4. Botanical gardens, 5. Transfrontier conservation areas, 6. Transfrontier parks, 7. Military conservation areas and 8. Conservancies.

[56] SAPAD (2020): The definition of protected areas follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the “System of Protected Areas”, which consists of the following kinds of protected areas - 1. Special nature reserves; 2. National parks; 3. Nature reserves; 4. Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003); 5. World heritage sites declared in terms of the World Heritage Convention Act; 6. Marine protected areas declared in terms of the Marine Living Resources Act; 7. Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and 8. Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

	○ Blyderivierspoort NR; Henra Private NR; Mac Mac Reserve; Mount Anderson Catchment NR; Mount Sheba Private NR; Morgenzon Reserve; Ohrigstad Dam NR, and Tweefontein Reserve. • **Newly promulgated Morgenzon Forest Nature Reserve** (to be added to the SAPAD dataset with its next update) – GN 1062, Gazette number 45345, dated 19 October 2021 as it pertains to the National Forests Act (84/1998): Declaration of certain State Forests Properties in Mpumalanga Province as Forest Nature Reserves under Sec 8(1) and 9. • SACAD (2020, Q3) Conservation Areas (**Figure 39**): ○ The entire extent of the 83 MR UG area is in the Kruger to Canyons Biosphere Reserve. • SWSA (2017) (**Figure 40**): ○ The entire extent of the 83 MR UG areas is in the Mpumalanga Drakensberg SWSA. Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size. They include transboundary areas that extend into Lesotho and Swaziland. The sub-national Water Source Areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage. • IBA (2015) (**Figure 40**): ○ The 83 MR UG areas are within 5 km of the **Blyde River Canyon IBA**. This is the only site in South Africa that supports breeding *Falco fasciinucha*. At least one pair inhabits the gorges and there is potential habitat for several more birds. The cliffs at Manoutsa hold over 660 pairs of *Gyps coprotheres*, making it the world's fourth-largest colony. The gorges also hold breeding *Ciconia nigra, Falco peregrinus* and *Bubo capensis*. The surrounding grassland supports *Turnix hottentotta, Sarothrura affinis, Saxicola bifasciata, Neotis denhami, Grus paradisea, Bucorvus cafer, Tyto capensis* and *Geronticus calvus*, which breed within the reserve along the cliff gorges. The proteoid hillslopes hold *Promerops gurneyi*. The forest and forest edge support *Stephanoaetus coronatus, Buteo oreophilus, Lioptilus nigricapillus, Tauraco corythaix, Bradypterus barratti, Telophorus olivaceus, Cossypha dichroa, Cercotrichas signata, Estrilda melanotis* and *Serinus scotops*. • Additionally, the Mpumalanga Tourism and Parks Agency (MTPA) provides a database with provincially protected areas, much of which overlap with areas identified in the SAPAD and NPAES databases. The list includes the following provincially protected areas (**Figure 41**): ○ Blyde River Canyon NR ○ Graskop Grasslands Unique Community ○ Hartebeesvlakte Reserve ○ Henra Private NR ○ Mac Mac Reserve ○ Mariepskop Conservation Area ○ Morgenzon Reserve

	○ Mount Anderson Catchment NR ○ Mount Sheba Private NR ○ Ohrigstad Dam NR ○ Tweefontein Reserve		
MPUMALANGA BIODIVERSITY SECTOR PLAN (2019) TERRESTRIAL DATABASE			
CBA Irreplaceable **(Figure 42)**	Dukes is entirely located in an I**rreplaceable CBA**, with the southern section of Morgenzon and the northern section of Beta also within an Irreplaceable CBA. These are areas required to meet targets and with irreplaceability values of more than 80%; Critical linkages or pinch-points in the landscape that **must remain natural**; and often include Critically Endangered Ecosystems, or hosts species of conservation concern. Primary Objective: Maintain in a natural state with no loss of ecosystems, functionality, or species; no flexibility in land-use options.	**CBA Optimal** **(Figure 42)**	The north-western section of Frankfort is within an **Optimal CBA**. None of the other 83 MR UG areas occur in these CBAs. The CBA Optimal Areas (previously called 'important and necessary' in the Mpumalanga Biodiversity Conservation Plan - MBCP) are the areas optimally located to meet both the various biodiversity targets and other criteria defined in the analysis. Although these areas are not 'irreplaceable' they are the most efficient land configuration to meet all biodiversity targets and design criteria. Primary Objective: Maintain in a natural state with no loss of ecosystems, functionality, or species; some flexibility in land-use options.

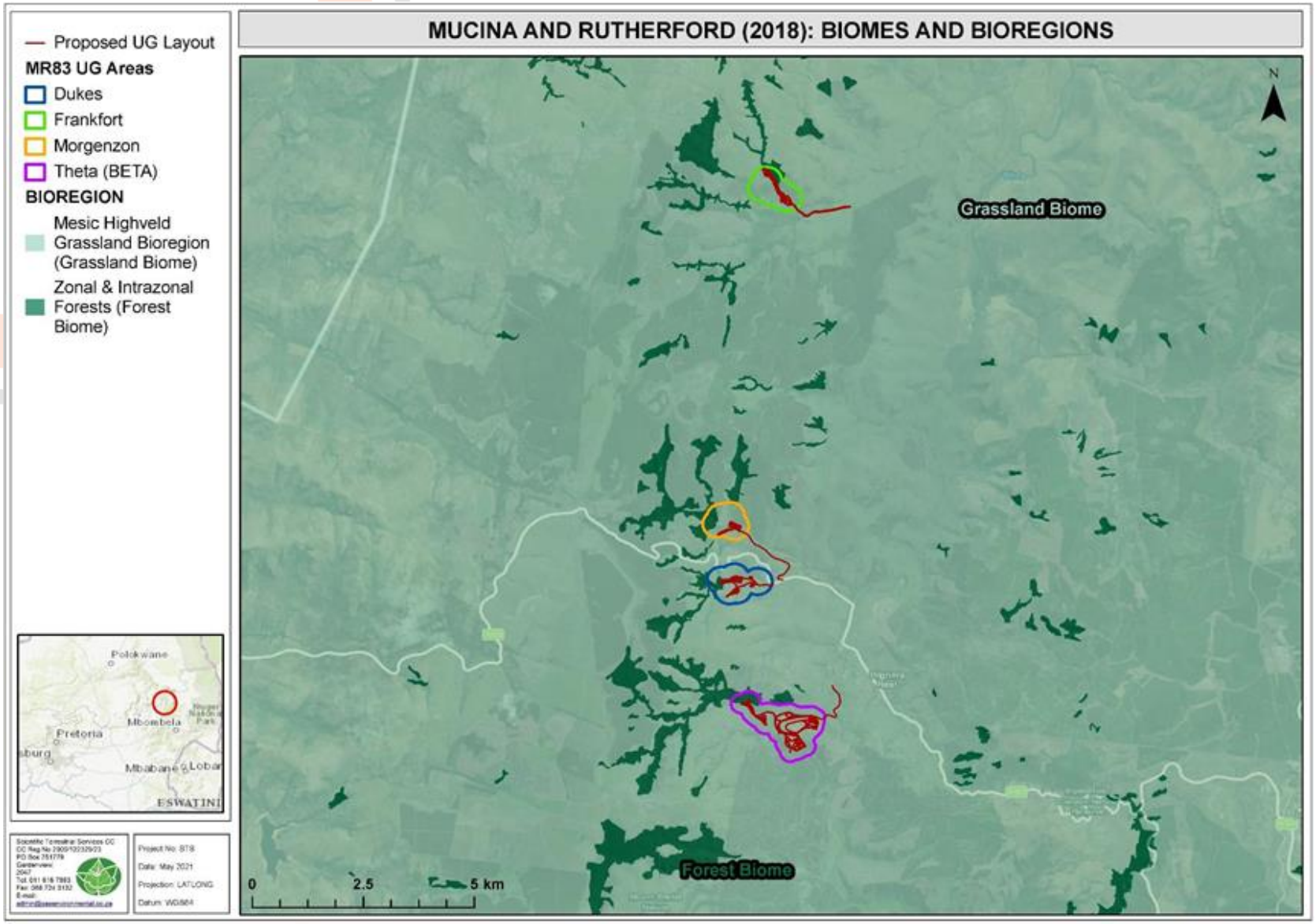

Figure 35: Biomes and Bioregions Associated with MR83 UG Areas (Mucina and Rutherford, 2018 Database)

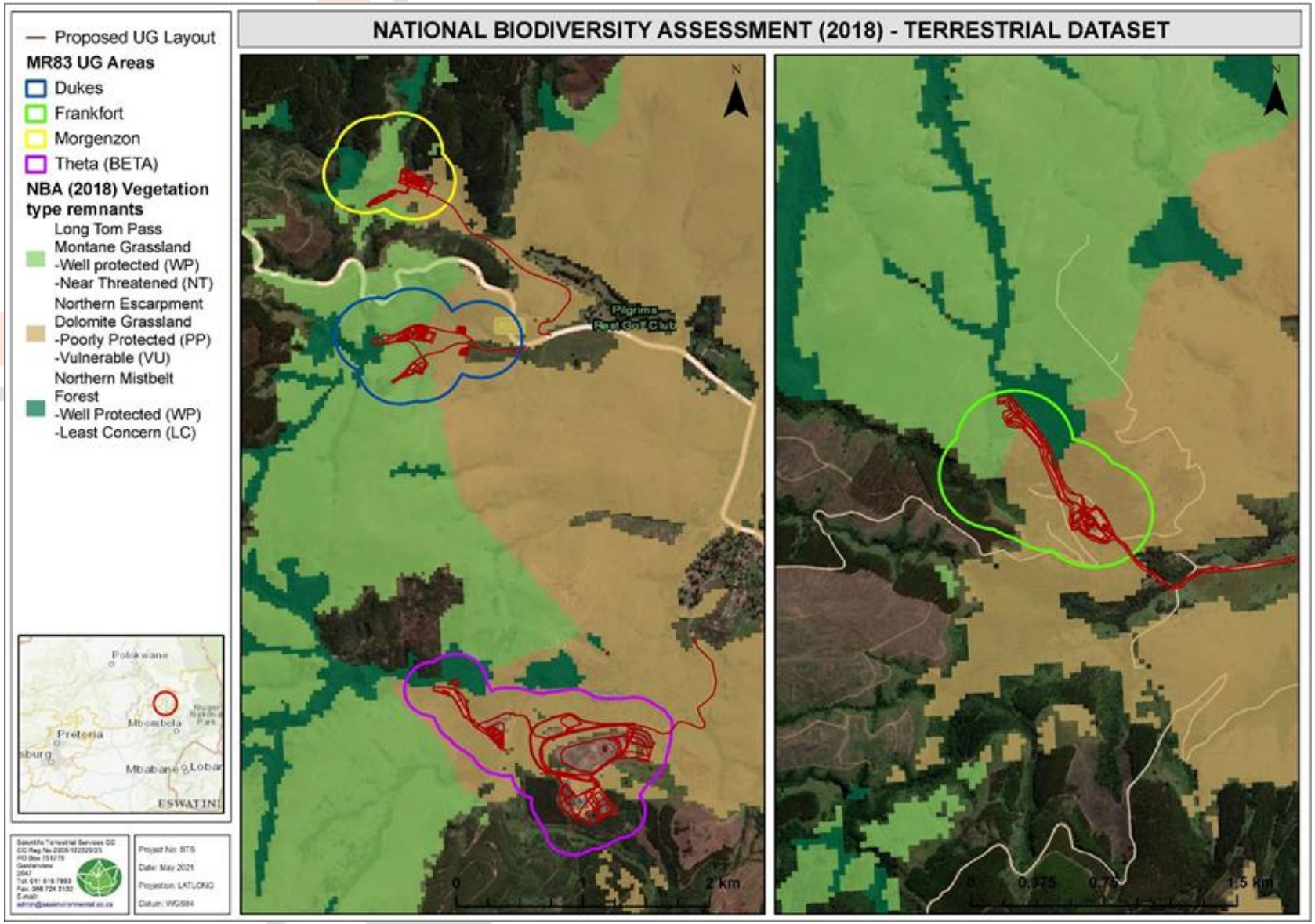

Figure 36: Remaining Extent of Ecosystems Associated with MR83 UG Areas (NBA, 2018)

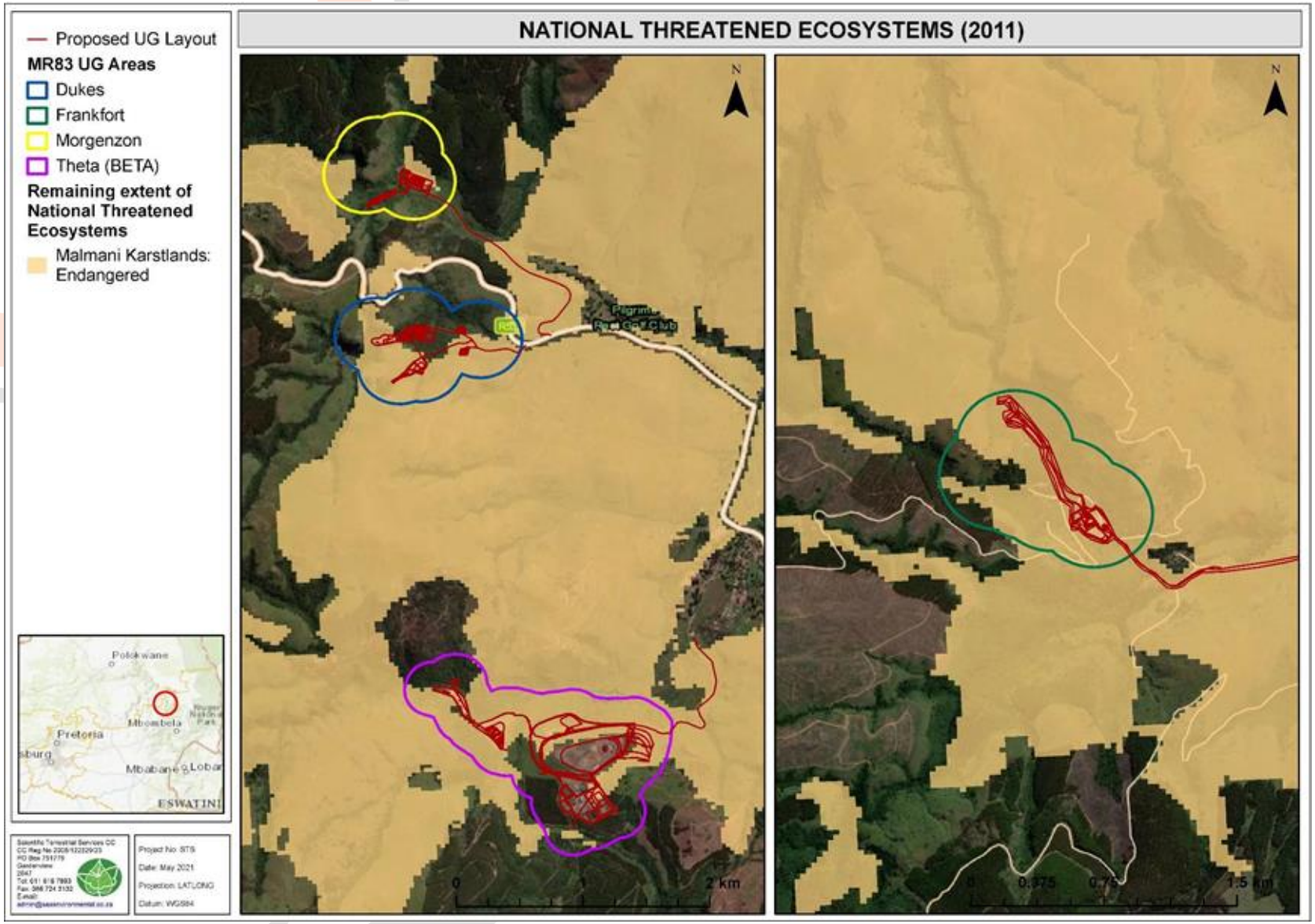

Figure 37: Remaining Extent of Threatened Ecosystems Associated with MR83 UG Areas - National Threatened Ecosystems Database (2011)

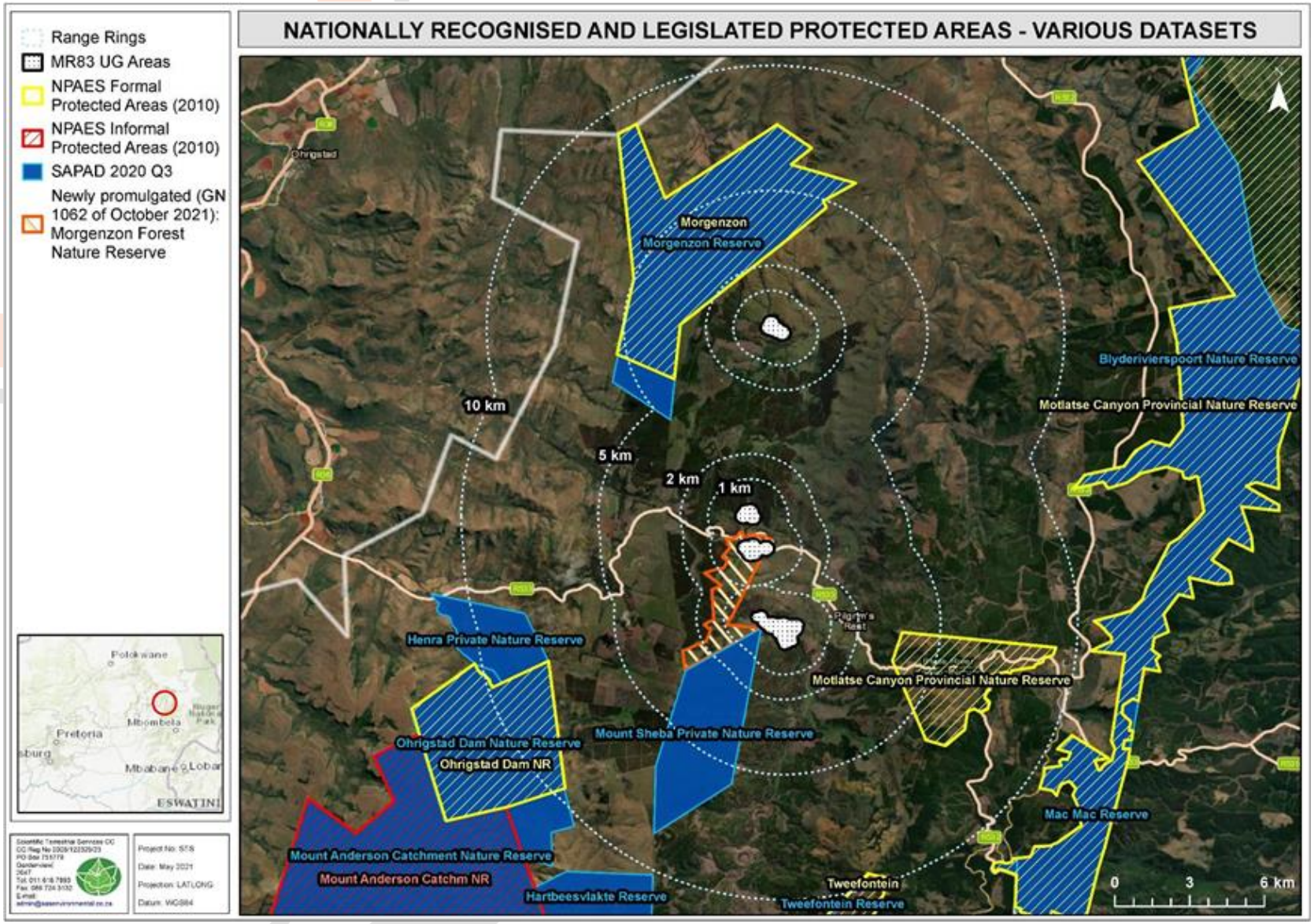

Figure 38: National Protected Areas in Close Proximity (within 10 km) to MR83 UG Areas (SAPAD, 2020 and NPAES, 2010)

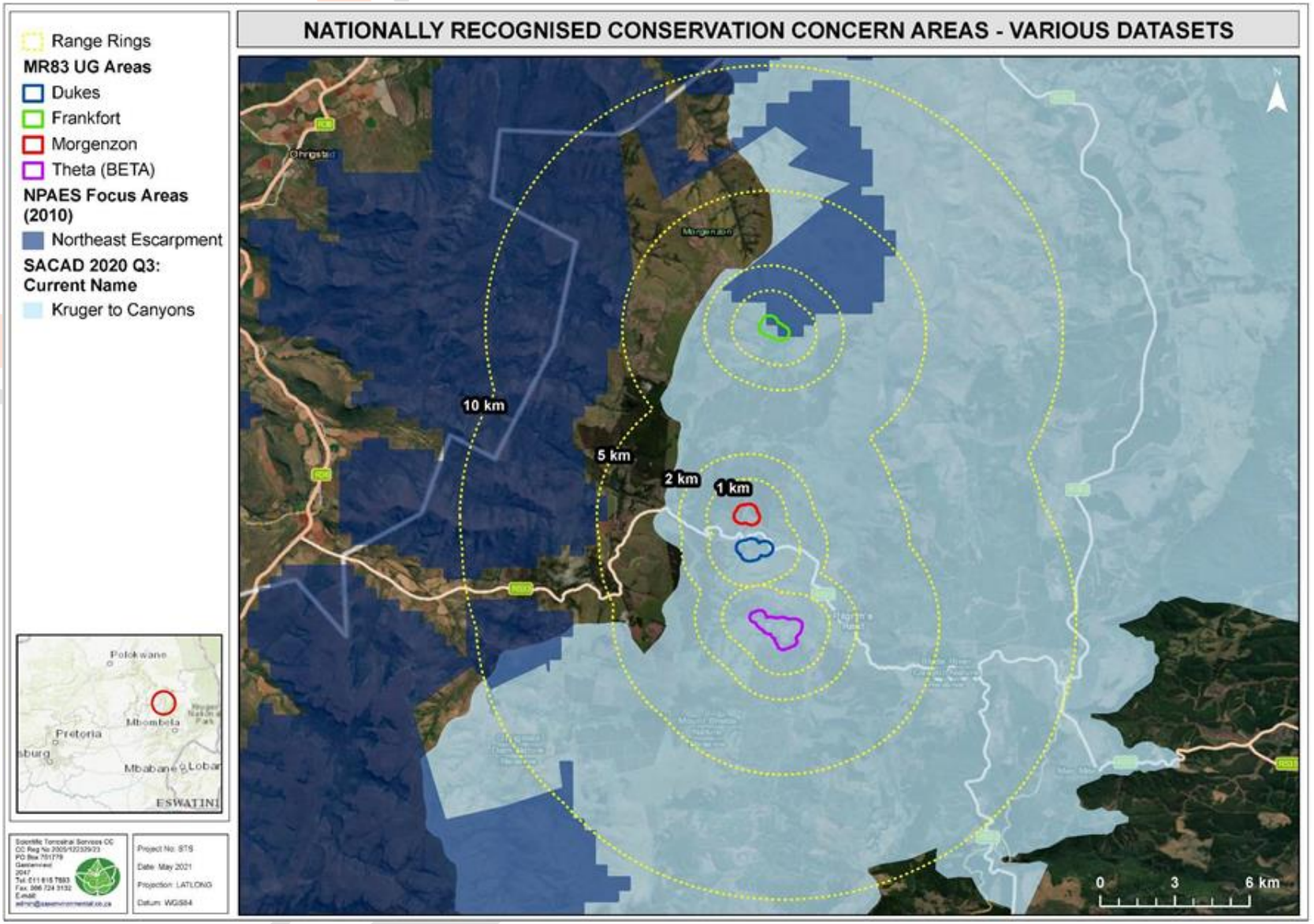

Figure 39: National Conservation Areas in Close Proximity (within 10 km) to MR83 UG Areas (NPAES, 2010 SACAD, 2020)

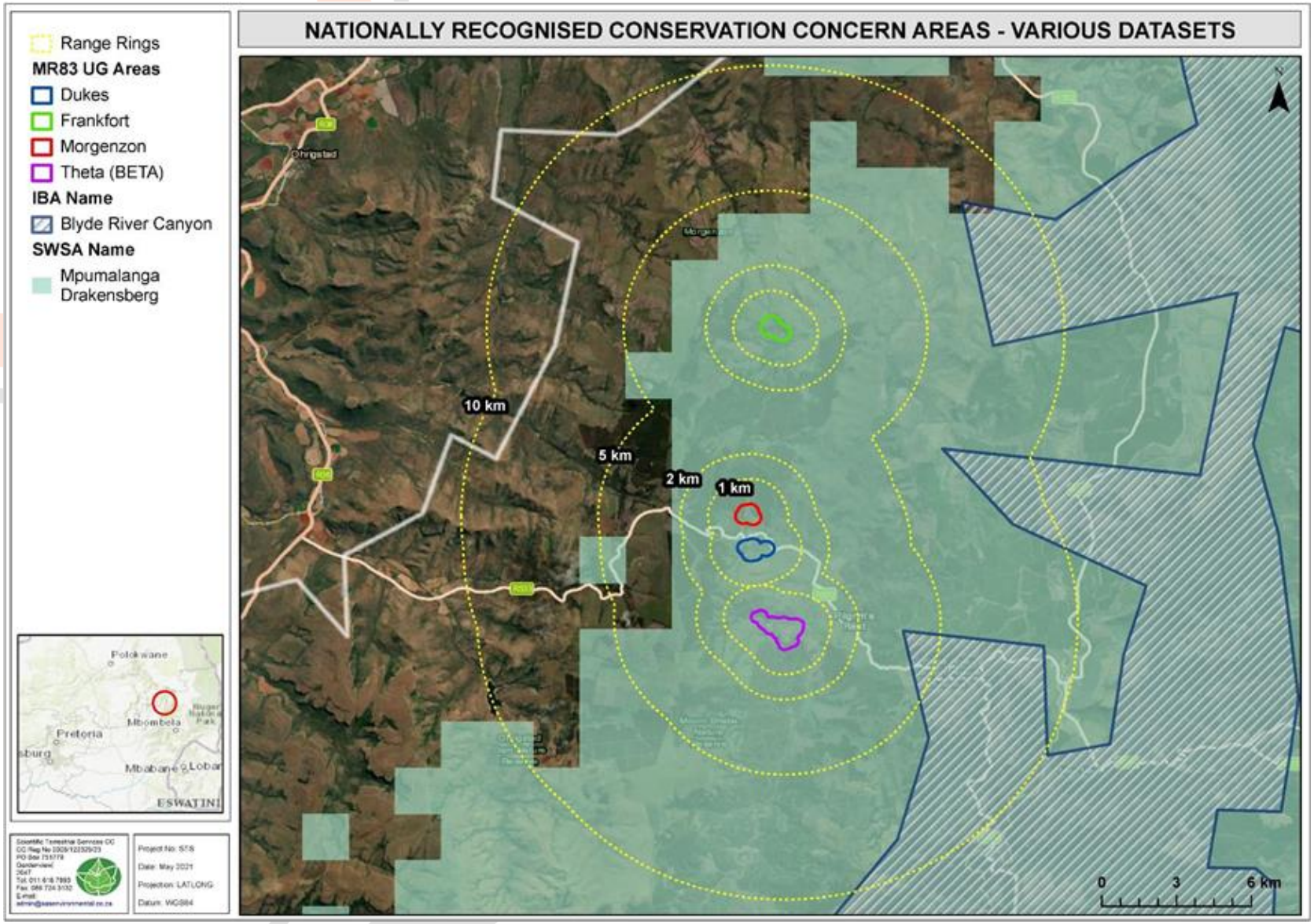

Figure 40: National Conservation Areas in Close Proximity (within 10 km) to MR83 UG Areas (IBA, 2015 and SWSA, 2017)

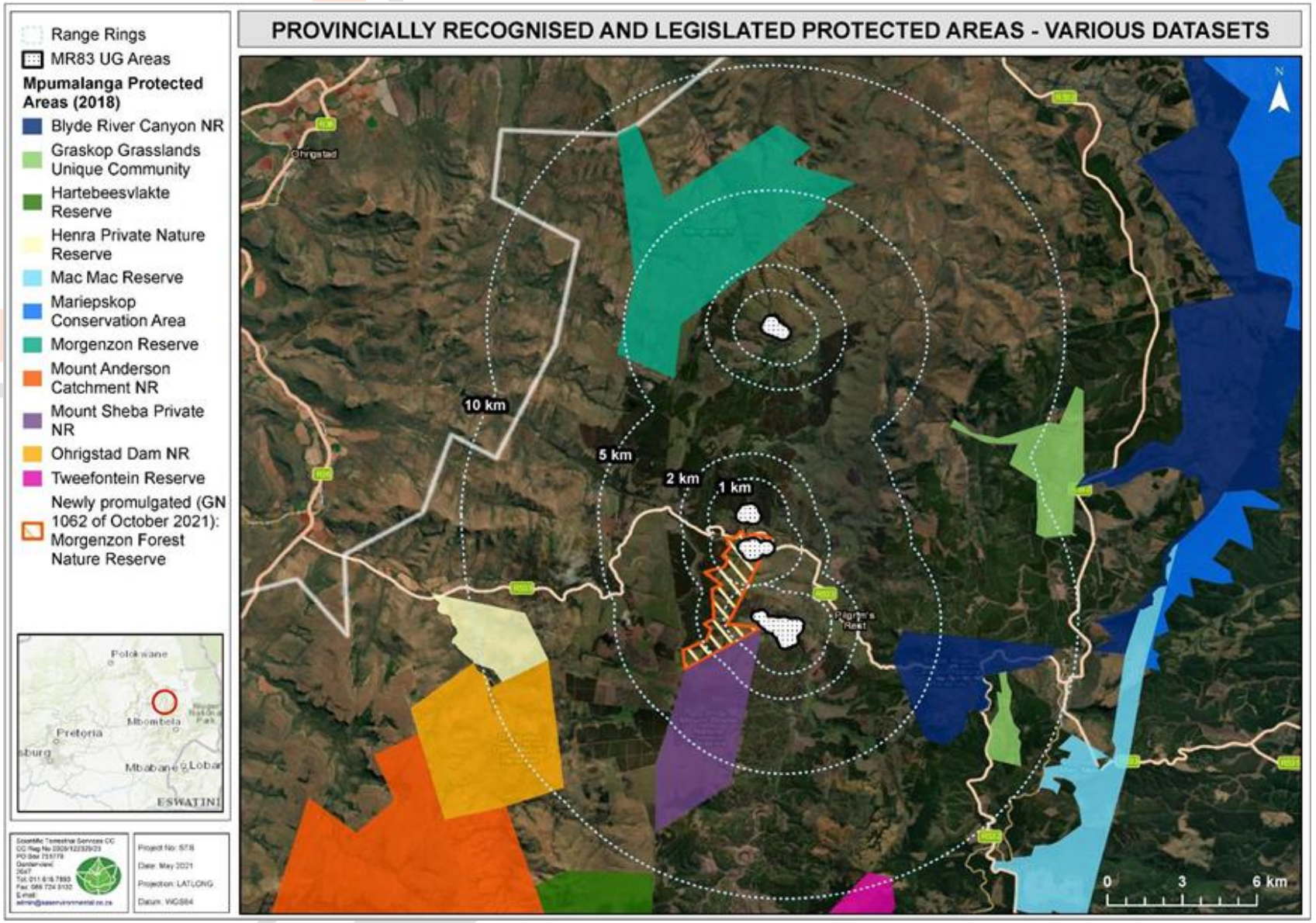

Figure 41: Provincial Protected Areas in Relation to MR83 UG Areas (MTPA, 2018)

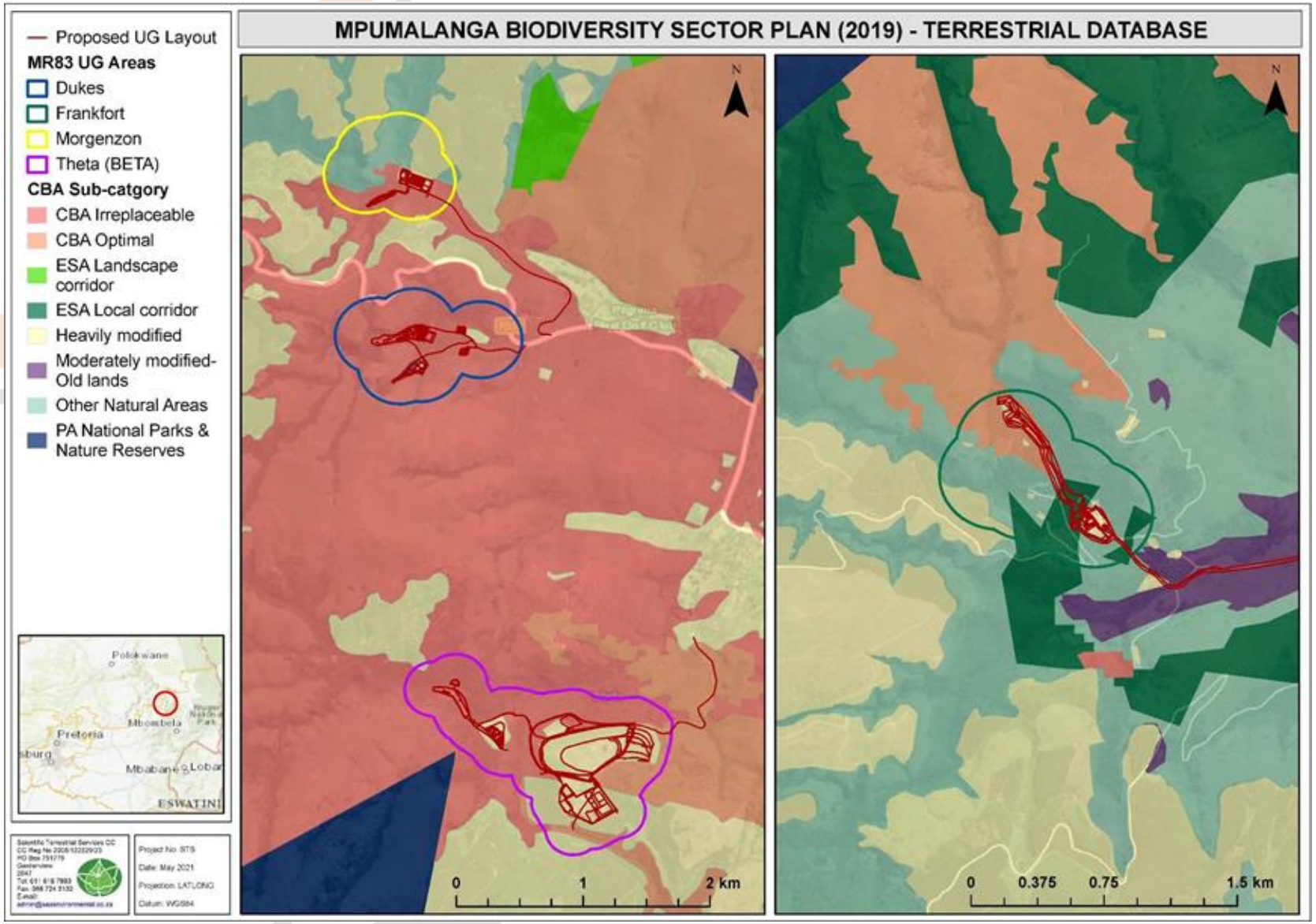

Figure 42: The MR83 UG Areas in relation to CBAs (CBA Irreplaceable and Optimal) (Mpumalanga Biodiversity Sector Plan, 2019)

10.9.2 AQUATIC ECOLOGY[57]

SAS concluded in their assessment of the aquatic ecology of the project area (SAS, 2021 (b)), that:

- Beta, Frankfort, and Dukes:
  - Project areas are not fatally flawed;
  - Cognisance must be taken of the very high level of sensitivity of the general environment, the very high level of ecological importance and sensitivity of the Blyde River, and the regional and national importance of the Blyde River.
- Morgenzon:
  - Very high sensitivity area;
  - The complex nature of the landscape will require very careful planning of the proposed mining project prevent any significant impact on this unique and very sensitive receiving environment throughout the life cycle of the mine.
- The mine will need to ensure practically, and demonstrate through the EIA and WULA process, a high level of Duty of Care of this receiving environment.

At this time, delineation of watercourse extents are based on high level ground truthing. This is confounded by the trees growing in the kloofs which makes differentiation between forest habitat and riparian habitat difficult. In addition, many areas had limited access due to terrain and due to safety concerns with the artisanal miners (particularly in the Dukes area). The mapped extent of watercourses must thus be considered with caution and further refinement must take place in the EIA phase of the project and the detailed design once the final detailed delineations are available.

Data accessed as part of the desktop assessment is presented in **Table 20**.

Table 20: Database Review (SAS, 2021 (b))

Acquatic Ecoregion and Sub-regions in which the Study Areas are Located	
Ecoregion	Northern Escarpment Mountains
Catchment	Olifants North
Quaternary Catchment	B60A (Dukes, Morgenzon & Beta), B60B (Frankfort)
WMA	Olifants
SubWMA	Lower Olifants
Dominant characteristics of the Northern Escarpment Mountains Qauatic Ecoregion Level II (10.01) (Kleynhans et al., 2007)	
Dominant primary terrain morphology	Closed hills, mountains; moderate and high relief
Dominant primary vegetation types	Patches Afromontane Forest, North Eastern Mountain Grassland, Sour Lowveld Bushveld.
Altitude (mamsl)	500 to 2100
MAP (mm)	500 to 1000
Coefficient of Variation (% of MAP)	<20 to 29
Rainfall concentration index	55 to 64
Rainfall seasonality	Early to mid-summer

[57] Maps and data shown in this section were taken from Taken from the SAS Freshwater Resource Pre-feasibility Study (2021) (SAS, 2021 (b)).

Mean annual temp. (°C)	10 to 22
Winter temperature (July)	0 – 24 °C
Summer temperature (Feb)	8 – 30 °C
Median annual simulated runoff (mm)	40 to 150; 200 to >250
Detail of Study Area in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) Database	
FEPACODE	The study areas are located within a subWMA currently defined as FEPA catchment. River Freshwater Ecosystem Priority Area (FEPA) achieve biodiversity targets for river ecosystems and threatened fish species and were identified in rivers that are currently in a good condition (A or B ecological category). Although the FEPA status applies to the actual river reach, shading of the whole sub-quaternary catchment reach indicates that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition of the river reach. Furthermore, the river systems are important for Enteromius treurensis (synonym Barbus treurensis) (EN), Amphilius natalensis (DD), Amphilius sp. 'natalensis cf. treur' (DD)
NFEPA Wetlands	According to the NFEPA database there are no wetland features situated within the Dukes and Morgenzon areas, however there is an artificial unchanneled valley bottom wetland located within the Beta area and a natural channelled valley bottom wetland located in the southern portion of the Frankfort area. The channelled valley bottom wetland is considered moderately modified (Class C), and it is classified as a FEPA wetland* considered important for the crane species: Wattled cranes (Bugeranus carunculatus), Grey Crowned cranes (Balearica regulorum) and Blue cranes (Anthropoides paradiseus). The artificial unchanneled valley bottom wetland associated with the Beta area is considered heavily to critically modified (Class Z2).
Wetland Vegetation Type (Figure 43)	The entire Beta area falls within the Mesic Highveld Grassland Group 9 (Least Threatened), while the Frankfort, Dukes and Morgenzon areas fall within both the Mesic Highveld Grassland Group 9 and Mesic Highveld Grassland Group 6 (Least Threatened) (conservation statuses taken from Mbona et al., 2014).
NFEPA Rivers	The Blyde River traverses the Beta area, and is situated approximately 1.9 km, 2.7 km, and 3.6 km east of Dukes, Morgenzon and Frankfort areas respectively. According to the PES 1999 Classification, the Blyde River is moderately modified (Class C), while the NFEPA database classifies the Blyde River as largely natural with few modifications (Class B). The Blyde River is considered a FEPA River, and therefore in terms of the NFEPA Implementation Manual (2011), mining (and/or prospecting) is not considered a compatible land use within 1 km (1000 m) of a riverine buffer around a river FEPA.
Detail of Study Area in terms of the Mpumalanga Biodiversity Sector Plan (MBSP, 2019) (Figure 5 & 6)	
Critical Biodiversity Area (CBA) Rivers	The Blyde River is considered a CBA FEPA River according to the MBSP Database. The MBSP Handbook (2014) stipulates a 1000 m (1 km) buffer for CBA Rivers, which needs to be maintained in a good ecological condition in order to meet biodiversity targets for freshwater ecosystems and threatened invertebrate and fish species. Mining and/or prospecting is not considered a compatible land use within this buffer zone according to the MBSP Handbook (2014). CBA Rivers have a 100 m buffer that needs to be maintained in a good ecological condition in order to meet biodiversity targets for freshwater ecosystems and threatened fish species. According to the Mpumalanga Tourism and Parks Agency, the Blyde River, and specifically the reach which flows through the farm Ponieskranz, is designated as a CBA Aquatic Species due to the occurrence of a Vulnerable damselfly species (order Odonata) as well as various fish species (mentioned above under NFEPA).
Ecological Support Area (ESA): SWSA	The study areas are situated within an ESA considered a SWSA. These areas have high rainfall that produce 50% of Mpumalanga's runoff in only 10% of the surface area, thus

	supporting biodiversity and underpinning regional water security. According to MTPA – Mining in this area is not a supported land-use in these areas.
ESA: Wetlands	The wetland located within the Frankfort Area identified by the NFEPA Database as a FEPA wetland is identified as an ESA Wetland according to the MBSP, and portions of the Blyde River that traverses the Beta area are also classified as ESA Wetlands. These wetlands support the hydrological functioning of rivers, water tables and freshwater biodiversity, as well as providing a host of ecosystem services through the ecological infrastructure that they provide.
ESA: Important Sub-catchments	The majority of the study areas fall within an area considered ESA: Important Sub-catchments, that are associated with river FEPAs and/or Fish Support Areas.
Heavily Modified	The remaining portions of the study areas are considered to be heavily modified. These include all areas currently modified to such an extent that any valuable biodiversity and ecological function has been lost.
National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	
According to the NBA 2018: SAIIAE the artificial unchanneled valley bottom wetland located within the Beta area as identified NFEPA Database, is classified as a dam according to the NBA. The NBA Dataset also identified the natural channelled valley bottom wetland in the Frankfort area. The channelled valley bottom wetland is currently affected by mining activities as such the wetland is heavily to critically modified (Class D/E/F). The portion of the Blyde River traversing the Beta area has an associated floodplain wetland, according to the NBA Dataset, which is currently affected by mining activities and roads, as such it is heavily to critically modified. Since both wetland features are currently affected it indicated that these wetlands are not protected (Ecosystem Protection Level (EPL)) and are therefore considered critically endangered (Ecosystem Threat Status (ETS)). According to the NBA Dataset the Blyde River is moderately modified (Class C), poorly protected (EPL) and Endangered (ETS).	
National Web Based Environmental Screening Tool (2020)	
The screening Tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EIA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitivity areas.	
According to the Screening tool the Dukes and Morgenzon areas have an overall aquatic biodiversity sensitivity of Very High, due to the area being classified as a SWSA and the area being identified as a FEPA catchment. The Beta and Frankfort areas also have a Very High aquatic sensitivity, due to aquatic CBAs, SWSAs, Wetlands and Estuaries and FEPA Catchments. According to the MBSP the study areas fall within an ESA: SWSA, and the Beta area is associated within the Aquatic CBA rivers and ESA Wetlands. Furthermore, the MBSP indicates that the Frankfort area is associated with an ESA Wetland. According to the SWSA Database (2017) the study area falls within the Northern Lowveld Escarpment Surface Water SWSA and the Mpumalanga Drakensberg Groundwater SWSA. Surface water SWSA's are found in areas with high rainfall and produce most of the runoff. The SWSA-sw study identified 22 areas that were significant at the national level and a further nine that are significant at a sub-national level. They are important because they contribute considerably to the overall water supply of the country. These multi-purpose landscapes are key ecological infrastructure assets for South Africa, supporting growth and development needs. The effective protection of surface water SWSA's areas is vital for national security because a lack of water security will compromise national security and human well-being. The SWSAs for groundwater (SWSA-gw) reflect areas that have high groundwater recharge and where the groundwater forms a nationally important resource. The areas are delineated for the purpose of research, and the outcomes are useful to national level planners and decision makers as an indication of the location of strategic groundwater sources and resources. Sub-national WSAs for groundwater were also identified.	
Importance According to the Mining and Biodiversity Guidelines (2013) (Figure 44)	
The entire Beta and Frankfort areas, as well as the majority (95%) of the Dukes areas and small portions of the Morgenzon area fall within areas considered of Highest Biodiversity Importance. The remaining portions of the Dukes and Morgenzon areas fall within the High Biodiversity Important Areas.	

Highest Biodiversity Importance Areas: These areas include critically endangered and endangered ecosystems, CBA's, river and wetland FEPA's and a 1 km buffer around these FEPA's and Ramsar sites. When applying for mining authorisation within highest biodiversity importance areas, environmental screening, environmental impact assessment (EIA and their associated specialist studies should focus on confirming the presence and significance of the abovementioned biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licences, and environmental authorisations. If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these area and the associated ecosystem services.

High Biodiversity Importance Areas: These areas included protected area buffers (including buffers around National Parks, World Heritage Site and Nature Reserves), Transfrontier Conservation Areas (remaining areas outside of formally proclaimed protected areas), other identified priorities from provincial spatial biodiversity plans and high water yield areas, amongst others. These areas are important for conserving biodiversity, for supporting of buffering other biodiversity priority areas, for maintaining important ecosystem services for particular communities or the country as a whole. An environmental impact assessment should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. Mining options may be limited in these areas, and red flags for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.

Ecological Status of the most Proximal Sub-quaternary Reach (DWS, 2014)		
Sub-quaternary Reach	B60A – 00653 (Blyde River)	B60B – 00566 (Blyde River)
Proximity to study areas	Traverses Beta area	Portion of the Blyde River closest to Frankfort area
Assessed by expert?	Yes	Yes
PES Category Median	Moderately Modified (Class C)	High (Class B)
Mean Ecological Importance (EI) Class	High	High
Mean Ecological Sensitivity (ES) Class	Very High	Very High
Stream Order	1	2
Default Ecological Class (based on median PES and highest EI or ES mean)	Very High (Class A)	Very High (Class A)

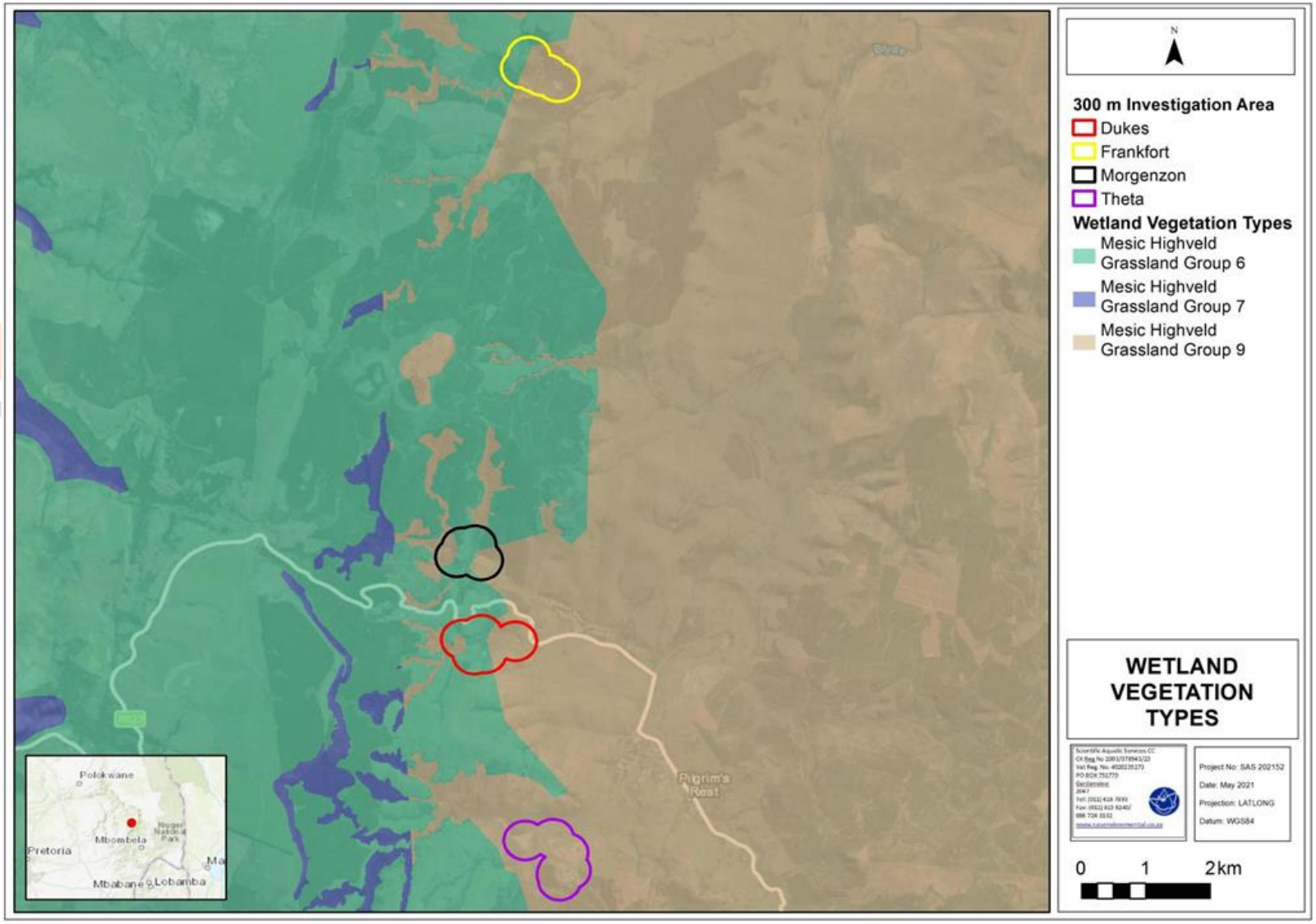

Figure 43: Wetland Vegetation Types (SAS, 2021 (b))

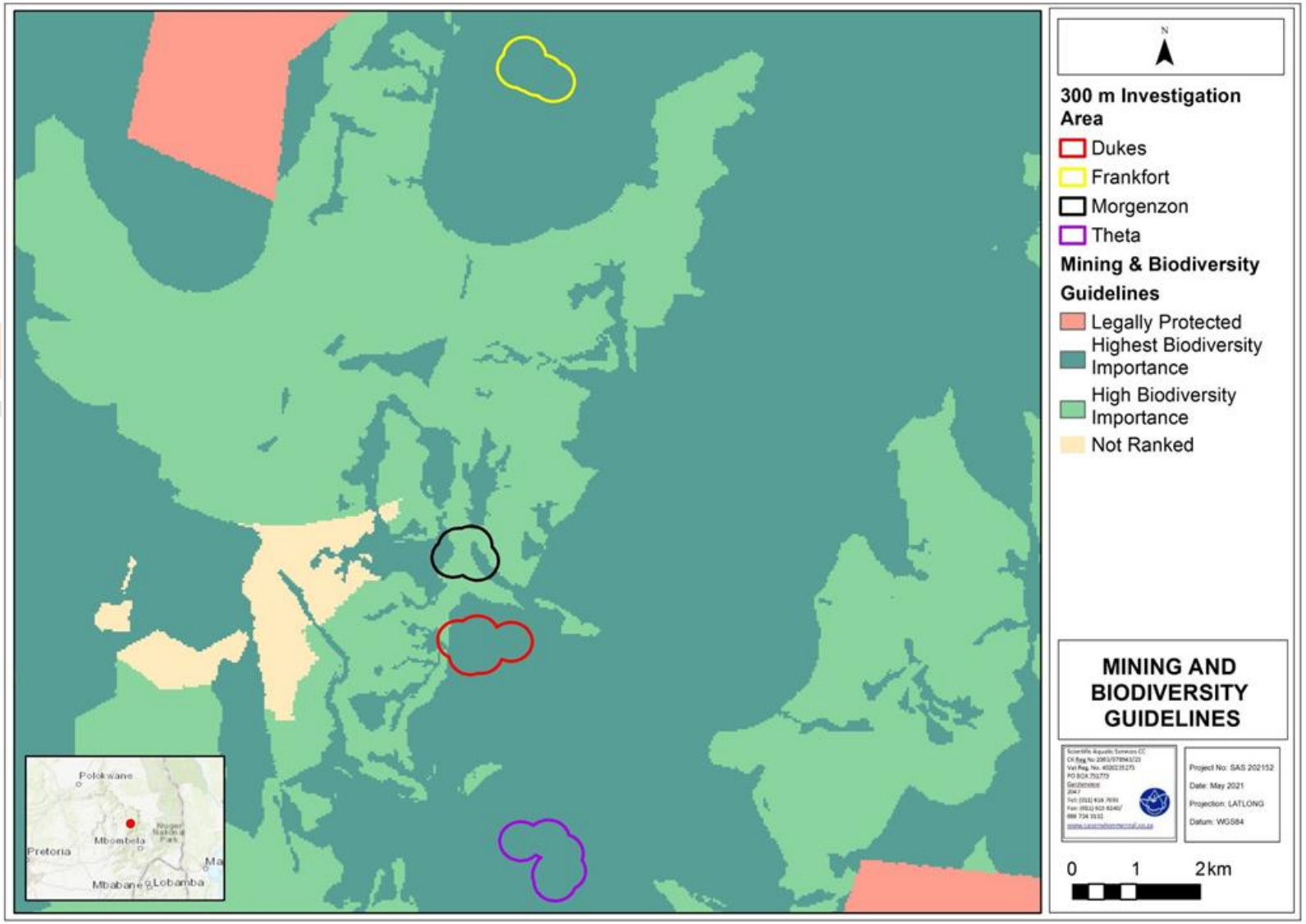

Figure 44: Mining and Biodiversity Guidelines (SAS, 2021 (b))

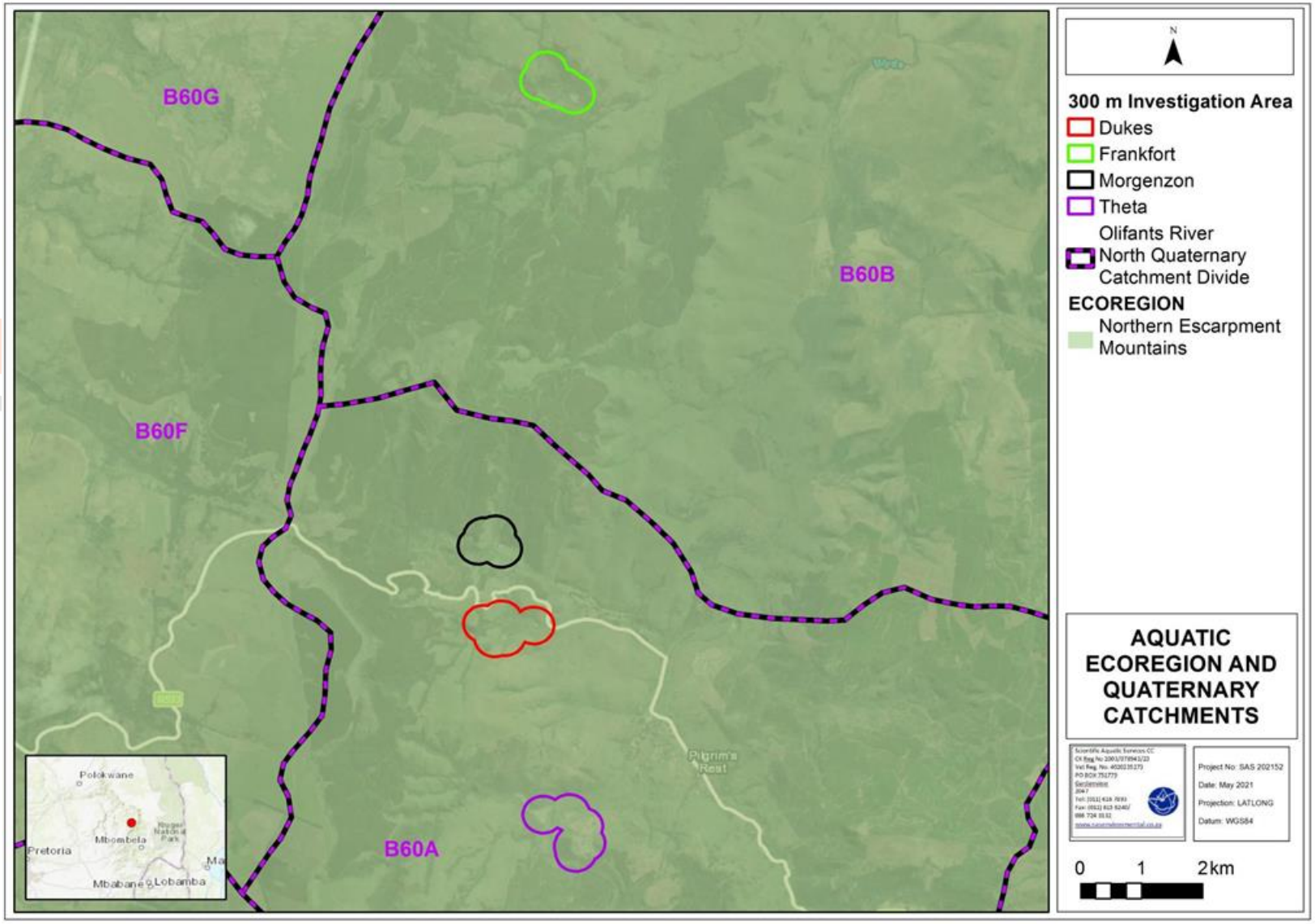

Figure 45: Aquatic Ecoregion and Quaternary Catchments (SAS, 2021 (b))

10.9.3 ECOLOGICAL MITAGATORY STRATEGY FOR CONTINUED MINING

A mitigatory and rehabilitation offering is proposed for the area around the mining operations to allow continued mining. The offering comprises the following:

- Replenishment of licensed abstraction volumes;
- Contribution to reducing the catchment scale threats to biodiversity and water security (I&APs and sedimentation) which impact the river, its biota, and the endangered ecosystem of the Malmani Karstlands - including a biocontrol component;
- Contributing to ameliorating the key threats to indigenous forests (including I&APs & wildfires); and
- Rehabilitation of diverted streams and drainages due to illegal mining activities.

10.10 NOISE BASELINE

EnviroRoots Pty (Ltd) was commissioned to undertake the Noise impact assessments as part of the scoping studies to determine the baseline noise environment around the mining areas. The baseline report is attached as ANNEXURE M of this report.

Five (5) receptors within proximity (±1,000 m) of the infrastructure footprint were identified, which comprised mostly singular dwellings, homesteads, and communities. Based on the measurements and site observations, the following rating levels were proposed for receptors:

- Suburban rating for all receptors that are based in communities;
- Rural rating for all receptors based on singular homesteads.

Field assessments in and around the sites were undertaken. This included the identification of the noise sensitive stakeholders, existing noise sources and other baseline noise contributors. Viable and alternative measurement localities at the identified monitoring localities were further investigated to ensure measurements were not influenced by extraneous noise sources (e.g. an air-conditioning condenser unit near a measured locality).

10.10.1 BASELINE NOISE ASSESSMENT

Baseline measurements were conducted on 3 October 2021 at three (3) localities (refer to **Figure 46**). Measurements were analysed to compile a subjective and objective determination of the Rating levels (LReq) based on the LAIeq measurements (LAIeq: A-weighted, impulse, leq sound level).

Ten-minute LAIeq (SANS 10103:2008) measurements were conducted during the daytime (22:00 – 06:00)[58] safe periods within the study area.

A SANAS calibrated type 1 Noise Sound Level Meter (SLM), set to A-weighting and with impulse settings applied, was used at each measurement point. The SLM are laboratory calibrated and the calibration certificates for the SLM as well as the sound calibrator are available on request. Using a SANAS-calibrated sound calibrator, the acoustic sensitivity of the SLMs was checked immediately before and after each of the sound level measurements, and the results coincided within 2.0 dB. Furthermore, certain statistical values and variables such as the LA90 LAMax, LAmin, and (fast) third octave data (dBZ) were logged and considered.

The conclusions drawn during analysis of the data, desktop information and onsite investigations are summarised in **Table 21.**

[58] SANS 10103:2008 criterion

Table 21: Baseline Sound Pressure Measurement Conclusions

Receptor/Measuring Point	Conclusions
AB01 - dwellings [Min 10-minute measurement on outside boundary]	• Calculated LAIeq was 39,8 dBA – The measurements reflected a rural area (daytime) • The measurements were influenced by one vehicle passing along the R533 route
AB02 – Pilgrim's Rest	• Calculated LAIeq was 42,4 dBA – The measurements reflected a developed suburban area (daytime). There is moderately high confidence in this measurement (based on desktop assessment, onsite investigations and noises/sounds heard during measurements) • The measurements were influenced by some domestic sounds and local routes (namely R533)
AB03 - Pilgrim's Rest	• Calculated LAIeq was 38,8 dBA – The measurements reflected a rural area (daytime)

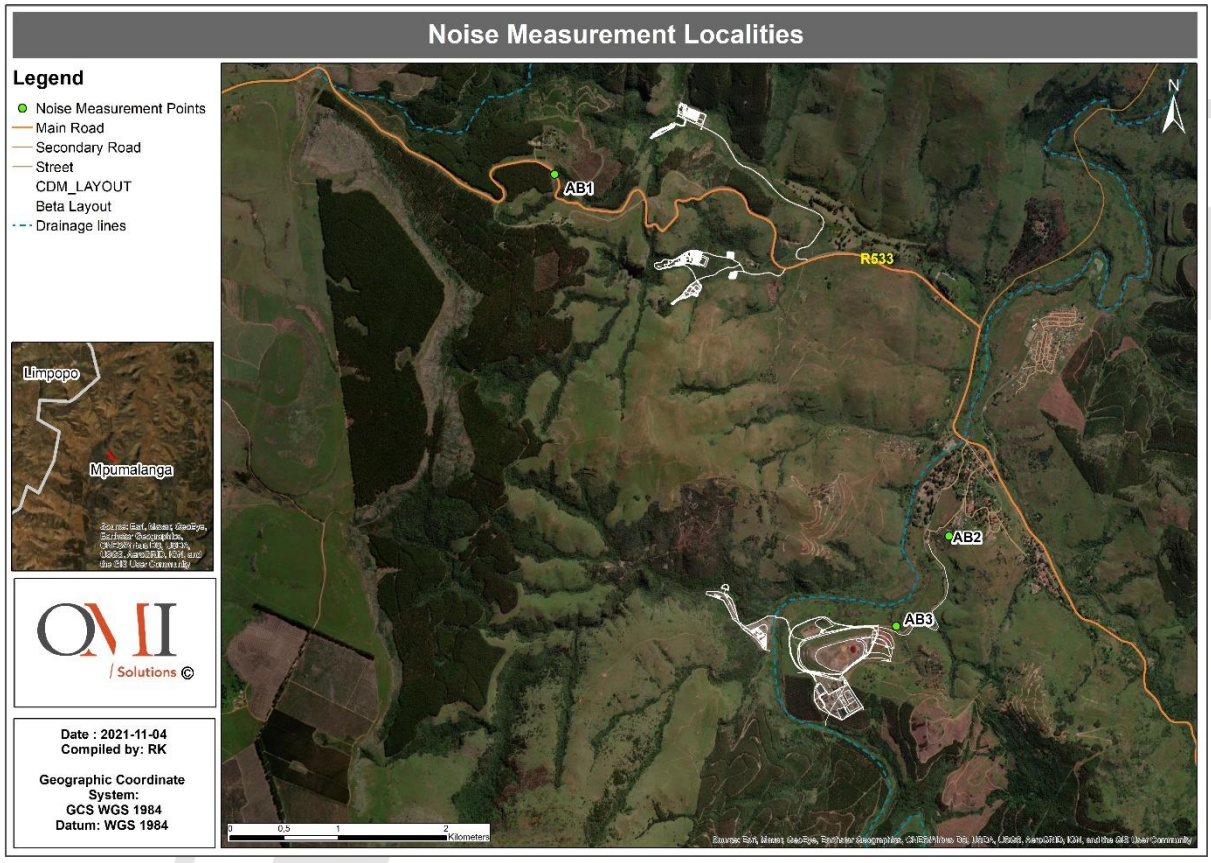

Figure 46: Noise Measurement Localities (Adapted from Enviroroots, 2021)

10.10.2 SCOPING NOISE ASSESSMENT

The scoping assessment for the construction and operational phases used one moderately high Sound Power Level (SPL) apparatus, operating at maximum capacity. The noise source was assessed in a linear fashion at the closest point of any footprint boundaries (or fixed infrastructure locality) in relation to the receptors.

A moderately high SPL (see max operations of Jaw crusher diesel ca 250 kW or Pneumatic breaker) was operated over a day period at the project footprint. The linear regression was applied to the distance of the receivers from the project footprint. The linear noise representation for the night-time period is presented below in (**Figure 47**).

A linear regression measured from receptors in relation to the project footprint was also used for a prediction and measurement relating to road traffic noise (**Figure 48**).

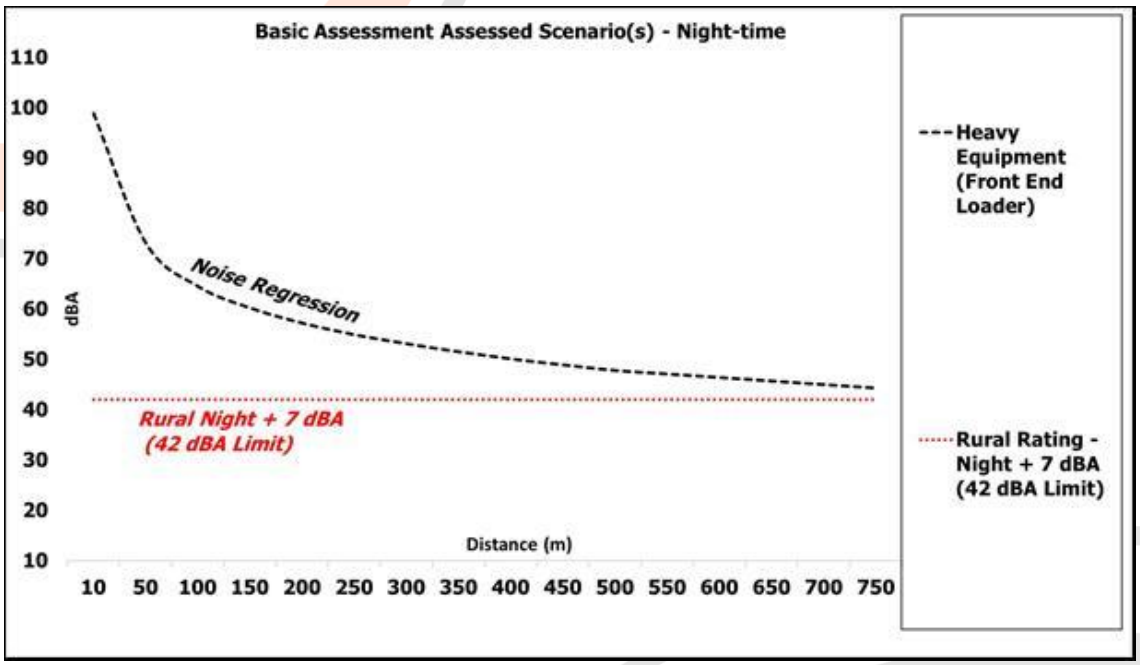

Figure 47 : Construction/Operational Noise Levels (Enviroroots, 2021)

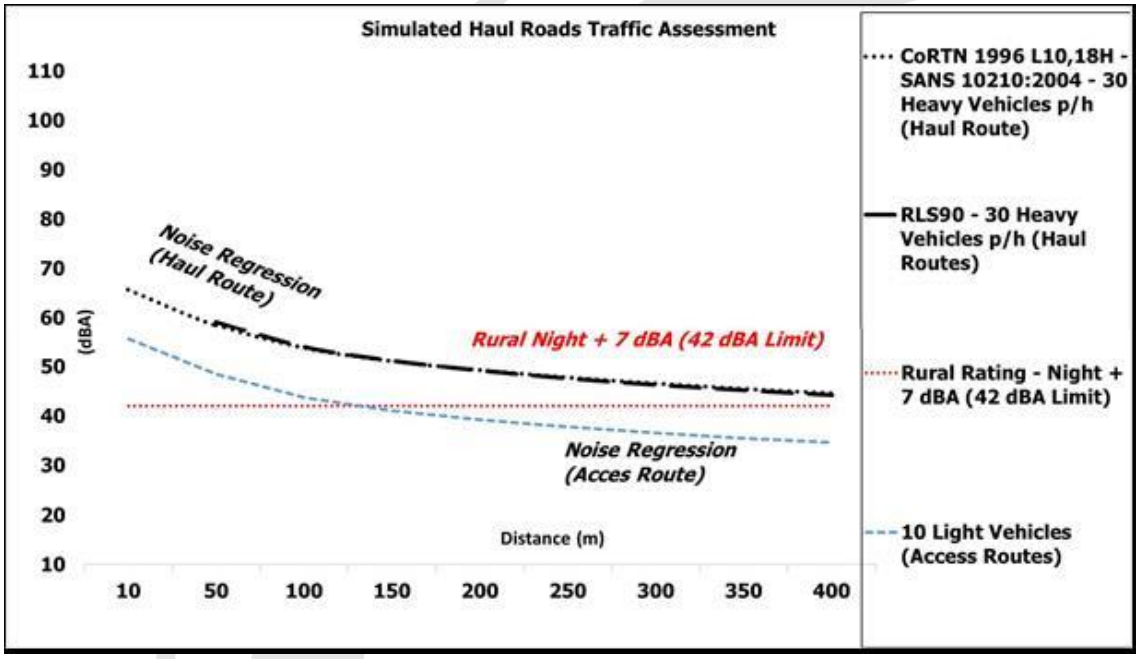

Figure 48: Haul Route Noise Levels - Linear Representation of Road Traffic (Enviroroots, 2021)

A full noise impact assessment will be done during the EIA phase to determine and refine the impacts on receptors from the mine.

10.11 VISUAL LANDSCAPE

SAS was commissioned to undertake a pre-feasibility visual assessment as part of the scoping and pre-feasibility studies to identify risks to the proposed projects and to guide the development of the project layout for further assessment of risk. The baseline report is attached as ANNEXURE L of this report.

The landscape quality associated with the TGME MR 83 UG Project Areas is considered high, due to the mountainous terrain forming part of the scenery of the greater region, the area being of national cultural and heritage importance, the town of Pilgrim's Rest being a tourist attraction, and the Blyde River being a dominant factor in the landscape (SAS, 2021 (c)).

The area can be described as calm, tranquil, peaceful and undeveloped, with a strong association to a semi-natural environment. The proposed large-scale mechanised mining infrastructure is likely to lower the landscape value of the area; however, the impact can be considered limited as the above-ground footprints will be limited.

The site has a moderate visual absorption capacity (VAC), indicating that the proposed mining activities will be partially absorbed in the area The vast mountainous backdrop of the larger region is the main contributing factor to the VAC, since the hills and mountains are unified, making it difficult to observe distinguishing features within the landscape from significant distances (SAS, 2021 (c)).

The town of Pilgrim's Rest is situated in a valley, thus the undulating landscape and local vegetation associated with the town will serve to somewhat limit the visual intrusion, especially central plant area, from certain receptor sites. The Dukes, Morgenzon and Beta Project Areas will be highly visible from the Mount Sheba hiking trail, especially from the S3 viewpoint of the Lost City Hiking Trail.

Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. It is created by the land use, character, and quality of a landscape, as well as by the tangible and intangible value assigned thereto. The landscape character type is defined as rural, mountainous area dominated by grassland, plantations and natural forests interspersed with watercourses, especially the Blyde River, villages, the town of Pilgrim's Rest and historic mining infrastructure.

Viewshed analysis was done for each of the sites. A maximum height of 10 m for the proposed mining infrastructure was used for all sites during the viewshed analyses. It is important to note that the viewshed analysis does not take into account the vegetation and existing anthropogenic structures of the area. Further field assessments will be undertaken to refine the viewsheds.

Preliminary findings show that the projected visibility of the Frankfort infrastructure is limited to approximately 500 m, and to scattered portions within a 5 km radius, mostly limited to the north and south. The three farmsteads located within 1 km of Frankfort are likely to observe the infrastructure. People visiting the Morgenzon Reserve are unlikely to observe the proposed mining infrastructure due to the mountainous terrain (SAS, 2021 (c)). The viewshed is presented in **Figure 49**.

According to the viewshed analysis for the Morgenzon infrastructure, it will likely be visible from the Golf Course, the northern portion of the town of Pilgrim's Rest, sections along the R 533, and several gravel roads. The viewshed analysis further indicates that any receptors located further than 2 km (all directions) or 3 km (southeast) will not have a clear line of sight towards the Morgenzon area, due to the mountainous terrain (SAS, 2021 (c)). The viewshed is presented in **Figure 50**.

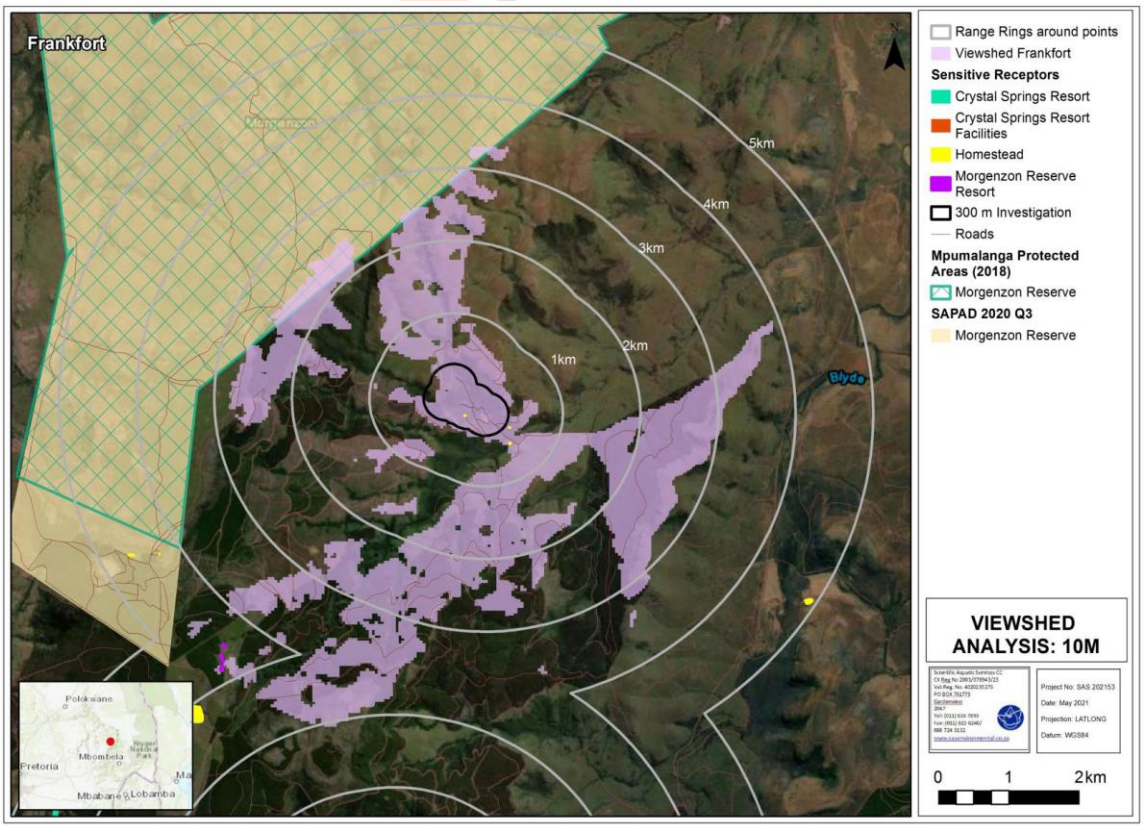

Figure 49: Viewshed Analysis for Frankfort Based on 10 m High Infrastructure (SAS, 2021 (c))

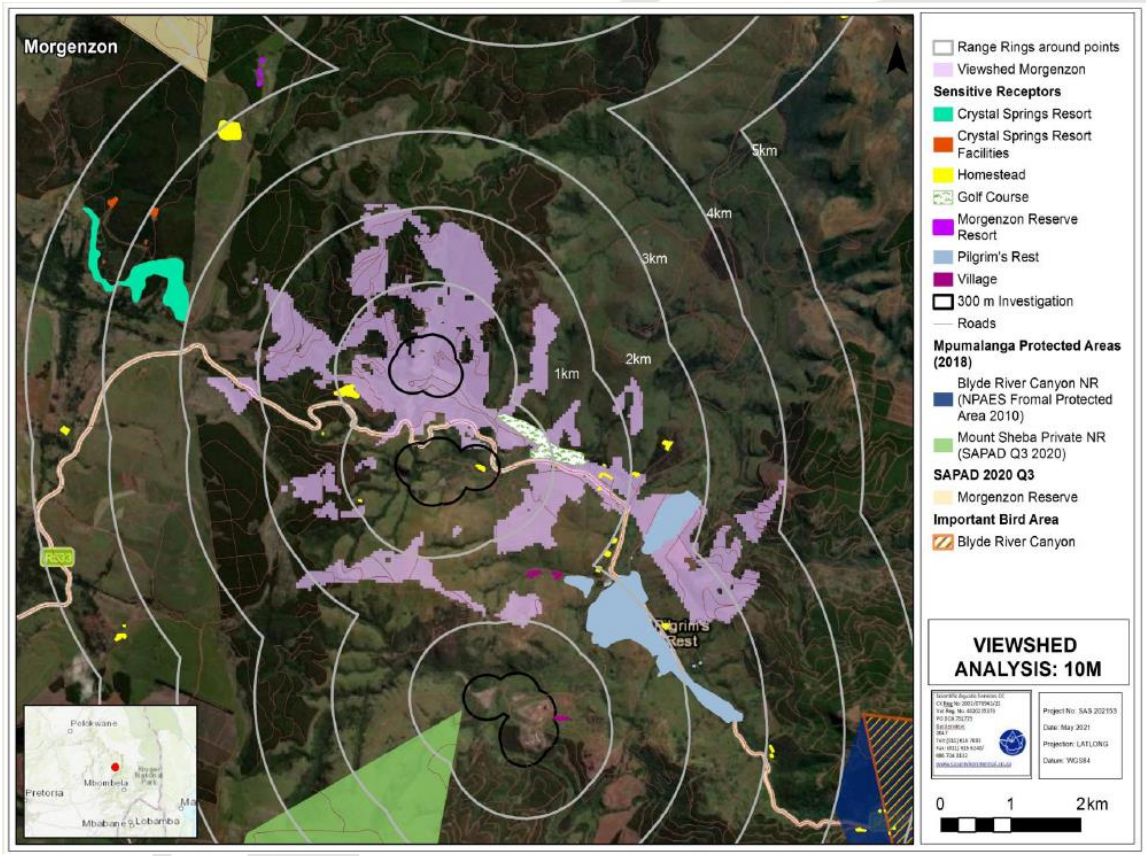

Figure 50: Viewshed Analysis for Morgenzon Based on 10 m High Infrastructure (SAS, 2021 (c))

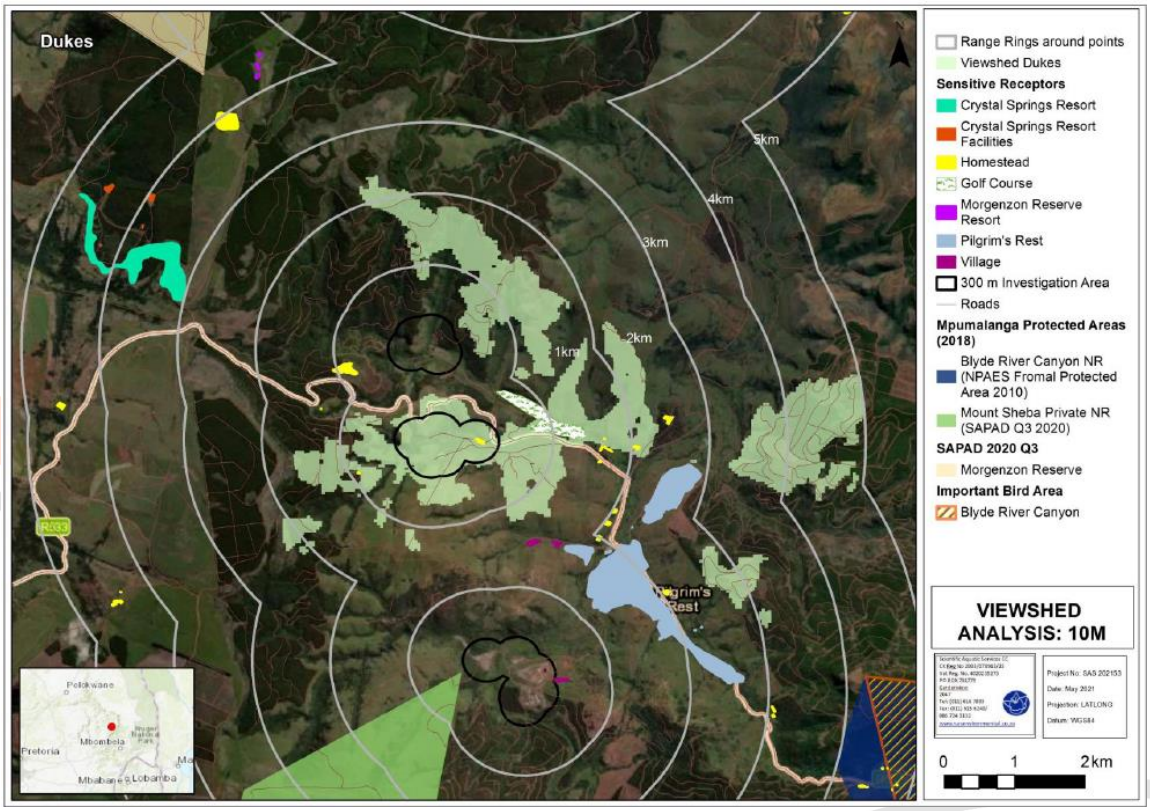

Figure 51: Viewshed Analysis for Dukes Based on 10 m High Infrastructure (SAS, 2021 (c))

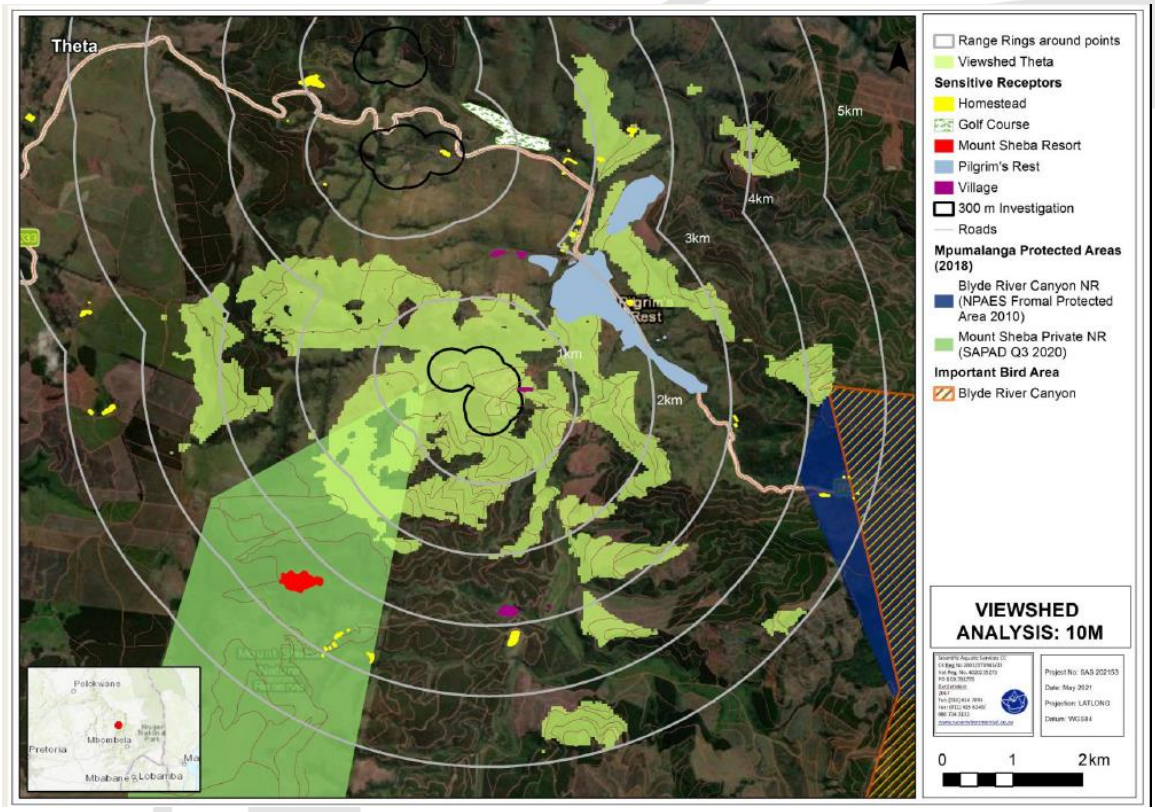

Figure 52: Viewshed Analysis for Beta, TSF and Plant Based on 10 m High Infrastructure (SAS, 2021 (c))

10.12 SOCIO ECONOMIC AND CULTURAL ENVIRONMENT

10.12.1 HERITAGE ASSESSMENT

Heritage Management Consulting was commissioned to undertake the Heritage and Paleontological assessments as part of the scoping specialist studies. The baseline reports are attached as ANNEXURE N of this report. A notice of intent to develop (NID) was submitted to SAHRA in terms of section 38 of the NHRA.

The study area has evidence for occupation over an extensive period of time, spanning from the Stone Age through to the historical period. Briefly, the Stone Age is associated with the manipulation of lithics to create tools. These date from as many as 2.5 million years to less than 150 years ago. This period overlaps with the migration of Bantu speakers into southern Africa, bringing with them agricultural technologies, herding and a settled way of life manifested through stone walling. For the purposes of this study, the literature review was primarily focused on the historical period as activities associated with the project are planned within a predominantly Historical Period landscape.

The farm Ponieskrans, which would later become Pilgrim's Rest, was officially declared a gold field in September 1873, heralding the dawn of one of South Africa’s largest and most significant gold rushes. Initially, alluvial gold was found where diggers were panning in the streams around Pilgrims Rest - some from as far away as California and Australia. Pilgrims Rest was declared a public digging in 1875 but gold panning declined in 1876 and subsequently, heavy equipment was employed to locate and mine subsurface reefs. Several smaller companies were formed which mined smaller claims, while larger conglomerates commenced with mining in deeper gold-bearing ore. In 1895, several small mining companies amalgamated to form the TGME. This company was listed on the London Stock Exchange and became the first listed gold mining company in South Africa. As the volumes of gold ore increased, the engineers constructed small, local hydro-electric plants to generate electricity for the electric tramway and the ore crushers at the reduction works, which was constructed in 1897.

Pilgrim's Rest was southern Africa's second town with street electricity, the first being Kimberley. Mining in Pilgrim’s Rest town ceased in 1971 and the village was acquired by the authorities for the formation of a National Museum and tourism destination.

The TGME Mine is situated within the larger Pilgrim’s Rest heritage landscape, which is regarded as highly significant and of national significance. Pilgrim’s Rest and the farm Ponieskrans were declared a Provincial Heritage Site in 1986 and an application for World Heritage Site status for the Reduction works was lodged in November 2006, but the declaration was never formalized.

Ponieskrans and the Pilgrim’s Rest region encompass a rich and significant historic landscape with regards to Section 3(3) of the National Heritage Resources Act in particular, as a result of:

- its importance in the community, or pattern of South Africa's history;
- its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects; and
- its importance in demonstrating a high degree of creative or technical achievement at a particular period.

It is therefore abundantly clear that the Pilgrim's Rest landscape represents a striking visual representation of mining, evoking images of time, place, and historical patterns associated with past mining epochs. The historical mining horizon provides clues to past activity and many historical layers form part of this significant landscape. However, the historical landscape is unfortunately highly compromised with vast site transformation in past decades - and in recent years in particular – evident as a result of the following:

- In this landscape, it is a common occurrence that newer mining infrastructure replace older heritage sites where mining continues. For example it has been noted that some of TGME's current portals may have been superimposed on old mining adits. An obvious consequence is that historical layering of mine features become intertwined and indistinct which also makes the accurate dating and sequencing of mining remains in the project areas challenging.
- Natural processes such as surface wash, erosion and changes in vegetation have inevitably impacted on heritage features and the heritage landscape.
- Large-scale illegal informal mining activities by so-called "Zama Zamas" in the landscape and areas subject to this assessment have resulted in an almost complete destruction of infrastructure associated with historical and recent mining. This includes heritage resources and features which, until relatively recently, remained in a well-preserved state of preservation. In addition, natural resources such as vegetation, geomorphological stability and water courses are also affected by illegal mining, which has sterilized large portions of the landscape from heritage remnants.

This scoping assessment attempted to capture as much of the remaining mining heritage in the baseline environment and the project development areas within notable project constraints, including site safety, restricted site movement during surveys, visibility constraints and a rapidly disintegrating heritage horizon. The assessment relied heavily on previously work conducted on the Pilgrim's Rest heritage landscape in order to compliment potential limitations in the assessment.

Cognizant of the above, the following observations and recommendations are made based on sites within the TGME Mining Project areas that risk direct impact from the project activities:

- In the proposed Beta North mining area, a number of features of significance were noted. These include Historical/extant adits and a Historical/extant drainage shaft (NH-TGME-2430DC-01 , NH-TGME-2430DC-02), the remains of the Historical tram line/cocopan line (NH-TGME-2430DC-03), the remains of a Historical concrete water furrow (NH-TGME-2430DC-04), Historical suspension bridge remains (NH-TGME-2430DC-06), the Historical Farmer's Race remains (NH-TGME-2430DC-08), Historical concrete structures (NH-TGME-2430DC-05, NH-TGME-2430DC-07) and a Historical concrete low-level bridge (NH-TGME-2430DC-09). Please refer to Figure 53.
- In the CDM mining area, Historical/extant adits (NH-TGME-2430DC-14, NH-TGME-2430DC-15, NH-TGME-2430DC-16, NH-TGME-2430DC-17, NH-TGME-2430DC-18), the remains of the Historical tram line/cocopan line (NH-TGME-2430DC-12) a Historical/contemporary water furrow (NH-TGME-2430DC-13) and a burial site (NH-TGME-2430DC-19) were noted. In many instances, these features are poorly preserved or destroyed but the sites are nonetheless intrinsically linked to the highly significant Pilgrim's Rest Mining legacy thus bearing high heritage value. In addition, the sites and features are older than 60 years and protected under the National Heritage Resource Act (NHRA 1999). Please refer to Figure 54.
- In the proposed Frankfort mining area, the remains of the Historical MET plant building (NH-TGME-2430DC-10) and the remains of a Historical suspension bridge or pulley system (NH-TGME-2430DC-11) were noted. Please refer to Figure 55.

The sites will be directly impacted on by the proposed project where the significance of the impact is essentially high. As the farm Ponieskrans is a declared Provincial Heritage site, retaining and conserving the sites would essentially be required but there remains little to conserve at most of the sites and uncontrolled destruction of the landscape by illegal miners is ongoing. For this reason, it is

recommended that a comprehensive research-driven Phase 2 heritage mitigation plan is implemented to include all these sites, informed by a robust research framework.

Various mitigation measures and plans have been recommended by the specialist and will have to be implemented by TGME. Where sites cannot be avoided, the necessary permitting application process will have to be followed.

The mining landscape around the project areas holds countless traces of historical mining, settlement, and industrial expansion. These include mining heritage remains associated with gold mining, many cemeteries and burial sites, mining settlement remains and the remains of individual historical period pioneer houses. In addition, the hills surrounding Pilgrim's Rest are littered with mine adits, ventilation shafts and underground drainage channels.

It should be noted that this Heritage Scoping Study will be converted into an integrated Heritage Impact Assessment (HIA) for inclusion in the EIA. The integrated HIA will include a detailed synthesis of baseline and heritage site data as well as an analysis of direct and indirect impact scenarios over the short-and long-term, on heritage receptors in the project area.

The Pilgrims Rest Museum will be involved at EIA level in order to provide input in final impact assessments and the final HIA Report.

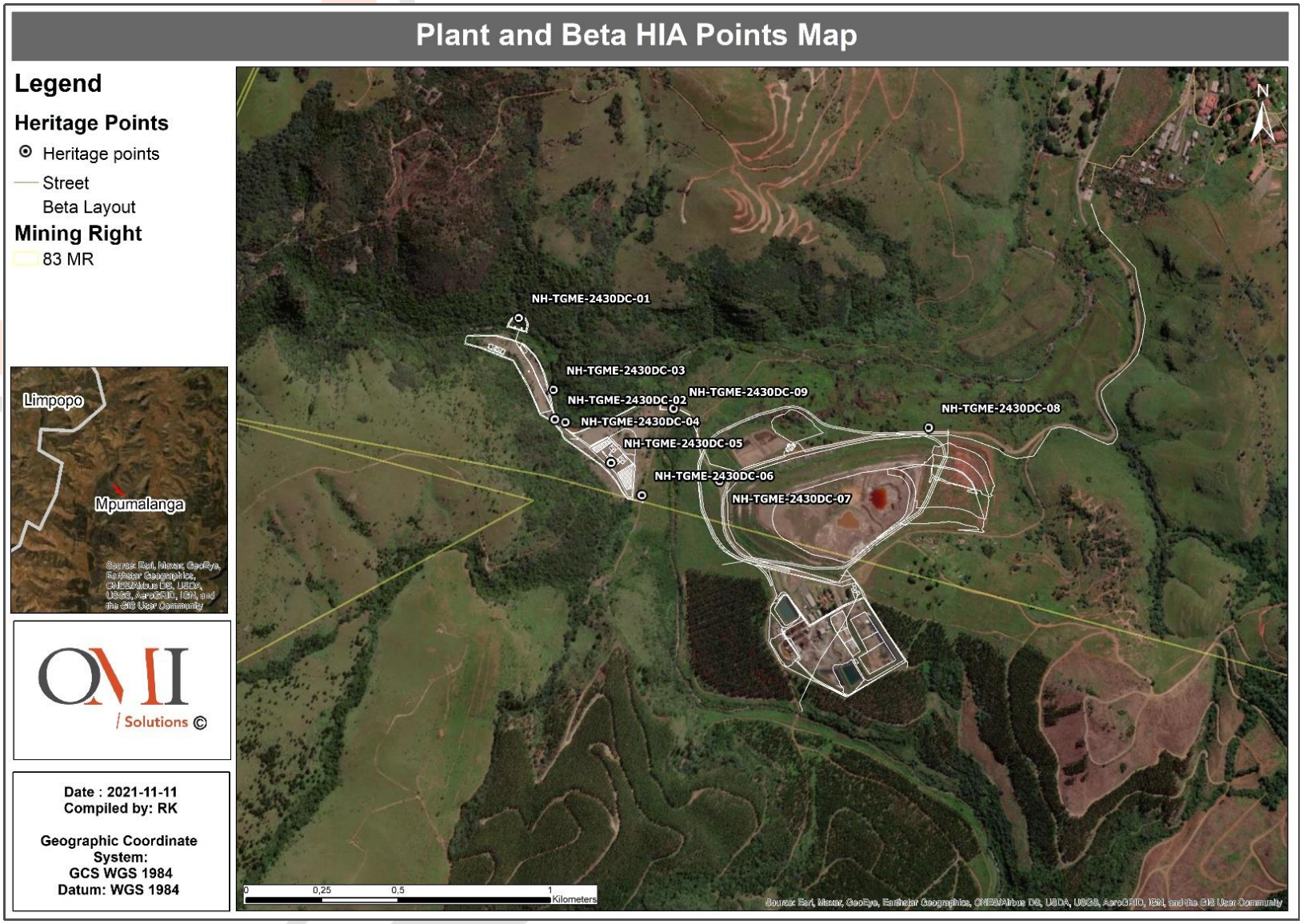

Figure 53: Beta North and Plant HIA Localities (Adapted from Heritage Management Consulting, 2021)

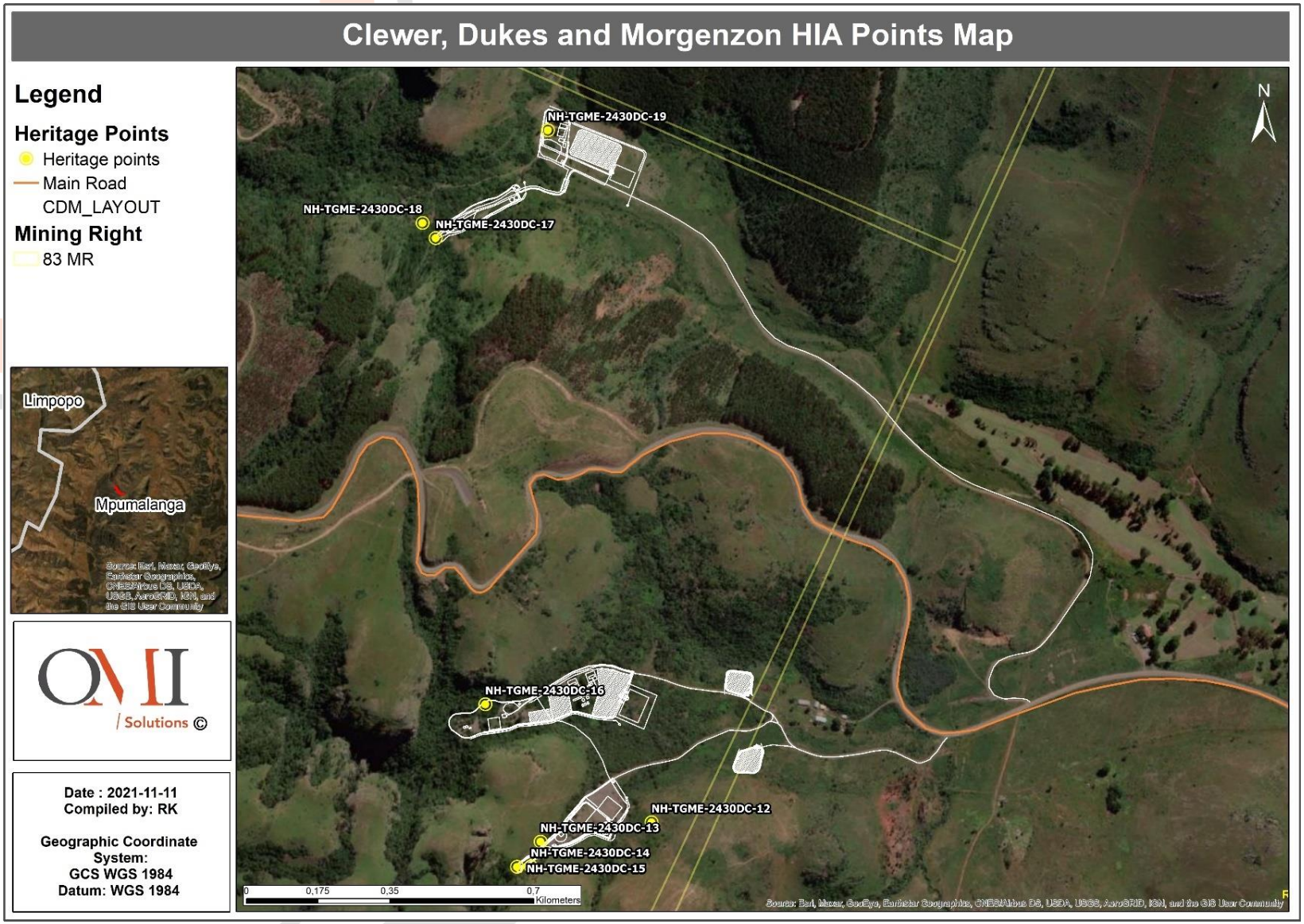

Figure 54: CDM HIA Localities (Adapted from Heritage Management Consulting, 2021)

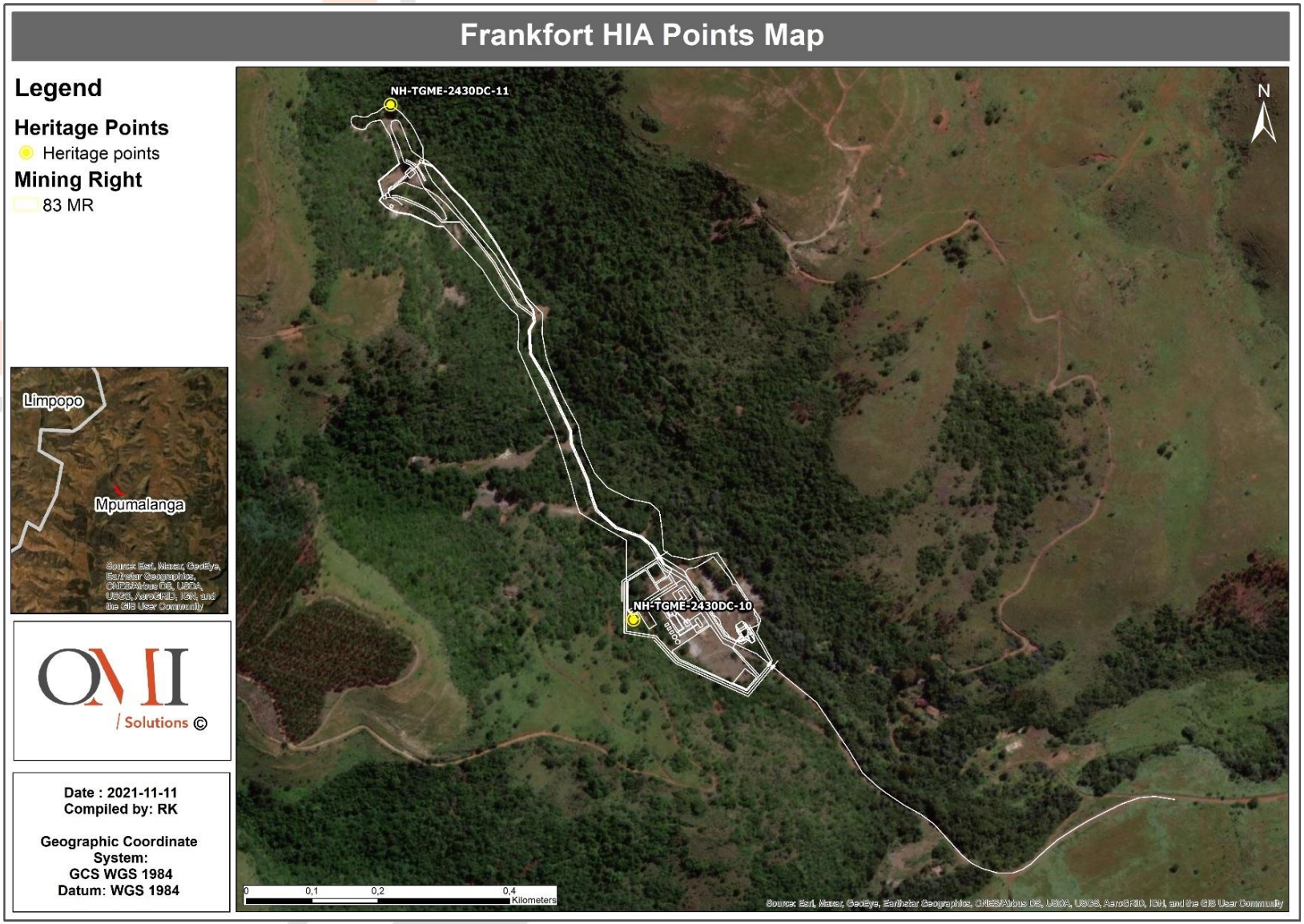

Figure 55: Frankfort HIA Localities (Adapted from Heritage Management Consulting, 2021)

10.12.2 PALAEONTOLOGICAL BASELINE

A Palaeontological Desktop Assessment (PDA) was undertaken by Banzai Environmental.

To comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PDA is necessary to confirm if fossil material could potentially be present in the planned mining area and to evaluate the impact of the proposed development on the Palaeontological Heritage.

The proposed mining site is underlain by Quaternary alluvium and scree, diabase, and the Timeball Hill Formation (Pretoria Group, Transvaal Supergroup) as well as the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup). According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Quaternary superficial sediments is low but locally High, the diabase is igneous in origin and has an insignificant Palaeontological Sensitivity while that of the Timeball Hill Formation is High and the Palaeontological Sensitivity of the Malmani Subgroup (Transvaal Supergroup) is Very High (Almond and Pether 2008, SAHRIS website). Table 22 shows the geology (in bold) associated with the developments as well as the associated fossil occurrences normally found within this geological type.

Table 22: Geology of Development Footprint and Possible Fossil Heritage Occurrences (Banzai Environmental, 2021)[59]

Supergroup/Group/Suite	Formation/ Subgroup	Lithology	Fossil Heritage
Quaternary sediments	Surface deposits including alluvium and scree		• Mammalian teeth, bones, horn corns, reptile skeletons, ostrich egg fragments. Microfossils, non-marine mollusc shells, foliage, wood, pollens, peats, trace fossils e.g. vertebrate tracks, burrows, termitaria and rhizoliths (root casts
Diabase	Unfossiliferous		
Transvaal Supergroup; Pretoria Group	Magaliesberg Fm	Sandstones and mudstones of coastal origin	Microbial mat structures/trace fossils
Silverton Fm	Volcanic rocks, marine mudrocks with carbonates		Stromatolites
Daspoort	Fluvial and Alluvial, deltaic sandstones and mudrocks, in east is marine sediments		Stromatolites
Transvaal Supergroup; Pretoria Group	Timeball Hill Formation	Quartzite, siltstone, shale, conglomerate, Fluvio-deltaic and lacustrine mudrocks with diamictite, quartzite, minor lavas.	Stromatolites

[59] Sediments present in the development is indicated in bold.

Supergroup/Group/Suite	Formation/ Subgroup	Lithology	Fossil Heritage
Transvaal Supergroup; Chuniespoort Group, Malmani Subgroup	Minor secondary mudrocks, cherts, containing carbonaceous shale, stromatolitic carbonates (limestones/dolomites),		Stromatolites: Shallow marine to intertidal stromatolites organic-walled microfossils

Due to various possible fossil heritage findings relating to the geology of the sites, it is recommended that an EIA level palaeontology report be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. A Phase 1 field-based assessment will be conducted, with research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

10.12.3 REGIONAL ECONOMIC CONTEXT

The socio-economic baseline was determined by Southern Economic Development (SED). The available Stats SA data regarding the population and infrastructure dates largely from 2011, with some data being available for 2016. However, as virtually no development has taken place in Pilgrim's Rest since 2016, these figures may be taken as valid for the baseline economic conditions. The field verification around some of the data will take place during the EIA level study.

The project is located in Ward 13 of the Thaba Chweu Local Municipality (TCLM) within the Ehlanzeni District Municipality (EDM) in Mpumalanga Province. Land use in the area is dominated by forestry, old mining shafts, agriculture areas (mainly grazing areas), tourism-related activities and residential areas. The main socio-economic sensitive receptors in the local area close to the project include Pilgrim's Rest Town, Brown's Hill, Darks Gully, Newtown/Schoonplaas, and a number of rural tourist establishments in and around Pilgrim's Rest town.

The population of the larger Pilgrim's Rest area ranges between 1,700 to 2,500. The majority lives in Newtown/Schoonplaas and Darks Gully close to the old town, while around 250 people live in the old historic part of the town. The population of the larger Pilgrim's Rest area represents less than 3% of the estimated 102,000 people living within the larger TCLM. The area is characterised by high historic (sporadic) in-migration to Newtown/Schoonplaas, resulting from periodic short-term construction works in the area.

Young people possibly leave Pilgrim's Rest for better job opportunities elsewhere, while illegal miners move into Pilgrim's Rest from areas as far afield as Free State, Lesotho, and Mozambique. In-migration of illegal miners has substantially increased in the last year. The illegal mining activities have significantly influenced the downstream biodiversity in and around the Blyde River, as well as the flow pattern of the Blyde River. Sedimentation from their activities is a further source of concern.

10.12.4 DEMOGRAPHICS AND POPULATION STATISTICS

Table 2 below shows that the working age population group as well as percentage males are relatively higher in TCLM and Pilgrim's Rest than nationally. This corresponds with the relatively higher population growth rates and possible in-migration into the municipal and local area. In the case of Pilgrim's Rest it could be due to sporadic and historic in-migration as mentioned above.

Table 23: The Age and Gender Structure of Selected Areas (Stats SA, 2011)

AREA	Young population (0 - 14 yrs)	Working population (15-64 yrs)	Elderly (65+)	% Males
Pilgrim's Rest	26.7%	70.2%	3.1%	53.1%
TCLM	25.2%	69.9%	4.9%	52.6%
South Africa	29.2%	65.5%	5.3%	49.0%

10.12.5 SERVICES AVAILABLE AND DELIVERY

Pilgrim's Rest was sold to government as a living national museum village in 1971 when mining activities in the town closed down. The town was declared a National Monument and became a provincial heritage site in 1986. The Mpumalanga Department of Public Works, Roads and Transport (DPWRT) is currently custodian of the town on behalf of the government and is responsible for the maintenance and restoration of Pilgrim's Rest. The TCLM is responsible for basic service provision while the other provincial departments (e.g. health, education) are responsible for their respective mandates in Pilgrim's Rest.

TCLM has a huge housing backlog, with only 70% of its population living in formal dwellings in 2016. The lack of available land as well as capacity constraints in terms of water, sanitation and energy provision are challenges that TLCM have been struggling to overcome.

Table 24 below shows that a lower percentage of households in the Pilgrim's Rest area had access to formal housing in 2011 (60%) compared to the national average (62%). The informal dwellings are mainly situated in Newtown/Schoonplaas. According to local sources there is dolomite in the vicinity of the old town that could pose challenges to the safety of structures in that area as well as to further development of the area. There have been discussions with some local farmers and the Maroabjang CPA related to the availability of land to expand/relocate Newtown in the future.

Table 24: Access to Housing and Basic Services (Stats SA, 2011)

Category	Pilgrim's Rest	TCLM	South Africa
% Households in formal dwellings	60%	65%	62%
% Households with tap inside dwelling	60%	39%	46%
%Households with flush toilets	61%	68%	60%
%Households with access to electricity	75%	84%	85%
% Households with regular waste collection services	68%	57%	58%

10.12.5.1 WATER PROVISION

Pilgrim's Rest rural area basically has two water supply schemes, the Matibidi scheme and the Pilgrim's Rest scheme. Only two surface water resources are currently being utilized for primary water use in the Pilgrim's Rest area. One source is called the Moremela spring that feeds the Moremela stream. Water is withdrawn from the spring. Detailed investigations are required to augment supply to the Matibidi scheme.

The Blyde River, which passes south east of Moremela, is not currently utilized as a bulk water source. Various options such as a bulk water pipeline, water treatment plant and reservoirs, as well as the refurbishment of the current reservoirs and reticulation lines are being investigated.

10.12.5.2 ELECTRICITY INFRASTRUCTURE

The electricity provision backlog in TCLM is huge. In 2016, more than 3,200 households still required electricity connections. A new substation (Duma) is planned in the Mashishing area. Furthermore, the maintenance of electrical infrastructure such as switchgears, transformers, streetlights, high mast lights and overhead lines is behind in most areas of the district municipality (TCLM, 2017).

The high contribution of the mining sector to the TCLM economy furthermore implies relative high energy use within the economy. Compared to other economic sectors, the mining sector is relatively energy inefficient, i.e. the production value of the sector is low relative to its energy use (EDM, 2017).

10.12.5.3 ROAD INFRASTRUCTURE

The TLCM does not have a road maintenance plan in place. However, various municipal roads within the towns of Sabie, Simile, Graskop and the Harmony Hill area have been identified as being in need of refurbishment, patching and/or reconstruction. Small sections of new municipal roads would also be required within these urban areas.

10.12.6 ECONOMIC ASPECTS

While mining dominates the larger TCLM economy, the economy of Pilgrim's Rest town is dominated by tourism-related activities such as accommodation, restaurants/taverns and arts and craft shops. The Gross Value Added[60] (GVA) of the local economy could be in the region of R20 million (2019 prices). An estimated 250 people are employed between formal businesses, entrepreneurships, hawkers and informal traders. The Pilgrim's Rest economy is very small relative to the TCLM economy, contributing less than 1% towards municipal output and employment.

The MDPWRT is currently custodian of the town on behalf of the government and is responsible for the maintenance and restoration of Pilgrim's Rest. The TCLM is responsible for basic service provision while the other provincial departments (e.g. health, education) are responsible for their respective mandates in Pilgrim's Rest. In terms of public services the local area is characterised by large housing backlogs, the need for road upgrading and maintenance, distance from healthcare services and the lack of sufficient clinics and Emergency Medical Services (EMS) as part of the primary health care services.

As is the case in the larger TCLM, Pilgrim's Rest saw more protest action in the past few years as a result of the high housing backlogs in Newtown/Schoonplaas. While absolute crime levels are low in Pilgrim's Rest, the crimes per capita is high. Illegal miners currently also pose a significant security threat in the Pilgrim's Rest area.

The local economy experienced a sharp decline since its peak in the early 1990's due to the general decline in tourism to Mpumalanga Province, deteriorating safety and hygiene conditions in Pilgrim's Rest, factors related to illegal mining activities, increased vagrancies due to poverty and unemployment and lack of public facilities and municipal functions such as street cleaning. Another contributing factor

[60] Gross Value Added (GVA) is an economic measure of output that includes only income generated for labour, entrepreneurs, property and owners of other assets. It excludes intermediary inputs and is therefore not the same as turnover. Turnover would include costs related to primary as well as intermediary inputs.

was the closure of many businesses due to the provincial government not renewing existing business leases, with the subsequent tender processes allegedly being irregular (The Public Protector, 2014).

Since 2018, the allocation of leases to business owners has improved and a new local business forum was established. The provincial Department of Public Works has improved services such as cleaning, and - despite the Covid-19 pandemic which hampered tourism between March 2020 and September 2021 - there are positive revival signs in Pilgrim's Rest.

Only limited opportunities are provided for the tourism sector of Pilgrim's Rest, formal and informal. The unemployment and poverty rates were much higher than the provincial and municipal averages in South Africa, with an estimated 48% of Ward 13 households living below the lower bound poverty line. This emphasizes the pressing need to create job opportunities for the working age group in the Pilgrim's Rest area.

11 DESCRIPTION OF THE CURRENT LAND USES[61]

Current land use activities associated with the investigation area and surrounding areas are largely dominated by wilderness, forestry, and historic mining infrastructure and is shown in **Figure 56**. No large scale commercial agricultural activities were observed to be occurring within the investigation area and the immediate surrounding areas (SAS, 2021).

[61] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site, and location of the development footprint within the site, including (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

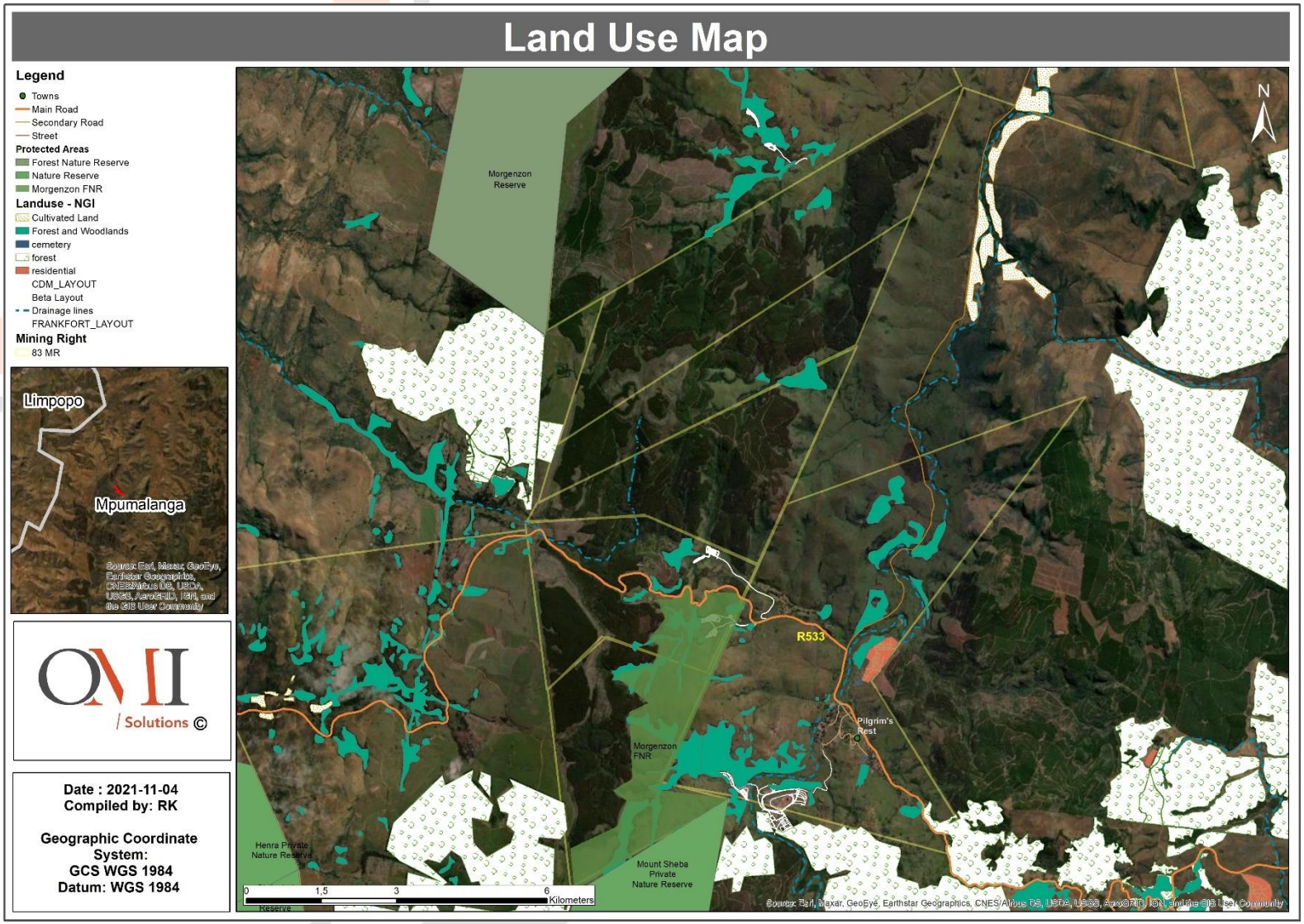

Figure 56: Land Uses Identified in the Area from the National Geo-spatial Information System

12 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE[62]

In terms of the DFFE[63] guidelines for Integrated Environmental Management (IEM), "sensitive landscapes" is a broad term applying to:

- Nature conservation or ecologically sensitive areas – indigenous plant communities (particularly rare communities or forests), wetlands, rivers, river banks, lakes, islands, lagoons, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species;
- Unstable physical environments, such as unstable soil and geo-technically unstable areas;
- Important nature reserves – river systems, groundwater systems, high potential agricultural land;
- Sites of special scientific interest;
- Sites of social significance or interest – including sites of archaeological, historic, cultural spiritual or religious importance and burial sites; and
- Green belts or public open space in municipal areas.

Sensitive landscapes in the project area (in terms of the above definition) are discussed in detail in Section 10. These include but are not limited to:

- Newly promulgated Morgenzon Forest Nature Reserve
- Kruger to Canyons Biosphere Reserve
- Mpumalanga Drakensberg Surface water SWSA
- Critical Biodiversity Area
- Provincial Heritage sites
- Dolomitic and karst aquifers

The map below **(Figure 57**) show overlays of the heritage and ecological findings as well as the protected areas in proximity to the mining areas. It should be re-iterated that the shaft areas are located on previously disturbed areas and that the proposed mining is redevelopment of existing underground mining areas.

[62] Required as per the EIA regulations Appendix 2 (g): a full description of the process followed to reach the proposed preferred activity, site, and location of the development footprint within the site, including (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

[63] At the time the Department of Environmental Affairs and Tourism (DEAT).

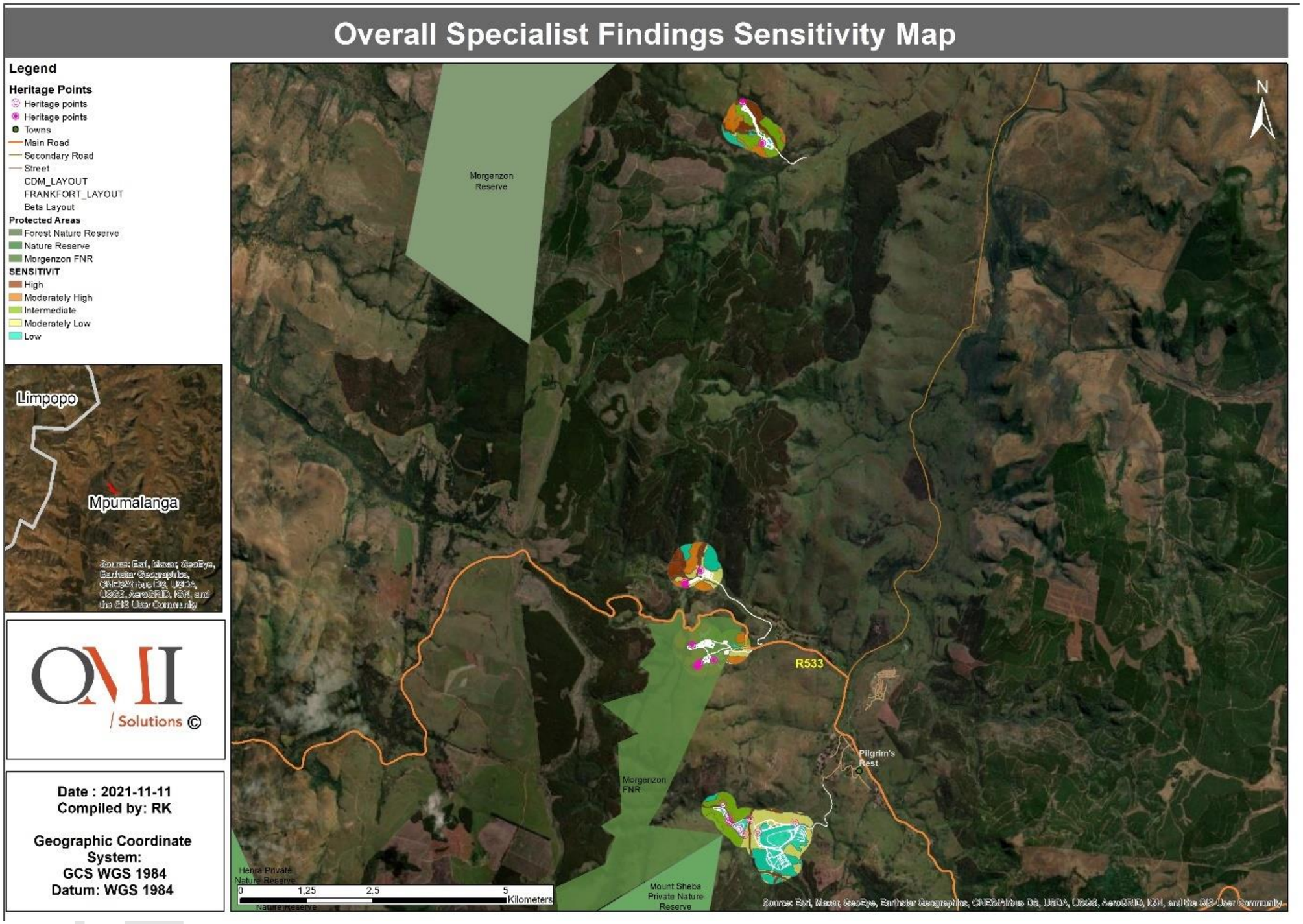

Figure 57: Overlay of Protected Areas, Layouts, and HIA and Ecological sensitivities of the various sites.

13 PRELIMINARY IMPACTS IDENTIFIED[64]

Table 25: Preliminary Impacts Identified during the Scoping Assessment[65]

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Geohydrological and Groundwater Assessment														
Construction Phase														
Tailings Facility - Continuation	Groundwater	Seepage of contaminated leachate into the aquifer system	WOM	Negative	Improbable	1	Short term	1	Local	1	Medium	6	8	Negligible
Underground Shaft Re-development	Groundwater Quality	• Prior to the actual mining commencing the opening up and dewatering of main accessways will take place • Dewatering of flooded underground workings may pose a risk of contaminated water spilling into the surface water streams	WOM	Negative	Probable	2	Short term	1	Regional	3	Medium	6	20	Negligible
Operational Phase														
Waste Deposition • TSF • RWD • WRD	Groundwater Quality	• Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. • Seepage of contaminated leachate into the aquifer system	WOM	Negative	Highly Probable	4	Long term	4	Site	2	High	8	50	Moderate

[64] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including (v) the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these impacts (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;

[65] Appendix 2 of the EIA Regulations of 2014 (as amended) and the template as provided by the DMR requires that the impacts and risk of each alternative including the nature, significance, consequence, extent, duration, and probability of such identified impacts, including the degree to which these can be reversed; may cause irreplaceable loss of resources; and can be avoided, managed, or mitigated, be included to the Scoping Report.

[66] **TAKE NOTE** – the preliminary impacts, mitigation measures and associated reporting are subject to being updated during the EIA phase subsequent to further and more detailed specialist studies being conducted as may be required or as new information becomes available (these being for scoping purposes at present). The impacts below were stated **without mitigation** measures being taken into account. The potential for residual risk with mitigation will only be established during the EIA Phase once all the specialist studies have been completed. The reason for including an impact statement is to identify which aspects need to be investigated further in the EIA Phase by means of specialist studies and to identify mitigation measures in order to reduce the significance of the impact identified during the Scoping Phase.

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Underground Mining	Groundwater Level and Yield	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	WOM	Negative	Highly Probable	4	Permanent	5	Local	1	Medium	6	48	Moderate
Underground Mining	Groundwater Quality	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	WOM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
Closure and Post-Closure														
Residual groundwater contamination from TSF, RWD and WRD after closure of the mine	Groundwater Quality	• Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. • Seepage of contaminated leachate into the aquifer system	WOM	Negative	Probable	2	Long term	4	Regional	3	High	8	30	Low
Continued groundwater inflow into the mine	Groundwater Level and Yield	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	WOM	Negative	Highly Probable	4	Permanent	5	Local	1	Medium	6	48	Moderate
Residual groundwater contamination after closure of the mine	Groundwater Quality	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
Soil and Land Capability Assessment														
Construction Phase														
	Soil Erosion	Loosening of soils due to removal of vegetation. Increased runoff, erosion, and consequent loss of	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		land capability in cleared areas.												
	Soil Compaction	Potential frequent movement of digging machinery and construction vehicles within lose and exposed soils, leading to excessive soil compaction.	WOM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
	Soil Contamination	• Spillage of petroleum hydrocarbons and other chemical constituents of concern during construction of associated infrastructure. • Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate
	Land Capability	Loss of land capability	WOM	Negative	Probable	2	Medium term	3	Regional	3	Medium	6	24	Low
Operational Phase														
	Soil Erosion	Constant disturbance of soils, resulting in risk of erosion	WOM	Negative	Probable	4	Long term	4	Site	2	Low	2	32	Low
	Soil Compaction	Constant disturbances of soils, resulting in risk of compaction	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Low	2	28	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
	Soil Contamination	• Leaching of hydrocarbons and other chemical constituents of concern into the soils, leading to alteration of the soil chemical status as well as contamination of ground water • Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	WOM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate
	Land Capability	Loss of land capability	WOM	Negative	Probable	2	Long term	4	Local	1	Low	6	22	Low
Closure and Post-Closure														
	Soil Erosion	Soil handling during backfilling and capping, leading to erosion	WOM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low
	Soil Compaction	Movement of vehicles and machinery during rehabilitation, leading to soil compaction	WOM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low
	Soil Contamination	Spillage of hydrocarbons resulting from leakages from demolition equipment/machinery and other chemical storage facilities, leading to soil contamination (soil chemical characteristics	WOM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
	Land Capability	• Potentially poor rehabilitation strategy may result to lower infiltration rate, and consequently increased surface runoff. • Increased soil erosion leading to permanent loss of soil resources	WOM	Negative	Probable	2	Long term	4	Regional	3	Low	6	26	Low
Biodiversity Assessment														
Dukes														
Construction Phase														
Clearance of vegetation	Fauna and flora	• Loss of floral and faunal habitat mostly associated with Thicket Vegetation and Degraded/ Transformed Habitat. Loss of floral and faunal habitat associated with the Freshwater and Forest Habitat is minimal (current layout impacting largely on historically modified freshwater systems and forest margin vegetation) • Loss of floral and faunal species diversity • Loss of protected species within the Long Tom Mistbelt Forest	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Footprint areas - all construction related activities	Fauna and flora	• Edge effects impacting on adjacent habitat e.g., spread of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
Operational Phase														
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Loss of floral species diversity as further unnecessary clearance of vegetation around the proposed surface footprints takes place • Loss of faunal species diversity as animals move away due to increased presence of surface operational activities • Loss of viable soils due to lack of concurrent rehabilitation where areas outside of the authorised footprints have been disturbed • Disturbed areas provide ideal grounds for the proliferation of AIPs	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	50	Moderate
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding intact forest and freshwater habitats (already a significant issue within the Dukes area due to historic mining and current Illegal mining) • Potential collisions between mine vehicles and fauna • Potential harvesting of floral SCC and/or medicinal plants and/or indigenous vegetation • Potential trapping and snaring of fauna within adjacent natural habitat	WOM	Negative	Definite	5	Long term	4	Site	2	High	8	70	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Erosion and surface water runoff	Fauna and flora	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas • Degradation of Freshwater systems	WOM	Negative	Definite	5	Long term	4	Local	2	Medium	6	60	Moderate
Closure and Post-Closure														
Failure to rehabilitate	Fauna and flora	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Ongoing proliferation of AIPs in the disturbed surface footprint areas as well as to surrounding intact habitat post mining, replacing indigenous (and endemic) vegetation and floral communities • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites, leading to avoidable loss of SCC	WOM	Negative	Definite	5	Long term	4	Local	2	Medium	6	60	Moderate
Frankfort														
Construction Phase														
Clearance of vegetation	Fauna and flora	• Loss of floral and faunal habitat associated with the Long Tom Mistbelt Forest, intact Freshwater Habitat, Scrub and Thicket vegetation, as well as current	WOM	Negative	Definite	5	Medium term	3	Site	2	High	8	65	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		Degraded/ Transformed Habitat • Loss of floral and faunal species diversity • Loss of protected species within the Long Tom Mistbelt Forest and Freshwater Habitat												
Footprint areas - all construction related activities	Fauna and flora	• Edge effects impacting on adjacent habitat e.g., spread of alien vegetation into and freshwater systems, as well as the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
Operational Phase														
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Further unnecessary clearance of vegetation around the proposed footprints resulting in loss of floral diversity • Loss of faunal diversity with the increased presence and movement of personnel and vehicles • Disturbed areas provide ideal	WOM	Negative	Definite	5	Long term	4	Site	3	High	6	70	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		grounds for the proliferation of AIPs • Loss of viable soils due to lack of concurrent rehabilitation where areas have been disturbed outside of the authorised footprints												
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding intact Forest and Freshwater habitats, with high potential of these species spreading further downstream • Collisions with mine vehicles and fauna • Potential harvesting of floral SCC and/or	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		medicinal plants and/or indigenous vegetation (especially within the Forest vegetation and Montane Grassland vegetation) • Potential trapping and snaring of fauna within adjacent natural habitat												
Erosion and surface water runoff	Fauna and flora	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas, especially relating to the downslope Freshwater Habitat (with implications to habitat integrity in downstream habitat) • Degradation of Freshwater systems	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High
Closure and Post-Closure														
Failure to rehabilitate	Fauna and flora	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Proliferation of AIPs originating in the disturbed areas post mining, then replacing indigenous (and endemic) vegetation and floral communities within the remaining intact forest and	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		freshwater habitats (potentially moving into the Montane Grasslands) • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites, leading to avoidable loss of SCC												
Morgenzon														
Construction Phase														
Clearance of vegetation	Fauna and flora	• Loss of floral and faunal habitat largely associated with the Degraded/ Transformed areas, with smaller impacts to Freshwater and Forest Habitat • Loss of floral and faunal species diversity	WOM	Negative	Definite	5	Medium term	3	Local	1	Medium	6	50	Moderate
Footprint areas - all construction related activities	Fauna and flora	• Edge effects impacting on adjacent habitat e.g., spread of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
Operational Phase														

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Further unnecessary clearance of vegetation around the proposed footprints • Loss of viable soils due to lack of concurrent rehabilitation where areas have been disturbed. Disturbed areas provide ideal grounds for the proliferation of AIPs	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	60	Moderate
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding habitats (high potential for AIPs to spread to downstream	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		habitats), especially with already high abundance of AIPs within the Degraded/ Transformed areas • Collisions with mine vehicles and fauna • Potential harvesting of floral SCC and/or medicinal plants and/or indigenous vegetation • Potential trapping and snaring of fauna within adjacent natural habitat												
Erosion and surface water runoff	Fauna and flora	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas • Degradation of Freshwater systems	WOM	Negative	Definite	5	Long term	4	Site	3	Medium	6	65	High
Closure and Post-Closure														
Failure to rehabilitate	Fauna and flora	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Proliferation of AIPs originating in the disturbed areas and spreading to intact habitat post mining, then replacing	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	70	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		indigenous (and endemic) vegetation and floral communities (of concern are the Long Tom Mistbelt Forest and Freshwater Habitat) • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites, leading to avoidable loss of SCC												
Beta														
Construction Phase														
Clearance of vegetation	Fauna and flora	• Loss of floral and faunal habitat mostly associated with the Degraded/ Transformed areas, with smaller surface infrastructure proposed within the Thicket Vegetation. Loss of habitat within the Blyde River and Peach tree Stream possible with the current proposed layout • Loss of floral and faunal species diversity	WOM	Negative	Definite	5	Medium term	3	Site	2	High	8	65	High
Footprint areas - all construction related activities	Fauna and flora	• Edge effects impacting adjacent habitat e.g., spread of alien vegetation and the loss of viable soils for re-	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes												
Operational Phase														
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Further unnecessary clearance of vegetation around the proposed footprints • Loss of viable soils due to lack of concurrent rehabilitation where areas have been disturbed outside of authorised footprints. Disturbed areas provide ideal grounds for the proliferation of AIPs	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water	WOM	Negative	Definite	5	Medium term	3	Regional	3	Medium	6	60	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		sources during rainfall events												
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding habitats • Collisions with mine vehicles and fauna • Potential harvesting of floral SCC and/or medicinal plants and/or indigenous vegetation • Potential trapping and snaring of fauna within adjacent natural habitat	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
Erosion and surface water runoff	Fauna and flora	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas • Degradation of Freshwater systems (of concern is the Blyde River and Peach Tree Stream)	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High
Closure and Post-Closure														

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance[66]	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Failure to rehabilitate	Fauna and flora	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Proliferation of AIPs in the disturbed areas spreading to surrounding uninvaded habitat post mining (of greatest concern is the freshwater systems), replacing indigenous (and endemic) vegetation and floral communities • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites, leading to avoidable loss of SCC	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Freshwater														
Construction Phase														
Site clearing and removal of vegetation in the study area.	Freshwater ecosystems situated within the investigation area, downgradient of the project footprint	• Topsoil and subsoil stripping, exposure of soil leading to sedimentation • Noise and anthropogenic disturbance to freshwater ecosystems and associated biota • Potential spills and seepage of hydrocarbons and chemical constituents of concern to the downgradient systems.	WOM	Negative	Definite	5	Short term	1	Regional	3	Medium	6	50	Moderate
Development of surface infrastructure in support of underground mining	Freshwater ecosystems situated within the investigation area, downgradient of the project footprint	• Sedimentation, topsoil and subsoil stripping, exposure of soil, noise and anthropogenic disturbance to freshwater ecosystems and associated biota • Potential spills and seepage of hydrocarbons and chemical constituents of concern to the downgradient systems • Potential loss of recharge to freshwater ecosystems situated downstream due to separation of clean and dirty areas in line with GNR 704.	WOM	Negative	Definite	5	Medium term	3	Regional	3	Medium	6	60	Moderate
Operational Phase														
Use of constructed surface infrastructure for underground mining.	Freshwater ecosystems situated within the investigation area, downgradient of the project footprint	• Potential for contaminated runoff and discharge from the defined dirty water area into the freshwater ecosystems situated downgradient • Potential loss of recharge to freshwater ecosystems situated downstream due to separation of clean and dirty areas in line with GNR 704	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		• Potential formation of a cone of depression from underground mining activities • Sedimentation and increased flood peaks into the freshwater ecosystems as a result of increased hardened surfaces												
Closure and Post-Closure														
Decommissioning and post-closure management activities associated with the proposed mining activities	• Potential decant of contaminated water from the rehabilitated mine area leaching into the receiving environment and potentially into the freshwater ecosystems situated downgradient • Decant of contaminated water from underground to receiving environment	• Sedimentation of the downgradient systems • Potential contamination of water within the receiving freshwater environment and subsequent reduction in water quality (increase in salts and specific contaminants of concern and reduced pH) • Alteration of flow regime, negative impacts on vegetation, habitat degradation and subsequent loss of biodiversity of the freshwater ecosystems as a result of potential leaching or decant.	WOM	Negative	Highly Probable	4	Long term	4	Site	3	High	8	60	Moderate
Socio-Economic														
All activities associated with mining	Social	Potential formal influx of people and households related to those formally employed by the project	WOM	Negative	Highly Probable	4	Medium term	3	Local	1	High	8	48	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
All activities associated with mining	Social	Potential informal influx of people refers to people in the form of job seekers who enter the area in search of employment.	WOM	Negative	Highly Probable	4	Long term	4	Local	1	High	8	52	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Local	1	High	8	52	Moderate
All activities associated with mining	Social	Change in the social fabric of the community	WOM	Negative	Highly Probable	4	Long term	4	Local	1	High	8	52	Moderate
			WM	Negative	Probable	2	Long term	4	Local	1	High	8	26	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
All activities associated with mining	Social	Increase in nuisance factors (noise and dust)	WOM	Negative	Highly Probable	4	Medium term	3	Local	1	High	8	48	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
All activities associated with mining	Social	Potential increase in transmitted diseases due to informal influx of job-seekers	WOM	Negative	Highly Probable	4	Long term	4	Local	1	High	8	52	Moderate
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
All activities associated with mining	Social	Unfulfilled community expectations in terms of the employment creation and community development funds could increase the potential for civil unrest in the area	WOM	Negative	Highly Probable	4	Medium term	3	Local	1	High	8	48	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
All activities associated with mining	Social	Community safety due to remaining infrastructure	WOM	Negative	Probable	2	Long term	4	Local	1	High	8	26	Low
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
All activities associated with mining	Social	A potential increase in crime related to influx of job-seekers into the area	WOM	Negative	Highly Probable	4	Long term	4	Local	1	High	8	52	Moderate
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
All activities associated with mining and the movement of vehicles	Social	Risk of traffic accidents due to increased traffic flow	WOM	Negative	Definite	5	Medium term	3	Local	1	Medium	6	50	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
All activities associated with mining	Social	Impacts on illegal mining activities	WOM	Positive	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
			WM	Positive	Definite	5	Medium term	3	Local	1	High	8	60	Moderate
All activities associated with mining	Social	Potential pressure on local infrastructure and services due to influx of people seeking employment	WOM	Negative	Highly Probable	4	Long term	4	Local	1	High	8	52	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate
All activities associated with mining	Economic	Positive impacts on local employment and income due to the operation itself and due to supply-links with local suppliers.	WOM	Positive	Probable	2	Medium term	3	Regional	3	High	8	28	Low
			WM	Positive	Highly Probable	4	Medium term	3	Regional	3	High	8	56	Moderate
All activities associated with mining	Economic	A decrease/cessation in employment and community funds could negatively impact former beneficiaries	WOM	Negative	Definite	5	Long term	4	Local	1	High	8	65	High
			WM	Negative	Definite	5	Long term	4	Local	1	High	8	65	High
All activities associated with mining	Economic	Potential impact on other (non-supply linked) businesses (e.g. tourism activities) already established in the local area or downstream region	WOM	Negative	Probable	2	Long term	4	Local	1	High	8	26	Low
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
All activities associated with mining	Economic	Increase in tax income: Due to net positive spin-offs on employment and income levels, it is expected that tax revenue to local, provincial, and central government will increase	WOM	Positive	Definite	5	Medium term	3	Regional	3	Medium	6	60	Moderate
			WM	Positive	Definite	5	Medium term	3	Regional	3	Medium	6	60	Moderate
All activities associated with mining	Economic	Increase in other social funds	WOM	Positive	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
			WM	Positive	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
All activities associated with mining	Economic	Loss of income due to negative environmental or social impacts (external costs related to project):	WOM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low
			WM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low
All activities associated with mining	Economic	Job creation for low-income groups: the project is expected to create a number of unskilled jobs.	WOM	Positive	Probable	2	Medium term	3	Local	1	High	8	24	Low
			WM	Positive	Highly Probable	4	Medium term	3	Local	1	High	8	48	Moderate
All activities associated with mining	Economic	The project could contribute to increased concentration of economic activities in the commodity/mining sector, leaving the local economy vulnerable to external fluctuations	WOM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
			WM	Negative	Probable	2	Medium term	3	Local	1	Medium	6	20	Negligible
All activities associated with mining	Economic	The energy and water use of the project needs to be considered as it could be high compared to its economic output. This needs further investigation	WOM	Negative	Highly Probable	4	Medium term	3	Local	1	High	8	48	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
Heritage Assessment														
Construction Phase														
Construction of infrastructure and roads	Heritage	Damage/destruction of high significance heritage resources in the Beta North Frankfort and CDM mining areas	WOM	Negative	Highly Probable	4	Permanent	5	Regional	3	High	8	64	High
			WM	Negative	Definite	5	Permanent	5	Local	1	Low	6	40	Low
Operational Phase														
Operation of the mining areas and possible proliferating impacts	Heritage	Damage/destruction of high significance heritage resources in the Beta North Frankfort and CDM mining areas	WOM	Negative	Highly Probable	4	Permanent	5	Regional	3	High	8	64	High
			WM	Negative	Probable	2	Long term	4	Regional	3	High	8	30	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Closure and Post-Closure														
Decommissioning of infrastructure	Heritage	Damage/destruction of high significance heritage resources in the Beta North Frankfort and CDM mining areas	WOM	Negative	Improbable	1	Permanent	5	Regional	3	High	8	16	Negligible
			WM	Negative	Improbable	1	Long term	4	Site	2	High	8	14	Negligible
Noise Assessment														
Construction Phase														
Activities associated with the construction of the mines	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Probable	2	Short term	1	Site	2	Medium	6	18	Negligible
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible
Operational Phase														
Activities associated with the operations of the mines	Environmental Noise	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24-hour period (at the boundary of the mine footprint)	WOM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible
Movement of vehicles on mine and haul roads	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible
Underground mine ventilation stacks operations	Environmental Noise	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24-hour period (at the boundary of the mine footprint)	WOM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible
Closure and Post-Closure														
Activities associated with the construction of the mines	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Probable	2	Short term	1	Site	2	Medium	6	18	Negligible
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible
Blasting and Vibration														
Operational Phase														
Blasting at underground mining areas	Ground Vibration	• Damage to houses or infrastructure not owned by the mine • Upset people and occupants of houses	WOM	Negative	Highly Probable	4	Medium term	3	Local	2	Medium	6	40	Low
			WM	Negative	Probable	2	Medium term	3	Local	1	Low	2	12	Negligible

14 METHODOLOGY USED IN INDENTIFYING AND RANKING ENVIRONMENTAL IMPACTS[67]

The EIA 2014 Regulations (as amended) promulgated in terms of Sections 24 (5), 24(m) and 44 of the NEMA, require that all identified potential impacts associated with the project be assessed in terms of their overall potential significance on the natural, social, and economic environments. The criteria identified in the EIA Regulations (2014 as amended) include the following:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact;
- Probability of the impact occurring;
- Degree to which impact can be reversed;
- Degree to which impact may cause irreplaceable loss of resources;
- Degree to which the impact can be mitigated; and
- Cumulative impacts.

The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

Table 26: Methodology to Determine the Significance (Plomp, 2004)

Aspect	Description	Weight
Probability: This describes the likelihood of the impact actually occurring		
Improbable:	The possibility of the impact occurring is very low, due to the circumstances, design, or experience.	1
Probable:	There is a probability that the impact will occur to the extent that provision must be made therefore.	2
Highly Probable:	It is most likely that the impact will occur at some stage of the development.	4
Definite:	The impact will take place regardless of any prevention plans, and there can only be relied on mitigatory actions or contingency plans to contain the effect.	5
Duration: The lifetime of the impact		
Short term:	The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.	1
Medium term:	The impact will last up to the end of the phases, where after it will be negated.	3

[67] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site, and location of the development footprint within the site, including (vi) the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives

Aspect	Description	Weight
Long term:	The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.	4
Permanent:	Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.	5
Scale: The physical and spatial size of the impact		
Local:	The impacted area extends only as far as the activity, e.g. footprint	1
Site:	The impact could affect the whole, or a measurable portion of the above-mentioned properties.	2
Regional:	The impact could affect the area including the neighbouring residential areas.	3
Magnitude/Severity: Does the impact destroy the environment or alter its function?		
Low:	The impact alters the affected environment in such a way that natural processes are not affected.	2
Medium:	The affected environment is altered, but functions and processes continue in a modified way.	6
High:	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.	8
Significance: This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required ***Significance = Sum (Duration, Scale, Magnitude) x Probability***		
Negligible:	The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.	<20
Low:	The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.	<40
Moderate:	The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.	<60
High:	The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.	>60

15 THE POSITIVE AND NEGATIVE IMPACTS AND RISKS WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY THAT MAY BE AFFECTED THAT INFOMRED THE IDENTIFICATION OF EACH ALTERNATIVE [68]

Refer to the Alternatives Assessment discussion in Section 8 for the advantages and disadvantages of the site layout alternative options considered. An assessment of preliminary impacts identified for the proposed mining development was undertaken in Table 25.

16 THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK[69]

Table 27: Preliminary Mitigation Measures[70]

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
Geohydrological and Groundwater Assessment							
Construction Phase							
Tailings Facility - Continuation	Groundwater	Seepage of contaminated leachate into the aquifer system	WOM	Negative	Negligible	Tailings deposition will not take place during the construction phase and no impact is therefore expected. No management measures are recommended other than the establishment of a suitable groundwater monitoring network.	NEMA
Underground Shaft Re-development	Groundwater Quality	• Prior to the actual mining commencing the opening up and dewatering of main accessways will take place • Dewatering of flooded underground workings may pose a risk of contaminated water spilling into the surface water streams	WOM	Negative	Negligible	• Sample the water regularly to assess the water quality • If quality is not suitable for discharge, it should be pumped to an adequate holding facility.	NEMA NWA
Operational Phase							
Waste Deposition • TSF • RWD • WRD	Groundwater Quality	• Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. • Seepage of contaminated leachate into the aquifer system	WOM	Negative	Moderate	• Design and placement of suitable liner and drainage system according to the waste classification requirements. • Routine monitoring to act as early warning of potential impacts. • Implementation of remedial options to contain or remove contaminant plume, if required.	NEMA NWA NEMWA GN R632 of 2015 GN R634 of 2013 GN R635 of 2013

[68] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including (vii) 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;

[69] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including (viii) the possible mitigation measures that could be applied and level of residual risk

[70] Note that the above mitigation measures are subject to being updated during the EIA phase subsequent to further and more detailed work being conducted as may be required or as new information becomes available (these being for scoping purposes at present). Monitoring is listed as part of the mitigation measures; however it must be noted that monitoring in itself is not a mitigation measure. Monitoring is important to quantify and verify impacts against pre-development baseline and must be used to pro-actively determine when mitigations should be required.

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
Underground Mining	Groundwater Level and Yield	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	WOM	Negative	Moderate	• Drilling of cover boreholes ahead of development in virgin ground. These holes must be equipped with valves so that they can be closed if water is intersected and to allow for later grouting if necessary • It is recommended that groundwater intersections in the cover holes are grouted to allow for dry mining of the development ends • Pillars may be required around water-bearing geological structures • Accurate record keeping of all water intersections; the following should be recorded: ○ Position of the water intersection ○ Water pressure of the intersection as this provides an indication of the groundwater level ○ Groundwater quality ○ Grout volumes and sealing pressure.	NEMA NWA
Underground Mining	Groundwater Quality	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	WOM	Negative	Low	• Water that cannot be sealed should be included in the mining and processing circuit as far as possible • Water should be contained in underground dams from where it can be piped to holding dams on surface (prevent the water from flowing through the mineralised areas) • Reduce the contact time between the water and the rock.	NEMA NWA
Closure and Post-Closure							
Residual groundwater contamination from TSF, RWD and WRD after closure of the mine	Groundwater Quality	• Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. • Seepage of contaminated leachate into the aquifer system	WOM	Negative	Low	Design and implementation of a suitable rehabilitation plan.	NEMA NWA
Continued groundwater inflow into the mine	Groundwater Level and Yield	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	WOM	Negative	Moderate	Water entering the mine should be sealed as far as possible.	NEMA NWA
Residual groundwater contamination after closure of the mine	Groundwater Quality	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	WM	Negative	Low	Continued monitoring of the water quality and possible treatment of water if required.	NEMA NWA
Soil and Land Capability Assessment							

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
Construction Phase							
	Soil Erosion	Loosening of soils due to removal of vegetation. Increased runoff, erosion, and consequent loss of land capability in cleared areas.	WOM	Negative	Moderate	• All vehicles and mining equipment must be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks • All leaks should be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner • The approved Integrated Water and Waste Management Plan to be implemented. • All hazardous waste generated shall be kept separate and shall not be mixed with general waste • All hazardous waste shall be stored within appropriate facilities with appropriate linings where applicable. Prevent and reduce and remedy through management measures • • Activity should be limited to areas of historical disturbance as far as possible. Where required the compacted soils should be disked to an adequate depth and re-vegetated with indigenous plants • Soils compacted, should be deeply ripped to loosen compacted layers and re-graded to even running levels.	NEMA NWA
	Soil Compaction	Potential frequent movement of digging machinery and construction vehicles within lose and exposed soils, leading to excessive soil compaction.	WOM	Negative	Low		NEMWA GN R625 of 2012 GN R634 of 2013 GN 926 of 2013
	Soil Contamination	• Spillage of petroleum hydrocarbons and other chemical constituents of concern during construction of associated infrastructure. • Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	WOM	Negative	Moderate		CARA
	Land Capability	Loss of land capability	WOM	Negative	Low		MPRDA
Operational Phase							
	Soil Erosion	Constant disturbances of soils, resulting in risk of erosion	WOM	Negative	Low	• Excessive compaction of the soil by heavy machinery should be avoided by using prescribed access routes • Contractors should be committed not to overload trucks to avoid spillage. Spillage from trucks will be monitored and if necessary remedial measures should be implemented • If spills occur and soils are polluted, the affected soils should be removed and discarded at an appropriate permitted waste site • Compacted soils should be deeply ripped to loosen compacted layers and re-graded to even running levels • Contamination of these soils by possible seepage and return water runoff should be reduced by the use of collector drains and cut off trenches. Excess vegetation will be removed from the storm water berm drainage route to prevent back-up of flood occurring • All vehicles and mining equipment maintained as per the maintenance schedule to ensure they are in a proper working condition and to avoid any oil leaks • An emergency management system with procedures and training will be developed • If spills occur the affected soils will be removed using absorbent material and spill kits and disposed of to a permitted waste site.	NEMA
	Soil Compaction	Constant disturbances of soils, resulting in risk of compaction	WOM	Negative	Low		NEMWAA GN R625 of 2012 GN R634 of 2013 GN 926 of 2013
	Soil Contamination	• Leaching of hydrocarbons and other chemical constituents of concern into the soils, leading to alteration of the soil chemical status as well as contamination of ground water • Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	WOM	Negative	Moderate		CARA
	Land Capability	Loss of land capability	WOM	Negative	Low		MPRDA
Closure and Post-Closure							

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
	Soil Erosion	Soil handling during backfilling and capping leading to erosion.	WOM	Negative	Low	• Compacted soils adjacent to the proposed developments during construction should be lightly ripped to at least 25 cm below ground surface to alleviate compaction • Soil Compaction is usually greatest when soils are moist, so soils should be stripped when moisture content is as low as possible. If they have to be moved when wet, truck and shovel should be used as bowl scrapers create excessive compaction when moving wet soils • All disturbed areas should be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion • Temporary erosion control measures may be used to protect the disturbed soils during the rehabilitation until adequate vegetation has established • A site-specific drainage system design should be implemented to reduce the volume and velocity of flows crossing disturbed areas and to prevent the mixing of clean and dirty runoff as far as possible • Runoff attenuation, which function as wetlands or bioswales can potentially be placed at strategic points in the bottom of the landscape to assist with the assimilation of contaminants and to trap sediments	NEMA
	Soil Compaction	Movement of vehicles and machinery during rehabilitation leading to soil compaction.	WOM	Negative	Low		NEMA
	Soil Contamination	Spillage of hydrocarbons resulting from leakages from demolition equipment/machinery and other chemical storage facilities, leading to soil contamination (soil chemical characteristics.	WOM	Negative	Low		CARA
	Land Capability	Potentially poor rehabilitation strategy may result to lower infiltration rate, and consequently increased surface runoff. Increased soil erosion leading to permanent loss of soil resources	WOM	Negative	Low		NEMWA
Biodiversity Assessment							
Dukes							
Construction Phase							

Clearance of vegetation	Fauna and flora	• Loss of floral and faunal habitat mostly associated with Thicket Vegetation and Degraded/ Transformed Habitat. Loss of floral and faunal habitat associated with the Freshwater and Forest Habitat is minimal (current layout impacting largely on historically modified freshwater systems and forest margin vegetation)
		• Loss of floral and faunal species diversity
		• Loss of protected species within the Long Tom Mistbelt Forest
			WOM	Negative	Moderate	• Footprint areas associated with each site should be clearly demarcated and only vegetation within these footprints is to be cleared (not the entire site)
						• No clearance of vegetation outside of the footprint areas may be permitted, unless such clearance is part of a rehabilitation plan that encompasses these areas
						• Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities.
						• Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal
						• Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation. An AIP Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur without a certified professional. A rehabilitation plan should be developed and where possible, concurrent rehabilitation should be done at all times
						• Care should be taken during the construction to limit edge effects to surrounding areas. This can be achieved by:
						  ○ Demarcating all footprint areas during construction activities
						  ○ No dumping of litter, rubble or cleared vegetation on site should be allowed. Infrastructure and rubble removed because of the construction activities should be disposed of at an authorised waste disposal facility away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general
							• National Biodiversity Assessment (NBA, 2018)
							• National Threatened Ecosystems (2011) (GN 1002)
							• NEMA
							• NEMBA.
							• GN R1020 of 2020
							• NVFFA

Footprint areas - all construction related activities	Fauna and flora	• Edge effects impacting on adjacent habitat e.g., spread of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	WOM	Negative	Moderate		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
						waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility; and ○ All soils compacted as a result of construction activities should be ripped, profiled, and reseeded as per the rehabilitation plan • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil • No collection/ harvesting/ hunting of floral or faunal species (especially species of medicinal and conservation significance) may take place • Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed • Any natural areas beyond the proposed mine expansion that have been affected by the construction activities, must be rehabilitated using indigenous species • All rehabilitated areas should be rehabilitated to a point where natural processes will allow the pre-development ecological functioning and biodiversity of the area to be re-instated	
Operational Phase							
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Loss of floral species diversity as further unnecessary clearance of vegetation around the proposed surface footprints takes place • Loss of faunal species diversity as animals move away due to increased presence of surface operational activities • Loss of viable soils due to lack of concurrent rehabilitation where areas outside of the authorised footprints have been disturbed • Disturbed areas provide ideal grounds for the proliferation of AIPs	WOM	Negative	Moderate	*Same as previous*	
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	WOM	Negative	Moderate		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding intact forest and freshwater habitats (already a significant issue within the Dukes area due to historic mining and current Illegal mining) • Potential collisions between mine vehicles and fauna • Potential harvesting of floral SCC and/or medicinal plants and/or indigenous vegetation • Potential trapping and snaring of fauna within adjacent natural habitat	WOM	Negative	High		
Erosion and surface water runoff	Fauna and flora	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas • Degradation of Freshwater systems	WOM	Negative	Moderate		
Closure and Post-Closure							
Failure to rehabilitate	Fauna and flora	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Ongoing proliferation of AIPs in the disturbed surface footprint areas as well as to surrounding intact habitat post mining, replacing indigenous (and endemic) vegetation and floral communities • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites, leading to avoidable loss of SCC	WOM	Negative	Moderate	*Same as above*	
Frankfort							
Construction Phase							
Clearance of vegetation	Fauna and flora	• Loss of floral and faunal habitat associated with the Long Tom Mistbelt Forest, intact Freshwater Habitat, Scrub and Thicket vegetation, as well as current Degraded/ Transformed Habitat	WOM	Negative	High	*Same as previous*	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
		• Loss of floral and faunal species diversity • Loss of protected species within the Long Tom Mistbelt Forest and Freshwater Habitat					
Footprint areas - all construction related activities	Fauna and flora	• Edge effects impacting on adjacent habitat e.g., spread of alien vegetation into and freshwater systems, as well as the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	WOM	Negative	Moderate		
Operational Phase							
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Further unnecessary clearance of vegetation around the proposed footprints resulting in loss of floral diversity • Loss of faunal diversity with the increased presence and movement of personnel and vehicles • Disturbed areas provide ideal grounds for the proliferation of AIPs • Loss of viable soils due to lack of concurrent rehabilitation where areas have been disturbed outside of the authorised footprints	WOM	Negative	High	*Same as previous*	
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	WOM	Negative	Moderate		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding intact Forest and Freshwater habitats, with high potential of these species spreading further downstream • Collisions with mine vehicles and fauna • Potential harvesting of floral SCC and/or medicinal plants and/or indigenous vegetation (especially within the Forest vegetation and Montane Grassland vegetation) • Potential trapping and snaring of fauna within adjacent natural habitat	WOM	Negative	High		
Erosion and surface water runoff	Fauna and flora	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas, especially relating to the downslope Freshwater Habitat (with implications to habitat integrity in downstream habitat) • Degradation of Freshwater systems	WOM	Negative	High		
Closure and Post-Closure							
Failure to rehabilitate	Fauna and flora	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Proliferation of AIPs originating in the disturbed areas post mining, then replacing indigenous (and endemic) vegetation and floral communities within the remaining intact forest and freshwater habitats (potentially moving into the Montane Grasslands) • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites, leading to avoidable loss of SCC	WOM	Negative	High	*Same as above*	
Morgenzon							
Construction Phase							

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
Clearance of vegetation	Fauna and flora	• Loss of floral and faunal habitat largely associated with the Degraded/ Transformed areas, with smaller impacts to Freshwater and Forest Habitat • Loss of floral and faunal species diversity	WOM	Negative	Moderate	*Same as previous*	
Footprint areas - all construction related activities	Fauna and flora	• Edge effects impacting on adjacent habitat e.g., spread of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	WOM	Negative	Moderate		
Operational Phase							
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Further unnecessary clearance of vegetation around the proposed footprints • Loss of viable soils due to lack of concurrent rehabilitation where areas have been disturbed. Disturbed areas provide ideal grounds for the proliferation of AIPs	WOM	Negative	Moderate	*Same as previous*	
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	WOM	Negative	Moderate		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding habitats (high potential for AIPs to spread to downstream habitats), especially with already high abundance of AIPs within the Degraded/ Transformed areas • Collisions with mine vehicles and fauna • Potential harvesting of floral SCC and/or medicinal plants and/or indigenous vegetation • Potential trapping and snaring of fauna within adjacent natural habitat	WOM	Negative	High		
Erosion and surface water runoff	Fauna and flora	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas • Degradation of Freshwater systems	WOM	Negative	High		
Closure and Post-Closure							
Failure to rehabilitate	Fauna and flora	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Proliferation of AIPs originating in the disturbed areas and spreading to intact habitat post mining, then replacing indigenous (and endemic) vegetation and floral communities (of concern are the Long Tom Mistbelt Forest and Freshwater Habitat) • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites, leading to avoidable loss of SCC	WOM	Negative	High	*Same as previous*	
Beta							
Construction Phase							

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
Clearance of vegetation	Fauna and flora	• Loss of floral and faunal habitat mostly associated with the Degraded/ Transformed areas, with smaller surface infrastructure proposed within the Thicket Vegetation. Loss of habitat within the Blyde River and Peach tree Stream possible with the current proposed layout • Loss of floral and faunal species diversity	WOM	Negative	High	*Same as previous*	
Footprint areas - all construction related activities	Fauna and flora	• Edge effects impacting adjacent habitat e.g., spread of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	WOM	Negative	Moderate		
Operational Phase							
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Further unnecessary clearance of vegetation around the proposed footprints • Loss of viable soils due to lack of concurrent rehabilitation where areas have been disturbed outside of authorised footprints. Disturbed areas provide ideal grounds for the proliferation of AIPs	WOM	Negative	Moderate	*Same as previous*	
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	WOM	Negative	Moderate		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
All activities associated with mining and the movement of vehicles (surface operations).	Fauna and flora	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding habitats • Collisions with mine vehicles and fauna • Potential harvesting of floral SCC and/or medicinal plants and/or indigenous vegetation • Potential trapping and snaring of fauna within adjacent natural habitat	WOM	Negative	Moderate		
Erosion and surface water runoff	Fauna and flora	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas • Degradation of Freshwater systems (of concern is the Blyde River and Peach Tree Stream)	WOM	Negative	High		
Closure and Post-Closure							
Failure to rehabilitate	Fauna and flora	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Proliferation of AIPs in the disturbed areas spreading to surrounding uninvaded habitat post mining (of greatest concern is the freshwater systems), replacing indigenous (and endemic) vegetation and floral communities • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites, leading to avoidable loss of SCC	WOM	Negative	High	*Same as previous*	
Freshwater							
Construction Phase							
Site clearing and removal of vegetation in the study area.	Freshwater ecosystems situated within the investigation area, downgradient of the project footprint	• Topsoil and subsoil stripping, exposure of soil leading to sedimentation • Noise and anthropogenic disturbance to freshwater ecosystems and associated biota	WOM	Negative	Moderate	• The design, according to the requirements of GN 704, and use of clean and dirty water separation systems and suitable residue deposits are considered imperative and development of this infrastructure must occur first so as to contain runoff for the remainder of the construction period.	• NWA • GN 509 of 2016 • GN 704 of 1999

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
		• Potential spills and seepage of hydrocarbons and chemical constituents of concern to the downgradient systems.				• Any runoff and containment of contaminated runoff from the proposed mining activities must ensure that they are contained within a dirty water containment and that no discharge into the clean water environment occurs. • The delineated freshwater ecosystem boundaries and the applicable MTPA (2013) setback buffers should be marked as "no go" areas unless it is absolutely unavoidable for some small low risk infrastructure components to encroach on these systems; • All vehicle refuelling is to take place outside of the delineated boundaries of the freshwater ecosystems and associated 100 m buffer zone GN 704; The footprint of the proposed mining activities within the study area is to remain as small as possible and vegetation clearing is to be limited to what is absolutely essential to prevent excessive runoff and sedimentation of the freshwater ecosystems; • Any exposed soil should be protected by means of a suitable geotextile covering such as hessian sheeting. If necessary, compacted soil should be disked to an adequate depth and revegetated with indigenous plants, thereby preventing sedimentation and runoff to freshwater ecosystems situated downgradient; • Taking into consideration the infrastructure layout within the study sites that constitute the study area, it should be feasible to utilise existing roads to gain access to the study area and development of new roads should be avoided; • Vehicles and mining equipment should be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks; and All leaks/spills must be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner • Any exposed soil should be protected by means of a suitable geotextile covering. If necessary, compacted soil should be disked to an adequate depth and revegetated with indigenous plants, thereby preventing sedimentation and runoff to freshwater ecosystems situated downgradient; • Vehicles and mining equipment should be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks; • Upstream dewatering boreholes should be considered in order to minimise the creation of any potential dirty water associated with the proposed mining activities and this clean water can be discharged via the clean water system into the surrounding freshwater ecosystems. this must be guided by the geohydrologist; • No discharge from the dirty water area must be allowed to occur at any time. Water levels need to be strictly managed to ensure they are kept below any decant levels whilst ensuring that a significant cone of depression impact does not take place; rehabilitation must take place to ensure that residual impacts to the receiving environment are minimised and that the systems can recover	
Development of surface infrastructure in support of underground mining	Freshwater ecosystems situated within the investigation area, downgradient of the project footprint	• Sedimentation, topsoil and subsoil stripping, exposure of soil, noise and anthropogenic disturbance to freshwater ecosystems and associated biota • Potential spills and seepage of hydrocarbons and chemical constituents of concern to the downgradient systems • Potential loss of recharge to freshwater ecosystems situated downstream due to separation of clean and dirty areas in line with GNR 704.	WOM	Negative	Moderate		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
						from any impacts that occurred to the same or better condition than the pre project state	
Operational Phase							
Use of constructed surface infrastructure for underground mining.	Freshwater ecosystems situated within the investigation area, downgradient of the project footprint	• Potential for contaminated runoff and discharge from the defined dirty water area into the freshwater ecosystems situated downgradient • Potential loss of recharge to freshwater ecosystems situated downstream due to separation of clean and dirty areas in line with GNR 704 • Potential formation of a cone of depression from underground mining activities • Sedimentation and increased flood peaks into the freshwater ecosystems as a result of increased hardened surfaces	WOM	Negative	High		
Closure and Post-Closure							
Decommissioning and post-closure management activities associated with the proposed mining activities	• Potential decant of contaminated water from the rehabilitated mine area leaching into the receiving environment and potentially into the freshwater ecosystems situated downgradient • Decant of contaminated water from underground to	• Sedimentation of the downgradient systems • Potential contamination of water within the receiving freshwater environment and subsequent reduction in water quality (increase in salts and specific contaminants of concern and reduced pH) • Alteration of flow regime, negative impacts on vegetation, habitat degradation and subsequent loss of biodiversity of the freshwater ecosystems as a result of potential leaching or decant.	WOM	Negative	Moderate		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
	receiving environment.						
Socio-Economic							
All activities associated with mining	Social	Potential formal influx of people and households related to those formally employed by the project	WOM	Negative	Moderate	TBC	None
			WM	Negative	Low		
All activities associated with mining	Social	Potential informal influx of people refers to people in the form of job seekers who enter the area in search of employment.	WOM	Negative	Moderate	TBC	None
			WM	Negative	Moderate		
All activities associated with mining	Social	Change in the social fabric of the community	WOM	Negative	Moderate	TBC	None
			WM	Negative	Low		
All activities associated with mining and the movement of vehicles.	Social	Increase in nuisance factors (noise and dust)	WOM	Negative	Moderate	TBC	None
			WM	Negative	Low		
All activities associated with mining	Social	Potential increase in transmitted diseases due to informal influx of job-seekers	WOM	Negative	Moderate	TBC	None
			WM	Negative	Low		
All activities associated with mining	Social	Unfulfilled community expectations in terms of the employment creation and community development funds could increase the potential for civil unrest in the area	WOM	Negative	Moderate	TBC	None
			WM	Negative	Low		
All activities associated with mining	Social	Community safety due to remaining infrastructure	WOM	Negative	Low	TBC	None
			WM	Negative	Low		
All activities associated with mining	Social	A potential increase in crime related to influx of job-seekers into the area	WOM	Negative	Moderate	TBC	None
			WM	Negative	Low		
All activities associated with mining and the	Social	Risk of traffic accidents due to increased traffic flow	WOM	Negative	Moderate	TBC	None
			WM	Negative	Low		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
movement of vehicles.							
All activities associated with mining	Social	Impacts on illegal mining activities	WOM	Positive	Low	TBC	None
			WM	Positive	Moderate		
All activities associated with mining	Social	Potential pressure on local infrastructure and services due to influx of people seeking employment	WOM	Negative	Moderate	TBC	None
			WM	Negative	Moderate		
All activities associated with mining	Economic	Positive impacts on local employment and income due to the operation itself and due to supply-links with local suppliers.	WOM	Positive	Low	TBC	None
			WM	Positive	Moderate		
All activities associated with mining	Economic	A decrease/cessation in employment and community funds could negatively impact former beneficiaries	WOM	Negative	High	TBC	None
			WM	Negative	High		
All activities associated with mining	Economic	Potential impact on other (non-supply linked) businesses (e.g. tourism activities) already established in the local area or downstream region	WOM	Negative	Low	TBC	None
			WM	Negative	Low		
All activities associated with mining	Economic	Increase in tax income: Due to net positive spin-offs on employment and income levels, it is expected that tax revenue to local, provincial, and central government will increase	WOM	Positive	Moderate	TBC	None
			WM	Positive	Moderate		
All activities associated with mining	Economic	Increase in other social funds	WOM	Positive	Low	TBC	None
			WM	Positive	Low		
All activities associated with mining	Economic	Loss of income due to negative environmental or social impacts (external costs related to project):	WOM	Negative	Low	TBC	None
			WM	Negative	Low		
All activities associated with mining	Economic	Job creation for low-income groups: The project expected to create a number of unskilled jobs.	WOM	Positive	Low	TBC	None
			WM	Positive	Moderate		
All activities associated with mining	Economic	The project could contribute to increased concentration of economic activities in the commodity/mining sector leaving the local economy vulnerable to external fluctuations	WOM	Negative	Low	TBC	None
			WM	Negative	Negligible		
All activities associated with mining	Economic	The energy and water use of the project needs to be considered as it could be	WOM	Negative	Moderate	TBC	None
			WM	Negative	Low		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
		high compared to its economic output. This needs further investigation					
Heritage Assessment							
Construction Phase							
Construction of infrastructure and roads	Heritage	Damage/destruction of high significance heritage resources in the Beta North Frankfort and CDM mining areas.	WOM	Negative	High	• Site Management Plan: Compile a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric. • Phase 2 Mitigation: Integrated and Legally compliant Phase 2 Study and assessment. Site Monitoring: Strict monitoring (construction and commissioning) by the heritage consultant or an ECO familiar with the heritage occurrences of the sites. • Site Declaration Status: Engage the relevant heritage authority (SAHRA, SAHRA Built Environment) in terms of site declaration status as Grade II Provincial Heritage Resources subject to the NHRA 1999 (Section 7). • Further Research: Engage with tertiary institutions, academics and relevant specialists to document and further research the Pilgrim's Rest and Ponieskrants historical horizon. • Site Monitoring: General site monitoring by informed ECO on a bi-weekly basis during construction. • Burials - Avoidance: Implement a heritage conservation buffer of at least 100 m around the graves/cemetery, redesign the project layouts to avoid the heritage resource and the proposed conservation buffer. Fence all burial places and apply access control. Implement a site management plan detailing strict site management conservation measures. • Burials - Site Management Plan: Compile a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric. • Burials - Grave Relocation: Relocation of burials and documentation of site, full social consultation with affected parties, possible conservation management and protection measures. Subject to authorisations and relevant permitting from heritage authorities and affected parties.	NHRA
			WM	Negative	Low		
			WM	Negative	Negligible		
Operational Phase							
Operation of the Mining areas and possible proliferating impacts	Heritage	Damage/destruction of high significance heritage resources in the Beta North Frankfort and CDM mining areas.	WOM	Negative	High	• Site Management Plan: Implement heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric. • Phase 2 Mitigation: Integrated and Legally compliant Phase 2 Study and assessment. • Site Monitoring: Strict monitoring (construction and commissioning) by the heritage consultant or an ECO familiar with the heritage occurrences of the sites.	NHRA
			WM	Negative	Low		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
			WM	Negative	Low	• Further Research: Engage with tertiary institutions, academics and relevant specialists to document and further research the Pilgrim's Rest and Ponieskrants historical horizon. • Site Monitoring: General site monitoring by informed ECO on a bi-weekly basis during construction. • Burials - Avoidance: Implement a heritage conservation buffer of at least 100 m around the graves/cemetery, redesign the project layouts to avoid the heritage resource and the proposed conservation buffer. Fence all burial places and apply access control. Implement a site management plan detailing strict site management conservation measures. • Burials - Site Management Plan: Implement a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric.	
Closure and Post-Closure							
Decommissioned of infrastructure	Heritage	Damage/destruction of high significance heritage resources in the Beta North Frankfort and CDM mining areas.	WOM	Negative	Negligible	• Site Management Plan: Implement heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric • Site Monitoring: Strict monitoring (construction and commissioning) by the heritage consultant or an ECO familiar with the heritage occurrences of the sites • Further Research: Engage with tertiary institutions, academics and relevant specialists to document and further research the Pilgrim's Rest and Ponieskrants historical horizon • Burials - Site Monitoring: General site monitoring by informed ECO on a bi-weekly basis during construction • Burials - Avoidance: Implement a heritage conservation buffer of at least 100 m around the graves/cemetery, redesign the project layouts to avoid the heritage resource and the proposed conservation buffer • Burials -site Management Plan: Compile a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric.	
			WM	Negative	Negligible		
			WOM	Negative	Negligible		
Noise Assessment							
Construction Phase							
Activities associated with the construction of the mines	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Negligible	• Construction crew must conduct toolbox talks to educate their employees and ensure that they are aware of the legislation regarding noise • Should a noisy construction activity occur off the project footprint and near a receptor, the Environmental Coordinator should inform the receptor prior to the activity • Should noisy night-time activity occur (after 9pm, e.g. concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence.	GN R154 of 1992
			WM	Negative	Negligible		
Operational Phase							

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
Activities associated with the operations of the mines	Environmental Noise	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24-hour period (at the boundary of the mine footprint).	WOM	Negative	Low	The introduction of berms or acoustical shields in key areas.	GN R154 of 1992
			WM	Negative	Negligible		
Movement of vehicles on mine and haul roads	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Low	The project should consider reverse alarms that do not generate a high noise nuisance due to its tonality. Although heavy vehicle reverse alarms are exempt from noise legalisation (GN R154) and needs to meet occupational health and safety standards, certain reverse alarms are less intrusive (less tonal more broadband character etc.).	GN R154 of 1992
			WM	Negative	Negligible		
Underground mine ventilation stacks operations	Environmental Noise	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24-hour period (at the boundary of the mine footprint).	WOM	Negative	Low	The following could be considered • Sonic lining - Sonic Liner reduces the sound transmission along the vent duct • Silencers/sound attenuator, duct silencer, sound trap, muffler - Noise can be redirected or lowered by means of above-mentioned design implementation • Direction (to be discussed with project engineers) – Diffraction in the temperature layers at night could redirect the noise levels back to a receptor. The ventilation outputs could be directed rather away (opposed to upwards) from receptors within 2 km by means as previously stated (Silencers/sound attenuator, duct silencer, sound trap, muffler) • Barrier/berm - If feasible vents could be obscured (acoustical berm or shield) The berm/acoustical barrier should consider the following: ○ The berms should be solid (aggregate, brick etc. no foliage e.g. trees) ○ The height should be a minimum of two (2) meters higher than top of the vent shaft ○ The berm/barrier will assist in the spill over points (create an acoustical shadow at 900 due to vent noise spill over at 900) on the exit point of the vent, but not the return of noise levels due to refraction in the atmosphere temperature layers ○ Berms or the selected acoustical barrier should enclose all sides of the vent exit port in relation to receptors ○ A berm or solid double brick wall could be implemented here ○ The acoustical shield needs to be implemented as feasibly close as possible to the vents as possible.	GN R154 of 1992
			WM	Negative	Negligible		
Closure and Post-Closure							

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Preliminary Management Measures	Compliance with Standards (where applicable)
Activities associated with the construction of the mines	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Negligible	• Construction crew must conduct toolbox talks to educate their employees and ensure that they are aware of the legislation regarding noise • Should a noisy construction activity occur off the project footprint and near a receptor, the Environmental Coordinator should inform the receptor prior to the activity • Should noisy night-time activity occur (after 9pm, e.g. concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence.	GN R154 of 1992
			WM	Negative	Negligible		
Blasting and Vibration							
Operational Phase							
Blasting at underground mining areas	Ground Vibration	Damage to houses or infrastructure not owned by the mine, upset people and occupants of houses	WOM	Negative	Low	Specific blast design and planning to be considered, sequence of blasting operations, limit blast ends detonated simultaneously	MHSA GN R93 of 1997 EA
			WM	Negative	Negligible		

17 THE OUTCOME OF THE SITE SELECTION MATRIX - FINAL SITE LAYOUT PLAN[71]

The conceptual designs for the various sites have been informed by Ecological input and the previously disturbed footprint areas. Refinement of the layouts will be done for the EIA phase by the Engineers to allow for final construction designs. Some aspects that will be taken into account include heritage and palaeontological findings and the summer terrestrial and aquatic surveys.

The conceptual layouts are presented in Figure 4 to Figure 9 and ANNEXURE D.

18 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED. [72]

Refer to Section 8 for alternatives considered.

19 STATEMENT MOTIVATING THE PREFERRED SITE[73].

The sites are all previous underground mining areas which were approved as part of the EMPR for the 83 MR area. As the cut-off grade is not much lower than what was historically viable, these areas can be re-developed and mined viably with new technology with minimal additional impact. To mitigate the risk of loss of CBAs, sensitive floral communities, threatened ecosystems and floral SCCs, a biodiversity verification and pre-feasibility assessment was conducted in May 2021 to identify environmental buffer zones. These assessments then informed the engineering concept designs to ensure that the surface infrastructure layout is limited to previously disturbed areas where possible. No other sites where therefore evaluated.

20 PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

20.1 DESCRIPTION OF ALTERNATIVES TO BE CONSIDERED INCLUDING THE OPTION OF NOT GOING AHEAD WITH THE ACTIVITY.[74]

The DFFE guidelines for an Integrated Environmental Management (IEM) procedure requires that an environmental investigation considers feasible alternatives for any proposed development. Furthermore, the EIA Regulations (2014) (as amended)require that a number of alternatives for accomplishing the same objectives should be considered.

Various alternatives have been assessed for the project at scoping level, and workshopped during specialist, applicant, and engineering team interactions. The alternatives were also influenced by the existing baseline environmental data and specialist inputs, and by discussions with authorities and with I&APs.

Alternatives relevant to this development can be categorized as follows:

- Site location alternatives;

[71] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site, and location of the development footprint within the site, including (ix) the outcome of the site selection matrix;
[72] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such;
[73] Required as per the EIA regulations Appendix 2 (g) a full description of the process followed to reach the proposed preferred activity, site, and location of the development footprint within the site, including (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity
[74] Required as per the EIA regulations Appendix 2 (h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including-(i) a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity

- Layout alternatives:
  - Frankfort layout;
- Technology alternatives:
  - Electrical supply;
  - Renewable Energy
  - Mining method;
- The “no-go” alternative.

20.2 DESCRIPTION OF THE ASPECTS TO BE ASSESSED AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS[75]

Key aspects identified by the EAP, specialists and I&AP’s to be assessed as part of the EIA include inter alia:

- Groundwater impacts
- Surface water impact and pollution
- Stormwater management
- Air quality pollution (dust and emissions)
- Noise pollution
- Biodiversity impacts (Fauna and Flora)
- Impact on land use and land capability
- Soil degradation and pollution
- Visual impacts and Sense of place
- Heritage impacts
- Vibration/Blasting Concerns
- Mine closure and rehabilitation

20.3 DESCRIPTION OF ASPECTS TO BE ASSESSED BY SPECIALISTS[76]

As part of the Environmental Authorisation Process, a number of investigations will be undertaken and updated by suitably qualified specialists in order to gather baseline information pertaining to the current state of the environment as well as to identify the environmental impacts that may be associated with the proposed Project. The specialist studies to be undertaken include the following:

- Air Quality impact assessment and Greenhouse Gas Assessment (GHG)
- Biodiversity impact assessment
- Blasting and Vibration study
- Freshwater and aquatic ecology impact assessment
- Geohydrological impact assessment
- Dolomite Stability assessment
- Phase 1 Heritage impact assessment and paleontological assessment
- Noise impact assessment
- Socio-economic impact assessment
- Soil and land use capability

75 Required as per the EIA regulations Appendix 2 (h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including (ii) a description of the aspects to be assessed as part of the environmental impact assessment process;

76 Required as per the EIA regulations Appendix 2 (h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including (iii) aspects to be assessed by specialists;

- Stormwater management plans
- Traffic impact assessment
- Visual impact assessment
- Waste classification

It has been decided to exclude the following specialist studies, or to address them in other reports with motivation and references:

- *Hydrological impact study*: The outcomes of this study will be addressed within the stormwater engineering design study, the baseline surface water monitoring reporting, the geohydrological assessment and the Aquatic biodiversity study. It is therefore the opinion of the EAP that a separate study will not add value to the EIA decision making process.
- *Climate change study:* A study was conducted in 2020 for the larger opencast project proposed on the site. The opencast has since been placed on hold and the decision was made to pursue underground operations instead. As part of this EIA process, an air quality impact assessment with GHG assessment will be done and included in the EIA. With previous information and an air quality impact assessment that will cater for these impacts, it is the opinion of the EAP that a separate study will not add any value to the decision-making process.
- *Health Impact assessment:* The closest receptor to the TSF site is the Browns Community. The Browns Community will have to be resettled as part of the project. Air quality and water quality impacts will be assessed during the project and impacts on sensitive receptors will be identified. However, should these assessments still show impacts above allowable legislated limits with mitigation during the EIA specialist findings, the requirement for a health impact assessment will be re-evaluated.
- *Radiological assessment:* A study was conducted in 2020, which included a radiological assessment. The study has not shown any concerns and is currently being discussed with the NNR and NERSA. It was therefore decided that the previous assessment will be used in this EIA and no new study is required.

The Environmental Impact Assessment process will be used to determine the best practical environmental option for the proposed project and will assist the mine in identifying appropriate mitigation measures. The main objective of the mitigation measures will be to reduce the operational and long-term effects of the proposed project on the environment.

20.3.1 AIR QUALITY ASESSMENT

The Air Quality Impact Assessment (AQIA), GHG and AEL will be done by Airshed Planning Professionals.

Based on the activities associated with the proposed Project, an AQIA is required to be conducted as part of the EIA. The scope of work will include the following tasks:

- The compilation of an emissions inventory including the identification and quantification of all emissions associated with the proposed mining, processing, and smelting operations. Pollutants quantified will include particulate matter (TSP, PM_{10} and $PM_{2.5}$) and gaseous emissions (SO_2, NO_2, VOCs and CO). Use will be made of engineering design parameters, design emission standards, emissions factors published by the United States Environmental Protection Agency (US EPA) and Australian National Pollutant Inventory (NPI).
- Atmospheric dispersion simulations of all gaseous pollutants, PM_{10}, $PM_{2.5}$ and dust fallout and gaseous pollutants (SO2, NO2, VOCs and CO) as well as selected metals for the operations reflecting highest hourly, daily, and annual average concentrations and total daily dust deposition due to routine and upset emissions from the TGME operations. The US EPA approved AERMOD model will be used. AERMOD is a dispersion modelling system with three components, namely:

  - AERMOD (AERMIC Dispersion Model),
  - AERMAP (AERMOD terrain pre-processor), and
  - AERMET (AERMOD meteorological pre-processor).
- Impact assessment to be compiled by comparing ambient pollutant concentration levels to the NAAQS, NDCR, and other relevant health and odour screening limits to assess the potential impact on the surrounding environment and human health. This will inform the significance rating to be done in accordance with the significance rating methodology.
- The identification of air quality management and mitigation measures based on the findings of the compliance and impact assessment, and recommendations will be made to ensure legal compliance during operations.
- A GHG emissions inventory will be developed for the construction, operation and decommissioning of the project. This will be compared to the global and national emission inventory; and compared to international benchmarks for the project. Calculated emissions will be compared to guidelines provided by the International Finance Corporation.
- An AEL application will be completed once the AQIA is done, and this will be submitted on-line after the client has registered online at the SAAELIP (**online portal for the management of Atmospheric Emission Licenses)**.

20.3.2 SOILS AND LAND CAPABILITY SCOPE

The soil and land capability assessment will be done by SAS.

The scope of work and specific outcomes in terms of the EIA Phase report are presented in the points below:

- Detailed analysis of field results considering the various soil types;
- Analyse and interpret soil analysis data to assess the contamination risk/impacts under current conditions; and
- Provide detailed mitigation measures and management practices to implement in order to comply with applicable legislations.

The proposed methodology includes desktop analysis and existing data review to support the field work component, as presented below.

Phase I: Desktop Review

- Undertake a desktop reconnaissance survey of the study area;
- Review and identify broad soil patterns and land capability data within the investigated project area on the Agricultural Geo-referenced Information System (AGIS) and/or Agricultural Research Council Institute for Soil Climate and Water (ARC-ISCW) databases; and
- Identify selected points of interests (POIs) within the study area for verification Phase II: Field Verification Assessment
- A soil classification survey will be conducted within the proposed options;
- Subsurface soil observations and sampling will be made by means of a manual bucket hand auger;
- Dominant soil types will be classified, and soil boundaries established according to the South African Soil Classification System (Soil Classification Working Group, 2018);
- The assessed survey and sampling points will be recorded on a Global Positioning System (GPS); and
- Field assessment data will include a detailed description of physical soil properties

Phase II: Mapping and Data Analysis:

- Group uniform soil patterns into map units, according to observed limitations;
- Evaluate land capability of the demarcated soil map units in terms of land capability; Evaluate land use impacts of the proposed land use development;
- Assess the significance of the anticipated impacts of the proposed development on the Agricultural Resources in terms of Land Capability;
- Provide recommended mitigation measures and management practices to be implemented in order to offset the identified impacts; and

20.3.3 GEOHYDROLOGICAL IMPACT ASSESSMENT

The Geohydrological impact assessment will be undertaken by MVB Consulting.

The following actions are considered for the EIA phase above the scoping level input report:

- Drilling of additional groundwater monitoring boreholes, as per the recommendations in the SR.
- Aquifer testing of the new boreholes.
- The three-dimensional numerical groundwater flow and mass transport model will be updated with the new information. This will aim at quantifying the potential impact from the mine infrastructure and activities on the groundwater system as well as the possibility of mass movement. The development of the numerical model will allow the specialist to recommend mitigation measures for the predicted impacts.
- The future risk assessment will be re-evaluated against the scoping phase risk assessment and will be updated accordingly.

20.3.4 AQUATIC ECOLOGICAL ASSESSMENT

The aquatic ecological assessment will be done by SAS.

An initial site visit was undertaken as per the baseline description; however summer surveys will also take place at the various sites. Comprehensive and detailed freshwater ecological studies will need to take place to ensure that the landscape is adequately characterized and understood in the EIA phase of the project.

The points below will define the indices that will be used in the ecological assessment of the sites:

- On site biota specific water quality testing will take place for parameters including pH, conductivity, dissolved oxygen and temperature;
- Habitat integrity will be assessed according to the Index of Habitat Integrity (IHI) (Kleynhans, 2008);
- Habitat conditions for aquatic macro-invertebrates according to the IHAS index (McMillan, 1998);
- The Riparian Vegetation Response Assessment Index (VEGRAI) will be applied according to the protocol of Kleynhans et al., 2008;
- Assessment of the aquatic macro-invertebrate community. Assessments will be based on the SASS5 index according to the protocol of Dickens & Graham (2002). All assessments will be undertaken by a SA RHP accredited practitioner. Analyses of data will take place by comparing the data to the classification of Dallas (2007) Dickens & Graham (2002). In addition, the MIRAI ecostatus tool will be used to further characterize and define the PES and potential risks to the aquatic macroinvertebrate community;
- The fish community will be assessed based on the FRAI Ecostatus tool to characterize and define the PES and potential risks to the aquatic macroinvertebrate community; and

- All results will be compiled and used to update the draft report including; field assessment results, impact assessment and management and mitigation plans along with all supporting documentation as appendices;

20.3.5 TERRESTRIAL ECOLOGICAL ASSESSMENT

The EIA level aquatic ecological assessment will be done by STS.

An initial site visit was undertaken as per the baseline description; however summer surveys will also take place at the various sites. The following will form part of the EIA evaluation:

- Field assessments will be undertaken, and assessment methods will be applied to characterise the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of the site and to identify ecosystems and biological assemblages at risk. follow-up assessment will take place as part of the EIA and WULA phase studies, comprising:
- Update of the desktop assessment to reflect all relevant information in newly developed or updated databases;
- Biodiversity Reporting and Impact Assessment based on updated layouts and final site assessment. The assessment will fulfil the ecological assessment requirements of the EIA as required in terms of the National Environmental Management Act (NEMA) and the associated regulations as well as other legal requirements applicable on both a national and provincial level. The reports produced will also highlight key mitigatory and management measures to minimise impacts on both local and regional ecology. A site sensitivity map will be developed from the data gathered during the assessment.

20.3.6 NOISE ASSESSMENT

The EIA level noise assessment will be done by Enviroroots.

A full environmental noise impact assessment is required to ensure the mine would comply to the GN R154 of 1992. .

The baseline data gathered will be used and the following steps will take place for the EIA phase:

- Calculation of noise propagation;
- Analising of results; and
- Results of the survey, report and recommendations and mapping of noise contours for the proposed site(s).

20.3.7 VISUAL IMPACT ASSESSMENT

The EIA level visual impact assessment (VIA) will be done by SAS.

The assessment will be conducted across three phases:

- Desktop information will be gathered to obtain background information on the project;
- Field assessments will be undertaken. Once site-specific issues have been identified an impact assessment will be undertaken according to a predefined impact assessment methodology; and
- The VIA report will highlight all management and mitigation measures deemed necessary in order to avoid and mitigate impacts associated with the proposed project.

20.3.8 HERITAGE IMPACT ASSESSMENT

The EIA level heritage assessment will be conducted by Heritage Management Consulting.

A detailed evaluation of the area was done during the scoping level study however will be converted into an integrated HIA for inclusion in the EIA for the project. The integrated HIA will include a detailed synthesis of baseline and heritage site data as well as an analysis of direct and indirect impact scenarios over the short-and long-term, on heritage receptors in the project area.

The Pilgrims Rest Museum will be involved on EIA level to provide input in final impact assessments and the final HIA Report.

20.3.9 PALAEONTOLOGICAL ASSESSMENTS

The EIA level heritage assessment will be conducted by Banzai Environmental.

A site assessment will be conducted to compile an EIA level report. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase report. A Phase 1 field-based assessment will be conducted and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

20.3.10 SOCIO-ECONOMIC STUDY

The Socio-economic assessment will be facilitated by Kongiwe Environmental and conducted by Southern Economic Development.

The following steps will take place during the EIA level study:

- Compile household survey and focus group meeting information material;
- Conduct household survey/questionnaire/ focus group meetings/interviews;
- Establish social changes and potential project related and cumulative impacts;
- Economic modelling;
- Identification of appropriate mitigation measures;
- Develop strategies to support communities with social changes;
- Develop appropriate feedback and grievance mechanisms;
- Devise recommendations for implementation;
- Develop indicators to monitor change over time;
- Compile Social Management Plan; and
- Devise plan on how to undertake evaluation and periodic review.

20.3.11 REHABILIATION AND CLOSURE PLANNING

The rehabilitation and closure assessment will be conducted by OMI.

The Financial Provisioning Regulations, 2015 prescribes the determination and making of financial provision for existing rights/permit holders (Regulation 11 of GN R1147 of 2015). Importantly, the provisions in Section 24P of NEMA has been given effect through these promulgated regulations.

The Closure objectives of the Final Rehabilitation, Decommissioning and Mine Closure Plan will be measurable and auditable and will be developed on the bases that the rehabilitated areas are safe, stable, non-polluting and are able to support a self-sustaining ecosystem, similar to surrounding historical natural baseline environment.

It must be noted that the current natural baseline environment has been negatively impacted upon by historical mining, illegal miners and illegal mining from a Biodiversity and Socio-economic perspective. There is quantifiable evidence that the illegal mining has accelerated the loss of biodiversity in the area

and therefore the closure objectives will also focus strongly on remediating, those areas impacted by the illegal mining, that are in close proximity to the proposed mining activities. Refer to Figure 58, below, this is a summary of the preliminary recommended closure objectives for this project.

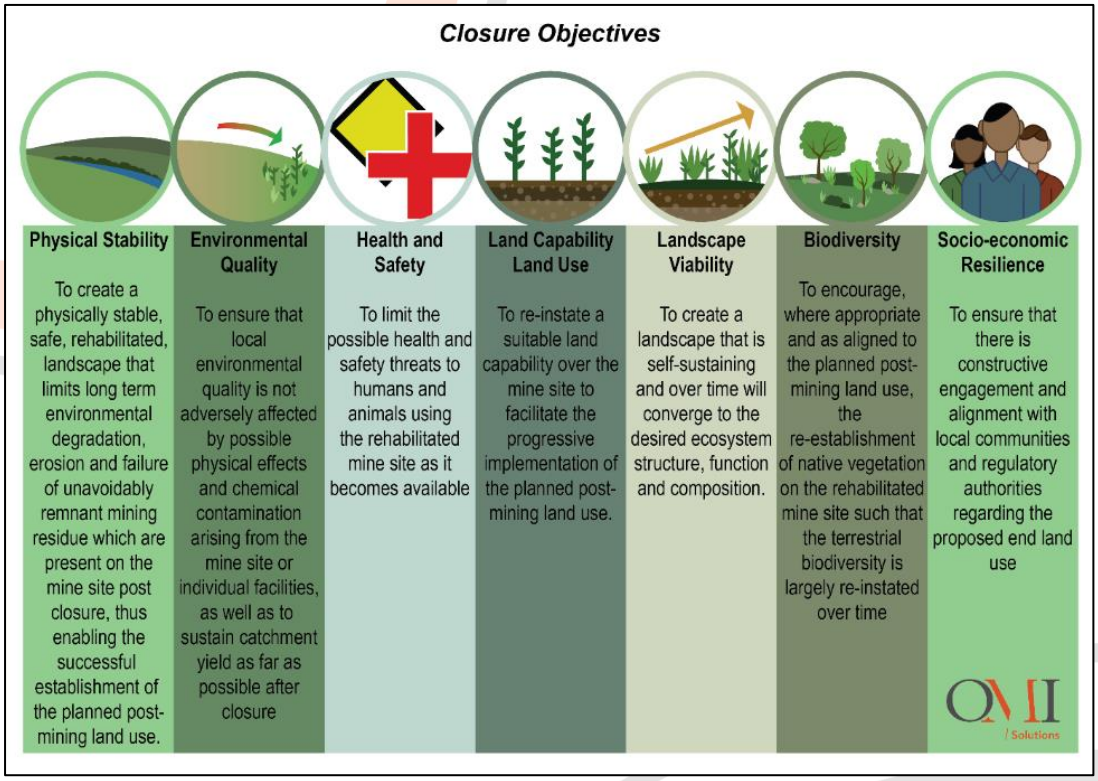

Figure 58: Recommended Closure Objectives

The proposed Final Rehabilitation, Decommissioning and Mine Closure Planning, refer to Figure 59 below, will include the following Mine Closure Planning Criteria:

- the vision, objectives, targets, and criteria for final rehabilitation, decommissioning and closure of the project;
- outlining the design principles for closure;
- explaining the risk assessment approach and outcomes and link closure activities to risk rehabilitation;
- detailing the closure actions that clearly indicate the measures that will be taken to mitigate and/or manage identified risks and describes the nature of residual risks that will need to be monitored and managed post-closure e.g. implementing an alien invasive management programme and erosion control measures;
- committing to a schedule, budget, roles, and responsibilities for final rehabilitation, decommissioning and closure of each relevant activity or item of infrastructure;
- identifying knowledge gaps and how these will be addressed and filled;
- detailing the full closure costs for the life of project at increasing levels of accuracy as the project develops and approaches closure in line with the final land use proposed; and
- outlining monitoring, auditing, and reporting requirements.

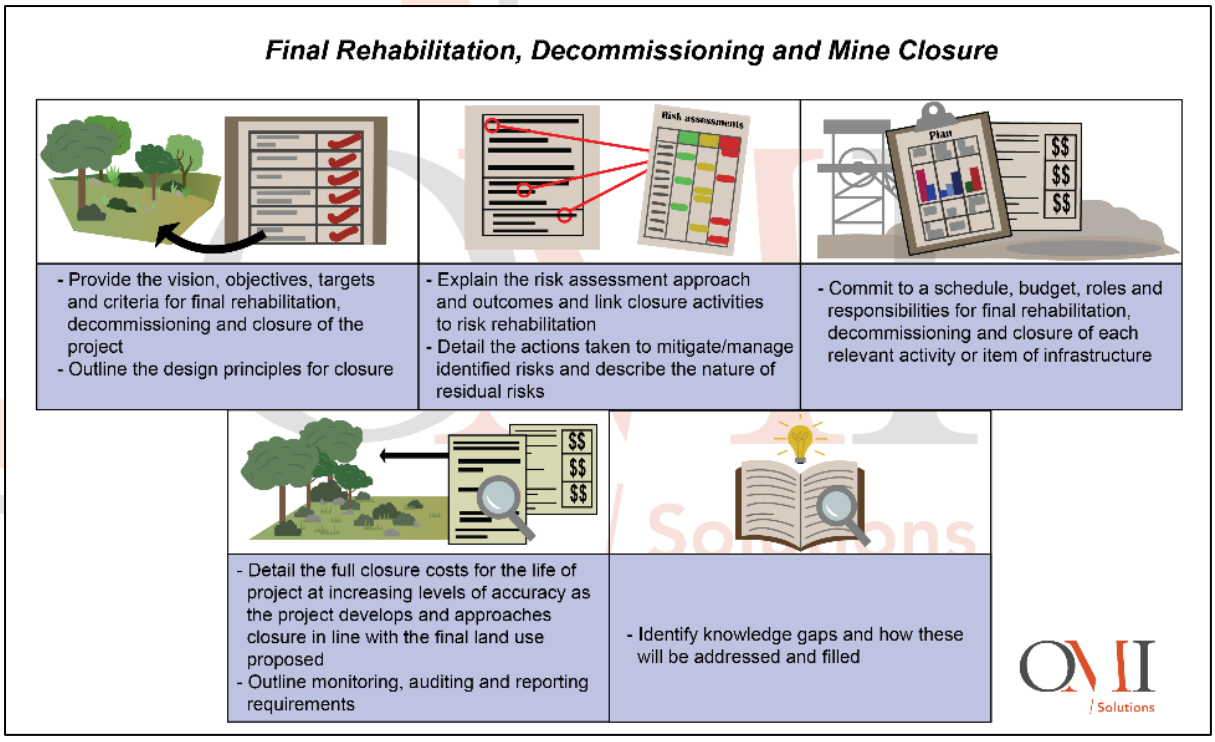

Figure 59: Mine Closure Planning Criteria

20.4 PROPOSED METHOD OF ASSESSING THE ENVIRONMENTAL ASPECTS INCLUDING THE PROPOSED METHOD OF ASSESSING ALTERNATIVES [77]

Assessment of environmental aspects and alternatives will be based on the Department of Environmental Affairs Guideline Document: EIA Regulations 2014. The significance of the aspects/impacts of the proposed activities will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts. Refer to Section 17 above for more details.

20.5 PROPOSED METHOD OF ASSESSING DURATION SIGNIFICANCE [78]

The significance of the impacts will be determined through a synthesis of the criteria described in Section 14.

20.6 THE STAGES AT WHICH THE COMPETENT AUTHORITY WILL BE CONSULTED[79]

The Department will also be consulted with upon submission of the following reports:

- Draft SR
- Final SR
- Draft EIA&EMPR
- Final EIA&EMPR

77 Required as per the EIA regulations Appendix 2 (h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including (iv) a description of the proposed method of assessing the environmental aspects, including aspects to be assessed by specialists;

78 Required as per the EIA regulations Appendix 2 (h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including (v) a description of the proposed method of assessing duration and significance;

79 Required as per the EIA regulations Appendix 2 (h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including (vi) an indication of the stages at which the competent authority will be consulted;

20.7 PARTICULARS OF THE PUBLIC PARTICIPATION PROCESS WITH REGARD TO THE IMPACT ASSESSMENT PROCESS THAT WILL BE CONDUCTED [80]

The stakeholder engagement forms an integral part of the EIA process and is conducted during the planning and design stages of the project as well as the scoping and EIA phases. The aim of public participation and consultation is to achieve the following:

- Provide for public input and facilitate negotiated outcomes;
- Create trust and partnerships;
- Minimize negative impacts and enhance positive impacts;
- Provide up-front indication of issues that may prevent project continuation or can cause costly delays at a later stage; and
- Enhanced and shared benefits.

In accordance with the Chapter 6 of the EIA Regulations, 2014, potential I&APs either have been or will be notified of the proposed project. Please refer to Section 9 and ANNEXURE E.

20.7.1 DETAILS OF THE ENGAGEMENT TO BE FOLLOWED PROCESS WITH REGARD TO THE IMPACT ASSESSMENT PROCESS THAT WILL BE CONDUCTED [81]

The I&AP database was updated during the entire process, as and when additional I&APs register for the project. Comments raised during the process will continually feed into a comments and response report to be made available with the Draft EIA&EMPR report.

In addition focus group meetings and open days will be held during the review period of the draft Scoping Report as well as the draft EIA&EMPR Report. The aim of these meetings will be to:

- Discuss and explain the project and contents of the draft Reports; and
- Obtain comments and issues with regards to the contents of the draft Reports.

20.7.2 DESCRIPTION OF THE INFORMATION TO BE PROVIDED TO INTERESTED AND AFFECTED PARTIES, THE ENGAGEMENT PROCESS AND

The following information will be provided to the Interested and affected parties:

- The site plan.
- List of activities to be authorised.
- Alternatives assessed.
- Scoping level specialist studies
- Scale and extent of activities to be authorised.
- Typical impacts of activities to be authorised (e.g. Surface disturbance, dust, noise, drainage, fly rock etc.).
- The duration of the activity.
- Sufficient detail of the intended operation to enable I&APs to assess what impact the activities will have on them or on the use of their land.

In addition, the following reports will be/has been provided to I&APs:

[80] Required as per the EIA regulations Appendix 2 (h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including (vii) particulars of the public participation process that will be conducted during the environmental impact assessment process;

[81] Required as per the EIA regulations Appendix 2 (h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including (vii) particulars of the public participation process that will be conducted during the environmental impact assessment process;

- Draft SR
- Draft EIA&EMPR report
- Scoping and EIA level specialist reports

During the scoping phase a public open day will be held where the following information will be made available:

- Site Plans;
- Alternatives;
- A description of activities and operations to be undertaken;
- Baseline information;
- Specialist studies to be undertaken; and
- Proposed impact assessment methods.

During the EIR Phase, the following information will be disclosed in the Draft EIA&EMPR:

- Impact assessment undertaken and results thereof;
- Outcome of the specialist's studies;
- Management measures;
- Monitoring plans; and
- Closure objectives.

20.8 DESCRIPTION OF THE TASKS THAT WILL BE UNDERTAKEN DURING THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS [82]

- Completion of the PPP: The comments received from I&APs will be included and assessed in the EIA&EMPR.
- Appointment of Specialists: The identified specialists were appointed to undertake the specialist studies as identified in this SR for the EIA.
- Draft EIA&EMPR: The results of the specialist studies will be synthesized by the project team to provide a draft EIA&EMPR.
- Draft EIA&EMPR published: The draft EIA&EMPR will be circulated to key I&APs for comment for a period of 60 days.
- Revise Draft EIA&EMPR: The draft report will be updated by addressing and responding to the issues raised in by I&APs.
- Final EIA&EMPR. The revised final report will be published with the various specialist reports appended. This will be submitted to the DMRE.

20.9 MEASURES TO AVOID, REVERSE, MITIGATE, OR MANAGE IDENTIFIED IMPACTS AND TO DETERMINE THE EXTENT OF THE RESIDUAL RISKS THAT NEED TO BE MANAGED AND MONITORED [83]

82 Required as per the EIA regulations Appendix 2 (h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including (viii) a description of the tasks that will be undertaken as part of the environmental impact assessment process;

83 Required as per the EIA regulations Appendix 2 (h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

Table 28: Preliminary Management objectives, and identification of residual risks[84]

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
Geohydrological and Groundwater Assessment				
Construction Phase				
Tailings Facility - Continuation	Seepage of contaminated leachate into the aquifer system	Tailings deposition will not take place during the construction phase and no impact is therefore expected. No management measures are recommended other than the establishment of a suitable groundwater monitoring network.	Avoid contaminated seepage	No
Underground Shaft Re-development	• Prior to the actual mining commencing the opening up and dewatering of main accessways will take place • Dewatering of flooded underground workings may pose a risk of contaminated water spilling into the surface water streams	• Sample the water regularly to assess the water quality • If quality is not suitable for discharge, it should be pumped to an adequate holding facility.	Prevent contaminated water from entering surface streams	No
Operational Phase				
Waste Deposition • TSF • RWD • WRD	• Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. • Seepage of contaminated	• Design and placement of suitable liner and drainage system according to the waste classification requirements.	Avoid or reduce contaminated seepage	Yes

[84] Note that the above mitigation measures are subject to being updated during the EIA phase subsequent to further and more detailed work being conducted as may be required or as new information becomes available (these being for scoping purposes at present). Monitoring is listed as part of the mitigation measures; however it must be noted that monitoring in itself is not a mitigation measure. Monitoring is important to quantify and verify impacts against pre-development baseline and must be used to pro-actively determine when mitigations should be required.

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	leachate into the aquifer system	• Routine monitoring to act as early warning of potential impacts. • Implementation of remedial options to contain or remove contaminant plume, if required.		
Underground Mining	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	• Drilling of cover boreholes ahead of development in virgin ground. These holes must be equipped with valves so that they can be closed if water is intersected and to allow for later grouting if necessary • It is recommended that groundwater intersections in the cover holes are grouted to allow for dry mining of the development ends • Pillars may be required around water-bearing geological structures • Accurate record keeping of all water intersections; the following should be recorded: o Position of the water intersection o Water pressure of the intersection as this provides an indication of the groundwater level o Groundwater quality	Reduce the volume of groundwater flowing into the mine	Yes

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
		○ Grout volumes and sealing pressure.		
Underground Mining	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	• Water that cannot be sealed should be included in the mining and processing circuit as far as possible • Water should be contained in underground dams from where it can be piped to holding dams on surface (prevent the water from flowing through the mineralised areas) • Reduce the contact time between the water and the rock.	Prevent groundwater from becoming contaminated when entering the mine.	Yes
Closure and Post-Closure				
Residual groundwater contamination from TSF, RWD and WRD after closure of the mine	• Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. • Seepage of contaminated leachate into the aquifer system	Design and implementation of a suitable rehabilitation plan.	Avoid seepage of rainwater through the waste material and contaminated leachate from entering the aquifer.	Yes
Continued groundwater inflow into the mine	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	Water entering the mine should be sealed as far as possible.	Reduce the volume of groundwater flowing into the mine	Yes
Residual groundwater contamination after closure of the mine	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	Continued monitoring of the water quality and possible treatment of water if required.	Prevent contaminated water from entering surface streams	Yes

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
Soil and Land Capability Assessment				
Construction Phase				
	Loosening of soils due to removal of vegetation. Increased runoff, erosion and consequent loss of land capability in cleared areas.	Avoid erosion leading to loss of land capability	Can be avoided, managed or mitigated	No
	Potential frequent movement of digging machinery and construction vehicles within lose and exposed soils, leading to excessive soil compaction.	Avoid soil compaction	Can be avoided, managed or mitigated	No
	• Spillage of petroleum hydrocarbons and other chemical constituents of concern during construction of associated infrastructure. • Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	Avoidance and immediate clean-up of hydrocarbon spillages	Can be avoided, managed or mitigated	No
	Loss of land capability	Avoid loss of land capability	Can be avoided, managed or mitigated	Yes
Operational Phase				
	Constant disturbance of soils, resulting in risk of erosion	Avoid erosion leading to loss of land capability	Can be avoided, managed or mitigated	No
	Constant disturbances of soils, resulting in risk of compaction	Avoid soil compaction	Can be avoided, managed or mitigated	No

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	• Leaching of hydrocarbons and other chemical constituents of concern into the soils, leading to alteration of the soil chemical status as well as contamination of ground water • Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	Avoid and immediate clean-up of hydrocarbon spillages	Can be avoided, managed or mitigated	No
	Loss of land capability	Avoid loss of land capability	Can be avoided, managed or mitigated	Yes
Closure and Post-Closure				
	Soil handling during backfilling and capping, leading to erosion.	Avoid erosion leading to loss of land capability	Can be avoided, managed or mitigated	No
	Movement of vehicles and machinery during rehabilitation, leading to soil compaction.	Avoid soil compaction	Can be avoided, managed or mitigated	No
	• Spillage of hydrocarbons resulting from leakages from demolition equipment/machinery and other chemical storage facilities, leading to soil contamination (soil chemical characteristics.	Avoid and/or immediate clean-up of hydrocarbon spillages	Can be avoided, managed or mitigated	No

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	• Potentially poor rehabilitation strategy may result to lower infiltration rate, and consequently increased surface runoff. • Increased soil erosion leading to permanent loss of soil resources	Avoid loss of land capability	Can be avoided, managed or mitigated	Yes
Biodiversity Assessment				
Dukes				
Construction Phase				
Clearance of vegetation	• Loss of floral and faunal habitat mostly associated with Thicket Vegetation and Degraded/ Transformed Habitat. Loss of floral and faunal habitat associated with the Freshwater and Forest Habitat is minimal (current layout impacting largely on historically modified freshwater systems and forest margin vegetation) • Loss of floral and faunal species diversity • Loss of protected species within the Long Tom Mistbelt Forest	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	no

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
Footprint areas - all construction related activities	• Edge effects impacting on adjacent habitat e.g., spread of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
Operational Phase				
All activities associated with mining and the movement of vehicles (surface operations).	• Loss of floral species diversity as further unnecessary clearance of vegetation around the proposed surface footprints takes place • Loss of faunal species diversity as animals move away due to increased presence of surface operational activities • Loss of viable soils due to lack of concurrent rehabilitation where areas outside of the authorised footprints have been disturbed • Disturbed areas provide ideal grounds for the proliferation of AIPs	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
All activities associated with mining and the movement of	• Spillage/leakage of chemicals, fuel and oils from equipment leading to	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
vehicles (surface operations).	hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events			
All activities associated with mining and the movement of vehicles (surface operations).	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding intact forest and freshwater habitats (already a significant issue within the Dukes area due to historic mining and current Illegal mining) • Potential collisions between mine vehicles and fauna • Potential harvesting of floral SCC and/or medicinal plants and/or indigenous vegetation • Potential trapping and snaring of fauna within adjacent natural habitat	Avoid AIP proliferation	Can be avoided, managed or mitigated	Yes
Erosion and surface water runoff	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas	Avoid sedimentation and erosion	Can be avoided, managed or mitigated	No

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	• Degradation of Freshwater systems			
Closure and Post-Closure				
Failure to rehabilitate	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Ongoing proliferation of AIPs in the disturbed surface footprint areas as well as to surrounding intact habitat post mining, replacing indigenous (and endemic) vegetation and floral communities • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites, leading to avoidable loss of SCC	Allow for effective rehabilitation	Can be avoided, managed or mitigated	Yes
Frankfort				
Construction Phase				
Clearance of vegetation	• Loss of floral and faunal habitat associated with the Long Tom Mistbelt Forest, intact Freshwater Habitat, Scrub and Thicket vegetation, as well as current Degraded/ Transformed Habitat • Loss of floral and faunal species diversity	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	• Loss of protected species within the Long Tom Mistbelt Forest and Freshwater Habitat			
Footprint areas - all construction related activities	• Edge effects impacting on adjacent habitat e.g., spread of alien vegetation into and freshwater systems, as well as the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
Operational Phase				
All activities associated with mining and the movement of vehicles (surface operations).	• Further unnecessary clearance of vegetation around the proposed footprints resulting in loss of floral diversity • Loss of faunal diversity with the increased presence and movement of personnel and vehicles • Disturbed areas provide ideal grounds for the proliferation of AIPs • Loss of viable soils due to lack of concurrent	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	rehabilitation where areas have been disturbed outside of the authorised footprints			
All activities associated with mining and the movement of vehicles (surface operations).	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
All activities associated with mining and the movement of vehicles (surface operations).	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding intact Forest and Freshwater habitats, with high potential of these species spreading further downstream • Collisions with mine vehicles and fauna • Potential harvesting of floral SCC and/or medicinal plants and/or indigenous vegetation (especially within the Forest vegetation and	Avoid AIP proliferation	Can be avoided, managed or mitigated	Yes

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	Montane Grassland vegetation) • Potential trapping and snaring of fauna within adjacent natural habitat			
Erosion and surface water runoff	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas, especially relating to the downslope Freshwater Habitat (with implications to habitat integrity in downstream habitat) • Degradation of Freshwater systems	Avoid sedimentation and erosion	Can be avoided, managed or mitigated	No
Closure and Post-Closure				
Failure to rehabilitate	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Proliferation of AIPs originating in the disturbed areas post mining, then replacing indigenous (and endemic) vegetation and floral communities within the remaining intact forest and freshwater habitats (potentially moving into the Montane Grasslands) • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites,	Allow for effective rehabilitation	Can be avoided, managed or mitigated	Yes

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	leading to avoidable loss of SCC			
Morgenzon				
Construction Phase				
Clearance of vegetation	• Loss of floral and faunal habitat largely associated with the Degraded/ Transformed areas, with smaller impacts to Freshwater and Forest Habitat • Loss of floral and faunal species diversity	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
Footprint areas - all construction related activities	• Edge effects impacting on adjacent habitat e.g., spread of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
Operational Phase				

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
All activities associated with mining and the movement of vehicles (surface operations).	• Further unnecessary clearance of vegetation around the proposed footprints • Loss of viable soils due to lack of concurrent rehabilitation where areas have been disturbed. Disturbed areas provide ideal grounds for the proliferation of AIPs	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
All activities associated with mining and the movement of vehicles (surface operations).	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
All activities associated with mining and the movement of vehicles (surface operations).	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding habitats (high potential for AIPs to spread to downstream habitats), especially with already high abundance of AIPs	Avoid AIP proliferation	Can be avoided, managed or mitigated	Yes

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	within the Degraded/ Transformed areas • Collisions with mine vehicles and fauna • Potential harvesting of floral SCC and/or medicinal plants and/or indigenous vegetation • Potential trapping and snaring of fauna within adjacent natural habitat			
Erosion and surface water runoff	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas • Degradation of Freshwater systems	Avoid sedimentation and erosion	Can be avoided, managed or mitigated	No
Closure and Post-Closure				
Failure to rehabilitate	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Proliferation of AIPs originating in the disturbed areas and spreading to intact habitat post mining, then replacing indigenous (and endemic) vegetation and floral communities (of concern are the Long Tom Mistbelt Forest and Freshwater Habitat) • Failure to reinstate floral SCC (if and where applicable) to	Allow for effective rehabilitation	Can be avoided, managed or mitigated	Yes

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	rehabilitated sites, leading to avoidable loss of SCC			
Beta				
Construction Phase				
Clearance of vegetation	• Loss of floral and faunal habitat mostly associated with the Degraded/ Transformed areas, with smaller surface infrastructure proposed within the Thicket Vegetation. Loss of habitat within the Blyde River and Peach tree Stream possible with the current proposed layout • Loss of floral and faunal species diversity	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
Footprint areas - all construction related activities	• Edge effects impacting adjacent habitat e.g., spread of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils become compacted • Loss of faunal and floral species diversity • Fauna mortalities from vehicle strikes	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
Operational Phase				
All activities associated with mining and the movement of vehicles (surface operations).	• Further unnecessary clearance of vegetation around the proposed footprints • Loss of viable soils due to lack of concurrent rehabilitation where areas have been disturbed outside of authorised footprints. Disturbed areas provide ideal grounds for the proliferation of AIPs	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
All activities associated with mining and the movement of vehicles u(surface operations).	• Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth and soil organisms • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
All activities associated with mining and the movement of vehicles (surface operations).	• Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding habitats • Collisions with mine vehicles and fauna • Potential harvesting of floral SCC and/or	Avoid AIP proliferation	Can be avoided, managed or mitigated	Yes

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	medicinal plants and/or indigenous vegetation • Potential trapping and snaring of fauna within adjacent natural habitat			
Erosion and surface water runoff	• Increased erosion and sediment runoff impacting on habitat in the surrounding areas • Degradation of Freshwater systems (of concern is the Blyde River and Peach Tree Stream)	Avoid sedimentation and erosion	Can be avoided, managed or mitigated	No
Closure and Post-Closure				
Failure to rehabilitate	• Failure to reinstate degraded and impacted floral and faunal habitat through rehabilitation activities • Proliferation of AIPs in the disturbed areas spreading to surrounding uninvaded habitat post mining (of greatest concern is the freshwater systems), replacing indigenous (and endemic) vegetation and floral communities • Failure to reinstate floral SCC (if and where applicable) to rehabilitated sites, leading to avoidable loss of SCC	Allow for effective rehabilitation	Can be avoided, managed or mitigated	Yes
Freshwater				

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
Construction Phase				
Site clearing and removal of vegetation in the study area.	• Topsoil and subsoil stripping, exposure of soil leading to sedimentation • Noise and anthropogenic disturbance to freshwater ecosystems and associated biota • Potential spills and seepage of hydrocarbons and chemical constituents of concern to the downgradient systems.	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
Development of surface infrastructure in support of underground mining	• Sedimentation, topsoil and subsoil stripping, exposure of soil, noise and anthropogenic disturbance to freshwater ecosystems and associated biota • Potential spills and seepage of hydrocarbons and chemical constituents of concern to the downgradient systems • Potential loss of recharge to freshwater ecosystems situated downstream due to separation of clean and dirty areas in line with GNR 704.	Minimise clearance of vegetation and habitat destruction	Can be avoided, managed or mitigated	No
Operational Phase				

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
Use of constructed surface infrastructure for underground mining.	• Potential for contaminated runoff and discharge from the defined dirty water area into the freshwater ecosystems situated downgradient • Potential loss of recharge to freshwater ecosystems situated downstream due to separation of clean and dirty areas in line with GNR 704 • Potential formation of a cone of depression from underground mining activities • Sedimentation and increased flood peaks into the freshwater ecosystems as a result of increased hardened surfaces	Avoid impact on the freshwater system	Can be avoided, managed or mitigated	No
Closure and Post-Closure				
Decommissioning and post-closure management activities associated with the proposed mining activities.	• Sedimentation of the downgradient systems • Potential contamination of water within the receiving freshwater environment and subsequent reduction in water quality (increase in salts and specific contaminants of concern and reduced pH) • Alteration of flow regime, negative	Effective rehabilitation to avoid future impact on the freshwater system	Can be avoided, managed or mitigated	Yes

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	impacts on vegetation, habitat degradation and subsequent loss of biodiversity of the freshwater ecosystems as a result of potential leaching or decant.			
Socio-Economic				
All activities associated with mining	Potential formal influx of people and households related to those formally employed by the project	Minimise negative impacts related to formal population influx	Can be avoided, managed or mitigated	No
All activities associated with mining	Potential informal influx of people refers to people in the form of job seekers who enter the area in search of employment.	Minimise negative impacts related to informal population influx	May cause irreplaceable loss of resources	Yes
All activities associated with mining	Change in the social fabric of the community	Limit negative sense of place and put measures in place to limit social conflict	May cause irreplaceable loss of resources	Yes
All activities associated with mining and the movement of vehicles.	Increase in nuisance factors (noise and dust)	Limit negative impacts of nuisance factors (intrusions, noise and dust)	Can be avoided, managed or mitigated	No
All activities associated with mining	Potential increase in transmitted diseases due to informal influx of job-seekers	Minimise negative impacts related to population influx	May cause irreplaceable loss of resources	Yes
All activities associated with mining	Unfulfilled community expectations in terms of the employment creation and community development funds could increase the potential for civil unrest in the area	Avoid creation of unrealistic expectations; implement transparent communication processes	Can be avoided, managed or mitigated	No

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
All activities associated with mining	Community safety due to remaining infrastructure	Limit safety and health risks	Can be avoided, managed or mitigated	No
All activities associated with mining	A potential increase in crime related to influx of job-seekers into the area	Minimise negative impacts related to population influx	May cause irreplaceable loss of resources	Yes
All activities associated with mining and the movement of vehicles.	Risk of traffic accidents due to increased traffic flow	Limit safety and health risks	Can be avoided, managed or mitigated	No
All activities associated with mining	Impacts on illegal mining activities	Limit safety risks and avoid social conflict	Can be avoided, managed or mitigated	No
All activities associated with mining	Potential pressure on local infrastructure and services due to influx of people seeking employment	Minimise negative impacts related to population influx	May cause irreplaceable loss of resources	Yes
All activities associated with mining	Positive impacts on local employment and income due to the operation itself and due to supply-links with local suppliers.	Maximise local employment opportunities	Can be reversed	No
All activities associated with mining	A decrease/cessation in employment and community funds could negatively impact former beneficiaries	Minimise the negative impacts associated with mine closure	May cause irreplaceable loss of resources	No
All activities associated with mining	Potential impact on other (non-supply linked) businesses (e.g. tourism activities) already established in the local area or downstream region	Support the local tourism industry	May cause irreplaceable loss of resources	Yes
All activities associated with mining	Increase in tax income: Due to net positive spin-offs on employment and income levels, it is expected that tax revenue to local,	Maximise social fund related to project	Can be reversed	No

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
	provincial and central government will increase			
All activities associated with mining	Increase in other social funds	Maximise social fund related to project	Can be reversed	No
All activities associated with mining	Loss of income due to negative environmental or social impacts (external costs related to project):	Provide positive support to the long term diversification of the local economy	May cause irreplaceable loss of resources	Yes
All activities associated with mining	Job creation for low-income groups: the project is expected to create a number of unskilled jobs.	Maximise local employment opportunities	Can be reversed	No
All activities associated with mining	The project could contribute to increased concentration of economic activities in the commodity/mining sector, leaving the local economy vulnerable to external fluctuations	Provide positive support to the long term diversification of the local economy	Can be avoided, managed or mitigated	No
All activities associated with mining	The energy and water use of the project needs to be considered as it could be high compared to its economic output. This needs further investigation	Minimise the negative impact on resource use intensity	Can be avoided, managed or mitigated	No
Heritage Assessment				
Construction Phase				
Construction of infrastructure and roads	Damage/destruction of high significance heritage resources in the Beta North Frankfort and CDM mining areas	Mitigate heritage resources, manage and preserve historical fabric of the sites .	May cause irreplaceable loss of resources	No
Operational Phase				

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
Operation of the mining areas and possible proliferating impacts	Damage/destruction of high significance heritage resources in the Beta North Frankfort and CDM mining areas	Mitigate heritage resources, manage and preserve historical fabric of the sites	May cause irreplaceable loss of resources	No
Closure and Post-Closure				
Decommissioning of infrastructure	Damage/destruction of high significance heritage resources in the Beta North Frankfort and CDM mining areas	Mitigate heritage resources, manage and preserve historical fabric of the sites	May cause irreplaceable loss of resources	No
Noise Assessment				
Construction Phase				
Activities associated with the construction of the mines	Increase above 7 dBA above Rating Level	Keep noise levels below 7 dBA at receptors Rating Level	Can be avoided, managed or mitigated	No
Operational Phase				
Activities associated with the operations of the mines	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24 hour period (at the boundary of the mine footprint)	Keep noise levels below 7 dBA at receptors Rating Level. Keep noise levels below 61 dBA (24 hr) at the boundary of the project footprint.	Can be avoided, managed or mitigated	No
Movement of vehicles on mine and haul roads	Increase above 7 dBA above Rating Level	Keep noise levels below 7 dBA at receptors Rating Level	Can be avoided, managed or mitigated	No
Underground mine ventilation stacks operations	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24 hour period (at the boundary of the mine footprint)	Keep noise levels below 7 dBA at receptors Rating Level. Keep noise levels below 61 dBA (24 hr) at the boundary of the project footprint.	Can be avoided, managed or mitigated	No
Activities associated with the construction of the mines	Increase above 7 dBA above Rating Level	Keep noise levels below 7 dBA at receptors Rating Level	Can be avoided, managed or mitigated	No
Blasting and Vibration				

Activity	Potential Impact	Management objective	Mitigation Effect	Potential for residual risk
Operational Phase				
Blasting at underground mining areas	• Damage to houses or infrastructure not owned by the mine • Upset people and occupants of houses	Keep noise levels below 7 dBA at receptors Rating Level	Can be avoided, managed or mitigated	No

21 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY[85]

21.1 COMPLIANCE WITH THE PROVISIONS OF SECTIONS 24(4)(A) AND (B) READ WITH SECTION 24(3)(A) AND (7) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998).

The EIA report must include the following:

21.1.1 IMPACT ON THE SOCIO-ECONOMIC CONDITIONS OF ANY DIRECTLY AFFECTED PERSON

The initial impact on the socio-economic environment has been undertaken as part of this scoping assessment. For details on the scoping level impacts identified please refer to **Table 25**.

The proposed project is in line with development priorities to support the mining sector in the district and province. The project is however expected to have both positive and negative socio-economic impacts on the local environment. The net effect on the socio-economic environment needs to be investigated further in the socio-economic impact assessment report. Negative socio-economic impacts also increase the operational risks for the mining company within the local area. The impact assessment report will focus on measures to enhance the benefits to the local community and mitigate negative socio-economic impact.

21.1.2 IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT

Heritage Management Consulting carried out a detailed evaluation of the project area during the scoping level study. The initial observations are shown on the maps in **Figure 53** to **Figure 55**. The assessment will be converted into an integrated HIA for inclusion in the EIA for the project. The integrated HIA will include a detailed synthesis of baseline and heritage site data as well as an analysis of direct and indirect impact scenarios over the short-and long-term, on heritage receptors in the project area.

The Pilgrims Rest Museum will be involved at EIA level in order to provide input in the final impact assessments and the final HIA Report.

[85] Required as per the EIA regulations Appendix 2 (k) where applicable, any specific information required by the competent authority;

21.2 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT.[86]

Please refer to the Alternatives Assessment in Section 8.

[86] Required as per the EIA regulations Appendix 2 (l) any other matter required in terms of section 24(4)(a) and (b) of the Act and Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a SR, the requirements as indicated in such notice will apply.

22 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION[87]

I herewith undertake that the have been correctly recorded in the report:

(i) the correctness of the information provided in the report;

(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and

(iii) 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;

_____

Signature of the EAP

DATE:

23 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

_____

Signature of the EAP

DATE:

[87] Required as per the EIA regulations Appendix 2 an undertaking under oath or affirmation by the EAP in relation to-(i) the correctness of the information provided in the report; (ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and (iii) 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.

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End of Report

ANNEXURE A CURRICULA VITAE OF ENVIRONMENTAL ASSESSMENT PRACTITIONERS

ANNEXURE B COMPANY PROFILE

ANNEXURE C LOCALITY MAP

ANNEXURE D PRELIMINARY LAYOUTS OF THE SITES

ANNEXURE E PUBLIC PARTICIPATION DOCUMENTS

ANNEXURE F AIR QUALITY BASELINE ASSESSMENT

ANNEXURE G SOIL AND LANDUSE BASELINE ASSESSMENT

ANNEXURE H SURFACE WATER QUALITY BASELINE ASSESSMENT

ANNEXURE I GEOHYDROLOGICAL BASELINE ASSESSMENT

ANNEXURE J TERRESTRIAL BASELINE ASSESSMENT

ANNEXURE K AQUATIC BASELINE ASSESSMENT

ANNEXURE L VISUAL BASELINE ASSESSMENT

ANNEXURE M NOISE BASELINE ASSESSMENT

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ANNEXURE O SOCIO-ECONOMIC BASELINE ASSESSMENT