APPLICATION FOR AN AMENDMENT TO THE ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED TGME THETA PROJECT, NEAR PILGRIM'S REST, MPUMALANGA

THIRD UPDATED DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT and DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

PREPARED FOR:

FOR PUBLIC REVIEW

Application in terms of the: National Environmental Management Act of 1998 (Act No. 107 of 1998), as amended, and the 2014 Environmental Impact Assessment (EIA) Regulations, 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) terms of section 40. National Environmental Management: Waste Act, Listed Activities (GNR 921) National Environmental Management: Air Quality Act, Act 39 of 2004 (NEMAQA) and associated listed activities; The National Heritage Resources Act (No. 25 of 1999).

APPLICANT:	Transvaal Gold Mining Estates Limited
ENVIRONMENTAL CONSULTANT:	Batho Earth Environmental Consulting
PREVIOUS DME PROJECT REFERENCE:	(MP) 30/5/1/2/3/2/1/ (83) EM
DATE:	July 2020

PROJECT DETAILS

	Title: APPLICATION FOR AN AMENDMENT TO THE ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED TGME THETA PROJECT LOCATED NEAR PILGRIM'S REST, MPUMALANGA.
Date: July 2020	**Report Status:** *THIRD UPDATED: DRAFT* Environmental Impact Assessment and Environmental Management Programme Report: additional *30-DAY PUBLIC REVIEW*
Carried out by: Batho Earth Environmental Consulting Postnet Private Suit 415, Private Bag x8, ELARDUSPARK, 0047 Tel: 073 157 7362 Fax: 0878074536 E-mail: dianav@lantic.net	**Client:** Transvaal Gold Mining Estates Limited (TGME) PO Box 21, Pilgrim's Rest, Mpumalanga 1290 Tel: 013 768 1271 Fax: 013 768 1272 E-mail: thetaproject@stonewallmining.co.za
Author: Diana Verster	**Client Contact Person:** Mr George Jenkins

Verification	**Capacity**	**Name**	**Signature and Date**
Author	EAP	Diana Verster	08 July 2020

INVITATION TO COMMENT ON THE *THIRD UPDATED* TGME THETA DRAFT EIA/EMPr REPORT

ADDITIONAL 30-DAY PUBLIC PARTICIPATION PROCESS (JULY 2020)

During the second quarter of 2020, Transvaal Gold Mining Estates Limited (TGME) commenced with detailed civil engineering planning and design works, specifically aimed at landform integrity, drainage, clean and dirty water management and infrastructure design. This work was also supported by geotechnical investigations, as required. . This planning and design is necessary for the development of engineering controls and to remove or reduce potential impacts completely or to an acceptable and sustainable level. These detailed engineering works have resulted in finalisation of the design footprints and it is therefore imperative to present the updated site layout plan (referred to as Layout 3), as well as the updated EIA/EMPr and specialist studies which reflect Layout 3.

The aim of the *third updated* Draft Environmental Impact Assessment and Draft Environmental Management Programme Report (EIA/EMPr) is:

- To communicate to all stakeholders the resultant layout (referred to as Layout 3), together with the updated mine schedule;
- To provide all stakeholders with the opportunity to review the updated specialist reports;
- To provide all stakeholders with the opportunity to review the third updated EIA/EMPr for a 30-day review period;

Please note that all comments received during previous consultation processes which included the, project announcement phase (Jan 2019), Scoping Phase, (April and July 2019), draft EIA/EMPr Report (Nov 2019 - Jan 2020) and updated draft EIA/EMPr Report (March 2020 – July 2020) have been included into this *third updated* Draft EIA/EMPr Report.

All comments and issues received during the initial public participation process, as well as the public participation process followed for the Scoping Phase were incorporated into the Issues and response report: Scoping Phase. Please refer to Appendix 3 A (Scoping Phase) for the Comments & Response Report to view the response to each comment received during this phase.

As part of the EIA/EMPr Phase a separate issues and response report was developed, incorporating all the comments received on the draft EIA report dated 13 November 2019 to 20 January 2020 and all the comments received during the updated draft EIA review period dated February 2020 – July 2020. Please also refer to Appendix 3 B (EIA Phase) for the Comments & Response Report.

YOUR COMMENT ON THE EIA/EMPr REPORT

This *third updated* Draft Environmental Impact Assessment and Environmental Management Programme (EIA/EMPr) Report will be available for public review for a period of 30 days from **13 July 2020 – 14 August 2020**.

Copies of the *third updated* EIA/EMPr Report have been made available on the following platforms:

- Electronic version of the report will be made accessible through the following methods:
  - Batho Earth Website
  - Data Portals in the form of Dropbox access links
  - Available on CD/USB on request
  - Community Authorities (Consultation with local Ward Councillor)

Batho Earth will also liaise with those stakeholders that do not have access to e-mail or internet.

- Hard copies of the document will also be available at:
  - Office of the local ward councillor, Pilgrims Rest; and
  - Offices of TGME, in Pilgrim's Rest;

DUE DATE FOR COMMENT

14 August 2020

Please submit comments to the stakeholder engagement officers:

BathoEarth

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TGME THETA: INTEGRATED ENVIRONMENTAL IMPACT ASSESSMENT AND WASTE MANAGEMENT LICENCE APPLICATION

Pursuant to section 102 of the Mineral and Petroleum Resources Development Act, 2002 ("the MPRDA") Transvaal Gold Mining Estates Limited (TGME) (the Applicant) lodged an application in terms of section 102 of the MPRDA specifically to incorporate additional open-cast mining areas located adjacent to the Applicant's existing metallurgical processing facility, which is situated 2.5km southwest of the town of Pilgrim's Rest, Mpumalanga Province and consequently to amend its Mining Works Program ("MWP") and Environmental Authorisation ("EA") which only relates to underground mining. This proposed project is referred to as the "TGME Theta Project".

As part of the Section 102 application, an Environmental Authorisation (EA) application is required. The proposed project, referred to as The Theta Project, triggers activities listed in terms of Listing Notices 1 (Activities 9, 11, 12,13, 19,24,25, 27, 28, 30, 56), Listing Notice 2 (Activities 6, 15, 16 and 17) and Listing Notice 3 (Activities 4, 10, 12, 14 and 18) of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) (as amended) and will require an Environmental Authorisation (EA) from the Department of Minerals, Resources and Energy (DMRE), Mpumalanga Province.

The project also triggers activities listed in Government Notice Regulation (GNR) 921 of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM:WA) (Category A: activities 12, Category B: activities 11) and will require a Waste Management Licence (WML) from the DMRE.

A separate application for an Integrated Water Use Licence (IWUL) will also be submitted to the Department of Water and Sanitation (DWS), Mpumalanga Province.

Before any proposed development can proceed, approval must be obtained from the appropriate regulatory authorities. For the specific TGME Theta amendment application, the Department of Mineral Resources and Energy (DMRE) Mpumalanga Region are responsible to evaluate and issue a decision on the said EIA application.

Batho Earth Environmental Consulting (Batho Earth) was appointed by TGME as the independent Environmental Assessment Practitioner (EAP) to conduct the Environmental Authorisation (EA) application and Waste Management Licence (WML) application process for the project.

The reports and documentation for the integrated EA/WML application process will be compiled and finalised for submission to the DMRE in terms of the NEMA for consideration and decision making. The DMRE will consult with other government authorities as required in terms of Section 24(K) of the NEMA.

An EIA seeks to identify the environmental consequences and possible impacts of a proposed project from the beginning, and helps to ensure that the project, over its life cycle, will be environmentally acceptable, and integrated into the surrounding environment in a sustainable way.

THETA EIA APPLICATION TIMELINE: SCOPING PHASE

The Scoping Phase provided Interested and Affected Parties (I&APs) an opportunity to provide the Environmental Assessment Practitioner (EAP) with issues and concerns with respect to the proposed project in order to inform the technical studies that were evaluated in this EIA phase of the project. The Scoping Report provided a guide to the EIA process and specialist studies.

The Environmental Impact Assessment ("EIA") and Public Participation Process (PPP) in respect of the Theta Project commenced in early 2019 and the *first* draft scoping report was placed in the public domain on *10 April 2019*.

Subsequently, TGME was informed by the DMRE Regional office that it was closed and did not have the mandate to receive and process such applications at the time. Given the delay in the Regional office accepting such applications and in light of the prescribed time periods for the processing of such applications, TGME accordingly had no other option but to withdraw its amendment application, out of an abundance of caution.

TGME was informed by the DMRE that it has been again mandated to commence processing section 102 applications and that TGME can relodge its application. On this basis, TGME formally relodged the amendment application with the DMRE on 4 July 2019.

The "second" Draft Scoping Report was made available to the public for review from Friday 12 July 2019 to Monday 12 August 2019. The Final Scoping Report was submitted to the DMRE on 16 August 2020, after which acknowledgement of receipt was received on 24 August 2020. The Report was accepted together with the accompanying Plan of Study on *07 November 2019*, allowing the Impact Assessment Phase to commence.

THETA EIA APPLICATION TIMELINE: EIA PHASE

The impact assessment phase entailed detailed specialist investigations, reporting and further stakeholder engagement. The initial draft EIA/EMPr report was made available to all registered stakeholders for review and comment during November 2019 to January 2020.

Comments received were incorporated into the updated EIA/EMPr report and again submitted for public review from 2 March 2020 until 3 April 2020. The second updated EIA/EMPR was also submitted to the DMRE for review.

However, the March 2020 review period was impacted by the Covid-19 Pandemic. Notification Letter was issued to all stakeholders on 30 March 2020, explaining the Regulations issued in terms of section 27(2) of the Disaster Management Act, 2002 (Act No. 57 of 2002) published under Government Notice No. 318 in Government Gazette No. 43107, 26 March 2020. The review period was placed "on hold" due to the nationwide lockdown implemented on 27 March 2020.

On 5 June 2020 the Minister of Environment, Forestry and Fisheries ("the Minister") issued directions ("the Directions") in terms of regulation 4(10) of the Regulations issued by the Minister of Cooperative Governance and Traditional Affairs in terms of section 27(2) of the Disaster Management Act, 2002 published on 29 April 2020 ("the Regulations").

Based on these Directions, the way forward in terms of the EIA and PPP and associated timeframes must be discussed and agreed upon with the DMRE before the applicant may continue. Batho Earth submitted a public participation plan to the DMRE to finlaise the March 2020 review period. The DMRE subsequently approved this plan on 26 June 2020.

The updated EIA/EMPr was made available to allow for an additional 8-day review period to enable I&APs to submit their final comments on the updated EIA documentation. The report was made available from 29 June 2020 to 08 July 2020.

As a result of detailed engineering designs and a revised mining schedule for the Theta Project, TGME has made some changes to the footprints. Due to these changes additional specialist studies were required. In order to provide all interested and affected parties an opportunity to review these additional reports, a further 30-day public participation process was required. The DMRE subsequently approved the additional 30-day public participation plan on 03 July 2020.

This <u>third updated</u> Draft EIA/EMPr Report is currently available for public review from 13 July 2020 to 14 August 2020.

EXECUTIVE SUMMARY

Project Location

The Theta project is located on Portion 42 of the farm Ponieskrans 543KT situated adjacent to the existing TGME metallurgical plant, 2.5km southwest of the town of Pilgrim's Rest Mpumalanga Province, within the jurisdiction of the Ehlanzeni District Municipality and the local Municipality of Thaba Chweu. The Project Area is approximately (~) 19 km to the east of Graskop and about 30 km to the south east of Sabie. The nearest sizeable town is Mashishing (previously known as Lydenburg) some 58 km to the southwest.

Project Description

TGME intends to reopen some of the historical mines and to exploit shallow mineral resources by means of opencast mining. The gold mining operations investigated in this study forms part of the existing Greater TGME mining rights. The Theta project will entail the following activities:

- Iota Opencast Pit;
- Theta Opencast Pits;
- Browns Opencast Pit;
- Iota Waste Rock Dump (WRD) North and South
- Iota Pollution Control Dam (PCD)
- Wishbone Pollution Control Dam (PCD)
- Wishbone Waste Rock Dump (WRD)
- Balancing Dam;
- Haul roads;
- Low level river crossing;
- Topsoil Stockpiles;
- Strategic Ore Stockpiles;
- Mine Constructers Offices: Buildings including workshops, fuel bay, offices, stores, a contractors' laydown area and ablution and parking areas;
- Stormwater management infrastructure;
- Power supply infrastructure and electrical powerlines;
- A package Wastewater Treatment Plant;
- Sewage Package Plant for ablution facilities at the contractor's office

These pits will be mined using modified terrace mining methods over a period of 5years.

Motivation for the Proposed Project

Theta Gold Mines is an Australian listed company that owns the gold assets of TGME and Sabie mines in the Pilgrims Rest and Sabie area. The Theta Hill Project provides the applicant with an entry point back into gold production in the area and also provides the opportunity to further expand its gold production profile through opening up further historical mines in the area. An operational project will generate revenues that can be used to realise the significant nett positive impacts to the area, some of which are described below.

Gold mining activities around Pilgrims Rest commenced in 1873 and it is considered to be the first official gold rush area in South Africa. An estimated 6.7 million ounces has been mined in the last 146 years of mining history. The towns of Pilgrims Rest and Sabie both owe their existence to gold mining. Furthermore, it was the mining companies that established the timber industry in the area to provide timber for underground mining and other uses such as housing.

During the past 146 years, the area has suffered some environmental degradation, both as a direct result of the mining activities and from the associated impacts of forestry, human settlement, and farming. In recent years, the socio-economic landscape has deteriorated as a result of the mine no longer being in operation. Other contributing factors to this degradation include the general reduction in tourism revenues as a result of the closure of many businesses over time. The current unemployment rate for Pilgrims Rest and surrounds is estimated at 75%, which is more than double the national average.

The project is expected to provide benefits in the following spheres:

- Environmental remediation;
- Improvement in local socio-economic environment;
- Contribution to improving Pilgrims Rest infrastructure;
- Contribution to the national economy;
- Reduction of local and national unemployment rates.

The largest positive impacts of the project at a local level will be in the creation of jobs in the Pilgrims Rest area as well as a significant economic injection through increased expenditure on goods and services by employees and service providers. It has been clearly demonstrated that the local, and regional economy, benefits from an operational mine and this is expected to be the case once again.

The operational mine is also expected to have a large nett positive environmental benefit to the area through the company's planned remediation activities.

Environmental remediation

Mining activities have been taking place in the Pilgrims Rest area for the last 146 years, and as a result the area has seen some environmental degradation. In particular, the introduction of timber plantations to support early mining activities has replaced vast tracts of native vegetation. Additionally, the introduction of invasive species, such as wattle, has resulted in these species proliferating and altering the environment. In recent years the mining industry as a whole has seen a significant increase in illegal mining activities. Since the cessation of mining by TGME in early 2015, there has been an explosion of illegal mining activities in the Blyde Valley and surrounds. All these activities have resulted in a degradation of the immediate area surrounding pilgrims Rest and the specialists have observed a degradation of the environment over the last 12 months of them visiting the project area, especially as a result of illegal mining.

As part of the Theta Project, the applicant is proposing two significant improvements to the environmental landscape:

- A significant offset and compensation plan that will result in protecting significantly larger areas than that impacted by the project. In addition, this plan make provision for rehabilitation of areas infested with alien invasive species, including current protected areas that are not being effectively managed resulting in a significant improvement to the environmental landscape;

- A reduction, and preferably total removal, of illegal miners from the rights packages under the control of the applicant. There is a significant introduction of sediment and other undesirable pollutants as a result of these illegal activities.

Implementation of these two offerings will result a large nett benefit to the environment in the Blyde valley however they require financial, human and specialist resources to implement. The commencement of the Theta Project will result in an operation that can generate the revenues needed to roll out these improvement strategies.

Local socio-economic environment

Pilgrims Rest has two main pillars for its economy and employment, tourism and mining.

Tourism in the area has seen a significant decline over time and in 2012 the town took a significant hit when businesses were forced to close. Since then the town has not seen the volume of tourists, particularly local tourists, as in previous years. The recent global Covid 19 Pandemic has also had a significant negative impact on tourism which is not expected to re-open until September 2020, and perhaps even later depending on local and global approaches to containing the pandemic.

Mining has always been the largest employer in Pilgrims Rest and with the mine ceasing operations in early 2015, the towns economy has declined, and the unemployment rate has increased significantly. Unfortunately, incidents of criminal activities rise with rising unemployment and Pilgrims Rest has not been spared this trend.

Given the 146 years of mining history of the Pilgrims Rest area, most of the local population are generational miners with some being up to sixth generation miners. Pilgrims Rest was built by mining and the town and immediate surrounds have co-existed with mining for many years, with the positive effects of an operational mining company clearly demonstrated through multiple mining periods.

The local socio-economic landscape will see a significant improvement once the applicant becomes operational on the Theta Project. Some of the improvements include, but are not limited to:

- Significant reduction in unemployment numbers through direct and indirect employment;
- Significant local, and to a lesser degree regional, economic injection through increased expenditure on goods and services by employees and service providers;
- Injection into the local and regional economy through direct purchases of goods and services by an operational mine;
- Reduction in secondary crime in Pilgrims Rest through the active removal of illegal miners;
- The offset and compensation offering will also provide employment and SMME opportunities into the local economy;
- Opportunity to establish new SMME's within Pilgrims Rest;
- Implementation of the applicants Social and Labour Plan will result in the delivery on community projects within the Thaba Chweu Municipality Integrated Development Plan;
- Reduction in secondary crime resulting from illegal miners as the company rolls out its specialist illegal mining teams.

There has been a significant increase in illegal mining activities in the area since the mine ceased operations in May 2015. This has led to secondary crime in the area which is directly impacting the local community. While the mine was operational, a specialist team was contracted to deal with illegal miners, and they had successfully eradicated the illegal mining gangs and syndicates. Since the mine's closure and the departure of this team, an estimated 30 illegal smelters have been established in the local communities. The budget for the Theta Hill Project includes the re-engagement of a specialist team to remove the illegal miners in the area.

The applicants corporate and social responsibility activities are well documented including:

- sponsoring 3 teachers and an assistant at a local school
- company providing printing facilities at the local schools
- renovation activities at the schools
- partnering in a feeding scheme for junior school children
- various local event sponsorships including annual National Gold Panning Championships

A revenue generating project will allow ongoing support for these activities and will also enable TGME to expand its SLP and CSR initiatives, particularly with a view to completing projects that can continue beyond the mine's life. These projects are expected to focus on ultimately supporting the tourism and agricultural industries.

Pilgrims Rest infrastructure

Due to the general degradation of the socio-economic environment and the increase in unemployment, the town has seen a significant increase in criminal activities. Theft is the biggest contributor to damage and loss of infrastructure. Illegal mining activities have caused significant damage to the historical reduction works. Significant damage and loss has also occurred at:

- Historical hydroelectric plant;
- Caravan park;
- Buildings and structures in the town;
- Historical graveyard.

The company is in the process of securing the caravan park, golf course and an old house in the village with a view to improving the overall condition of these facilities and re-establishing the caravan park as an operational facility. The company has placed security at the caravan park to limit further losses in the interim.

These initiatives, however, require significant capital which will only be realised should the project become operational.

Pilgrims Rest currently suffers from a lack of government funding to maintain the overall condition of the town. A profitable gold mining operation will enable the company to assist the local town management with various maintenance and improvement initiatives, which will in turn create a more attractive tourism venue and improve the general socio-economic environment.

National economy

The South African economy has been on a steady downward trajectory for the last several years. On 27 March 2020, rating agency Moody's cut South Africa's sovereign credit rating to sub investment grade, meaning the country now has a junk rating from all three major international rating agencies. The downgrade comes on the same day that South Africa entered a 21-day national lockdown in an effort to slow the spread of the coronavirus pandemic. The result of these two significant events is that the country's economy is in a very vulnerable position and is expected to significantly contract which will result in a large increase in the unemployment rate.

The Theta Hill Project provides new jobs and new revenue streams into the economy once it becomes operational and brings in new capital to the country. These contributions are certainly compelling when one considers the current state of the economy in a post Covid19 environment.

The company currently has a total resource base in the area of over 6.0 million ounces, which is almost the equivalent of all the gold that had been mined in the area over the last 146 years. The resource value equates to US$10.2 billion at 1,700 USD/oz, which is R172.9 billion at 16.95 ZAR/USD. This is a significant asset which, when exploited, would contribute significantly to the country's economy. The company also expects to expand the current resource base through the application of modern exploration techniques, and this would further add to the value of the area towards the economy.

The project is expected to require a total capital investment of R532.1m (US$31.4m) which will start flowing into the economy once it has been approved.

This project unlocks the first 260,000 ounces (4%) of the total resource; it will require future capital investment to unlock the remaining ounces. Should the project not proceed, the further unlocking of this portion of the country's resources may not materialise. Further expansion of the current resource base through modern exploration techniques will also not be possible without the project moving into a revenue generating business.

A total of 3.39 billion ZAR in operating cost expenditure and 6.74 billion ZAR in forex is expected to be generated by the project.

Local and national unemployment rates

The current national unemployment rate is 29.0% and the local unemployment rate in Pilgrims rest is estimated at 75%. The country is currently in the grip of the global Covid19 pandemic and coupled with a downgrade of the country's sovereign credit rating to sub investment grade unemployment is expected to rise significantly in 2020.

Treasury forecasts that the impact of the virus, and resulting lockdown period, could lead to job losses of between 690,000 and 1.79 million with a worst-case scenario being presented that unemployment could rise to over 50%.

The project is expected to create between 400 and 450 direct jobs and an estimated 1,200 to 1,400 indirect jobs during its lifetime. These are all new jobs into the economy and as the applicant expands its operations, further new jobs will be introduced into the regional economy.

PROEJCT LAYOUT (LAYOUT 3)

During the second quarter of 2020, Transvaal Gold Mining Estates Limited (TGME) commenced with detailed civil engineering planning and design works, specifically aimed at landform integrity, drainage, clean and dirty water management and infrastructure design. This work was also supported by geotechnical investigations, as required. This planning and design is necessary for the development of engineering controls and to remove or reduce potential impacts completely or to an acceptable and sustainable level. These detailed engineering works have resulted in finalisation of the design footprints and it is therefore imperative to present the updated site layout plan (referred to as Layout 3), as well as the updated EIA/EMPr and specialist studies which reflect Layout 3.

The layout has changed and has been informed by various engineering studies. The most significant changes made to the layout include the following:

- Enlarged pit layouts, with the Iota and Theta Pit being affected the most (Figure 65)

- Positioning of the strategic ore stockpiles, within the three pits, as mining progress per phase, each pit will be used as strategic ore stockpile areas;
- Increased size of the Wishbone PCD, informed by detailed engineering designs (geotechnical and stability) to ensure stable structures (Figure 65)
- Inclusion of a Balancing Dam, based on the detailed Water Balance (Figure 65)
- Increased capacity of the Iota North and South WRD informed by detailed engineering design (geotechnical and stability) to ensure stable structures (Figure 64)
- Detailed Storm Water Management Plan and Infrastructure Designs
- Footprints adjusted to further reduce impacts on significant biodiversity areas at a micro level
- Changes in mine schedule and pit sequences to improve funding attractiveness of the project

To respond to the expected changes in the global economic environment, TGME completed a re-evaluation of the Theta Project (i.e. 83MR) with a view to improving the economic metrics of the project to further enhance the attractiveness to potential funders. This has resulted in a new mine schedule being developed which has changed the sequence of the pits being mined and has also resulted in the pits being made slightly larger to bring in more gold bearing material while still taking cognisance of the environmental conditions in the area.

This EIA/EMPr provides a detailed description of the amended layout plan referred to as Layout 3 (Figure 14). This layout was identified by TGME as the only feasible alternative, which addressed both the environmental sensitivities and the global economic environment. The assessment also included the "no-go" option. All the identified alternatives were assessed in detail in the specialist studies and impact assessment phase.

Please see below Figure A, which depicts the final layout (referred to as layout 3) as assessed by the specialist and in this third draft EIA/EMPr.

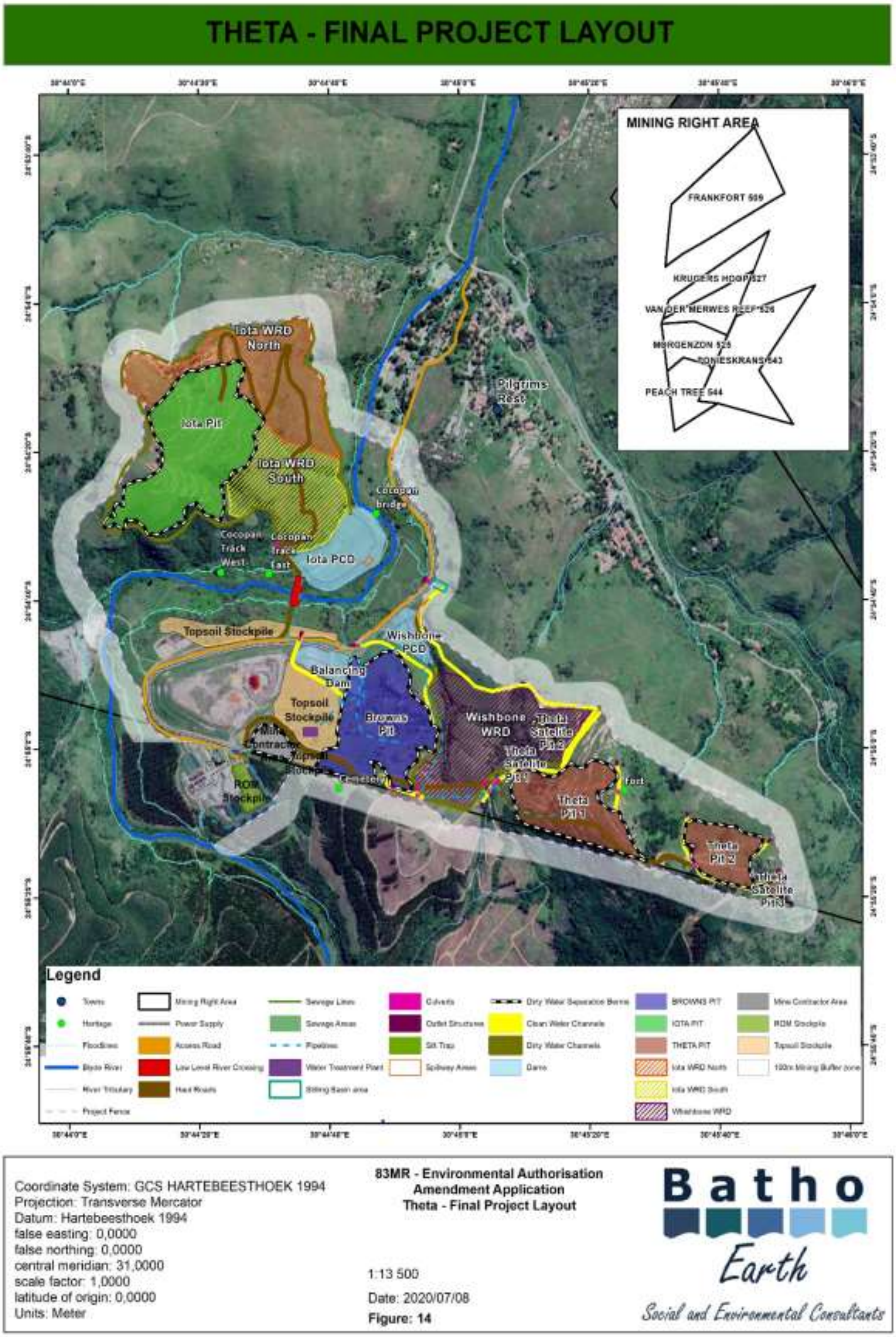

Figure A: Final EIA/EMPr Layout 3.

Alternatives Considered

Alternatives relating to location, type, layout and operation have been evaluated. The alternatives identified include:

Location Alternative

The location of the proposed project components is constrained to the location of the existing mineral resource.

As such, no property alternatives were considered for the location of the open cast pit areas.

Type of Activity Alternative

An alternative to the type of activity would be livestock farming. The current land use activities associated with the focus area and surrounding areas are largely dominated by wilderness, forestry, grazing, residential as well as some mining operations. No current cultivated agricultural activities were observed within the study area, except for cattle grazing on flatter areas, and closer to the areas next to the caravan park. The study area resembles a Lithic and Anthropic catena, with Mispah/Glenrosa and Witbank (Anthrosols) being the dominant soil forms within the total surveyed area. These soils are not considered to contribute significantly to agricultural productivity on a local, provincial as well as national scale. The economic injection of the proposed Theta Project to the local and regional economy compared to the agricultural sector was investigated in this EIA phase.

The land use alternatives of livestock farming were not considered as a feasible alternative.

Summary of the Site Layout Alternatives Assessed

The site layouts changed throughout the course of this study, from the Scoping Phase to the EIA Phase. The progression from the initial layout to the final EIA layout was significantly influenced by environmental and engineering considerations.

The engineering feasibility study informed the initial site layout plan, which was incorporated in the final scoping report (**Layout 1**) as submitted to the DMRE (dated 16 August 2019). The Scoping Report made provision for various biophysical and social studies which would determine the baseline conditions at the project site as well as make recommendations related to the feasibility of the proposed localities and alternatives as per the initial site layout plan (Figure 20).

These studies returned substantial environmental data as well as social sensitivities and nuances. The initial site layout plan was subsequently altered to reflect revised pit layouts, new WRD locations as well as optimisation of the overall project footprint to arrive at the final EIA Phase layout (Layout 2) plan (Figure 21). **Layout 2** was submitted for public review from 13 November 2019 to 20 January 2020. The same layout (Layout 2) was again submitted for public review from 03 March – 06 July 2020 to include some further data from a specialist seasonal review of the area.

During the detailed design process for the Water Use Licence application, additional geotechnical work was completed to inform the final designs of the waste rock dumps and pollution control dams in order to ensure that the structures are designed and constructed in a stable and safe manner. These detailed designs have resulted in changes to the footprint of the mining area. Due to these changes additional specialist studies were required. These studies include:

- Structural design engineer assessments: Mining area footprints had to change to ensure stable structures for the waste rock dumps and pollution control dams.
- Ecological Assessment: Due to the change in the mining footprint, an additional site visit was required to assess the sensitive areas. This has led to the change in the mine layout plan in order to avoid areas of high value such as the protea stand located near the wishbone waste rock dump.
- Mining Engineers study: Additional engineer studies were required to improve mining resource utilization.

During the same period, TGME recognised that significant changes in the global market had resulted due to the Corona virus pandemic. These changes have the potential to impact on TGME project due to, among others, an increase in the gold price and the downgrade of the South African economy to junk status.

To respond to the expected changes in the global economic environment, the Applicant completed a re-evaluation of the Theta Project (i.e. 83MR) with a view to improving the economic metrics of the project to further enhance the attractiveness to potential funders. This has resulted in a new mine schedule being developed which has changed the sequence of the pits being mined and has also resulted in the pits being made slightly larger to bring in more gold bearing material while still taking cognisance of the environmental conditions in the area. This planning and design is necessary for the development of engineering controls and to remove or reduce potential impacts completely or to an acceptable and sustainable level. These detailed engineering works have resulted in finalisation of the design footprints and it is therefore imperative to present the updated site layout plan (referred to as Layout 3), as well as the updated EIA/EMPr and specialist studies which reflect Layout 3.

This EIA/EMPr provides a detailed description of the amended layout plan referred to as **Layout 3**. This layout was identified by TGME as the only feasible alternative, which addressed both the environmental sensitivities and the project financial key performance indicators in the current global economic environment.

No-Go Alternative

Assessing the No-Go Alternative, or the scenario where a project does not go ahead, requires that all possible scenarios be taken into account, including the implications of not authorising the project.

Should the proposed mining development not take place, it entails that the status quo of the environment *will not change*.

- If the No-go Alternative is pursued, there will be no immediate and/or direct impact on sensitive floral communities within the proposed mine footprint and will thus avoid the loss of CBAs, threatened ecosystems and floral SCC. The No-go Alternative therefore better aligns with the intended land use and the conservation requirements for the region
- The proposed project, has the likelihood of resulting in the loss of not only near threatened and critically endangered species to this portion of the Blyde River and potentially further downstream, but also has the potential to compromise the water quality of the Blyde River and impact downstream users of this important resource should mitigation measures not be put in place.
- The sensitive Mountain Outcrops ecological habitat units encountered within the footprint areas, will not be under threat, nor impacted on. Floristically, this habitat unit is highly sensitive from both an ecological and conservation perspective, owing its sensitivity to high floral diversity, an abundance.
- The existing threats to biodiversity however remain present.

- Ongoing AIP proliferation along the Blyde River and its tributaries, as well as into Montane Grasslands;
- The current state of AIPs within the focus area and beyond already poses a significant risk to the local biodiversity and many indigenous species have been displaced by AIPs. Of increased concern is the presence of wattle and gum species along the freshwater resources.
- Influx of illegal miners and people to the area with insufficient and/or inadequate municipal infrastructure resulting in increased urbanisation and increased surface water runoff and resulting erosion and incision of the river banks;
- Ongoing illegal mining resulting in sedimentation of the instream habitat, loss of riparian habitat and impaired water quality, which has the potential to result in loss of sensitive aquatic species. Ongoing proliferation of alien and invasive species along the Blyde River and its tributaries resulting in the loss of riparian habitat and altered surface water runoff patterns (causing erosion and incision);
- Negative visual impacts with subsequent possible negative impacts on specific sectors of the local tourism industry and residents would be eliminated;
- The sense of place and historic character (including the two sensitive site near the mining right area) of Pilgrim's Rest would remain unchanged.

Should the proposed mining development be authorised, it entails that:

- The proposed project, if authorised, will result in the loss of not only rare and/or protected plant life, but also primary grasslands with habitat suitable to sustain and support diverse ecosystems. The impacts will be especially significant associated with the Iota Pit, Iota WRDs, Wishbone WRD and Theta Pits.
- Several studies have shown that diverse grasslands such as those associated with the Theta Project are impossible to completely restore following activities such as terrace mining. The proposed rehabilitation plan for the Theta Project is good and will undoubtably allow some ecological functions to return over time, even allowing for thriving ecosystems to return in the future – if implemented and managed adequately. Obtaining the pre-mined condition, however, is not possible.
- The financial requirements to control and manage the existing, vast population of AIPs associated with the focus area is undoubtably high and will realistically only be adequately managed once the mine is in operation.
- If the Theta Project is not approved, the necessary funding and resources required to control illegal miners will not be available, resulting in the ongoing pollution and sedimentation of the Blyde River and tributaries. Ongoing pressure on Blyde River (and tributaries) from illegal mining activities, resulting in local and downstream impacts on Riparian Habitat and general biodiversity;
- Approximately 400 to 450 jobs will be created;
- A total capital investment of R510m (US$34.3m) into the South African economy will be realized;
- The project unlocks the first 200,000 ounces of a total 6 million ounce resource. Further capital investment to unlock the remaining ounces will be materialize;
- The total resource of 6 million ounces in the project area will be utilised and will add to the improvement of the country's economy (126 Billion ZAR worth of gold at 1,450 USD/oz);
- Further expansion of the state resource of 6 million ounces of gold by the company though exploration will be realized;
- A total of 2.15 billion ZAR in operating cost expenditure over the life of the project will be realized;
- A total of 4.33 billion ZAR in FOREX over the life of the project will be realised for the country's economy;

- Employees will have the opportunity to undergo skills training and capacity building with human resource development whereby transferable skills could be created;
- The various corporate social investment programmes envisaged would be developed and implemented and thus no impacts on poverty alleviation would occur as a result of such programmes.
- Influx of job-seekers to the area with insufficient municipal infrastructure resulting in increased urbanisation and increased surface water runoff and resulting erosion and incision of the river banks;
- Rehabilitation of receiving environment to include revegetation with indigenous species, AIP control and improved habitat connectivity, however, floral ecological functions or processes to continue in a modified, functional way
- Downgradient and downstream freshwater and aquatic resources to be impacted by accidental spills, discharges, sedimentation and erosion – though these will be managed by readily available emergency action plans;
- Potential loss of critically endangered species (with special mention of Enteromius treurensis), potential impacts to water quality, potential loss of habitat as a result of sedimentation though the likelihood and severity may be mitigated to a certain extent; and
- Illegal mining to continue, to a lesser extent and post closure, with some impacts on the Blyde River and its associated instream and riparian habitat still possible

With authorisation comes the inclusion of mitigation measures that the mine would be obligated to implement, adhere to and be audited on. Strict control of mining activities, along with sound engineering designs, where no mine-related activities result in pollution or sedimentation of the Blyde River and downstream habitat, should be the goal.

Accidental discharge or spills can happen, and therefore strict adherence to cogent, well-conceived and ecologically sensitive mitigation measures is required, along with readily available emergency action plans (discharge, fires, spillages etc.).

Whilst large mining operations have greater potential for impact than small-scale artisanal mining (illegal mining in this case), they also have a greater capacity and incentives to minimise damage - where artisanal mining practises rarely take responsibility for environmental damage.

Stakeholder Engagement Process

Activities that were undertaken for the public involvement process during the scoping phase are:

- Announcement of the proposed project via advertisements, notification letters and onsite notices;
- Development of a stakeholder database:
- The draft Scoping Report was made available for a 30-day commenting period.
- Public focus group meetings and public open days to discuss the scoping report and plan of study;
- Compilation of the Comments and Responses Report (CRR).

During the EIA phase, stakeholder engagement entailed:

- Notification of the availability of the draft EIA/EMPr Report for review and comment:
- The 30-day review and comment period;

- Focus Group and public open days;
- Updating and finalisation of the CRR.

Detailed discussion on the stakeholder engagement process followed is described under section 9 of this document and in Appendix 3.

A summary of the comments received from the stakeholders and responses provided by the EAP have been incorporated and is also attached as Appendix 3.

As part of the proposed application, two Public Participation Reports were compiled which should be read together. These documents are:

- Public Participation and Comments and Response Report dated November 2019. This report includes a description of the public participation process as part of the Scoping Phase undertaken from January 2019 until November 2019; and
- Public Participation and Comments and Response Report dated February 2020. This report includes a description of the public participation process as part of the EIA Phase undertaken from November 2019 until January 2020.

As part of the EIA Phase Comments and Response Report dated July 2020. The comments received during the review process dated March – July 2020 have been included into this report. Both reports are attached to Appendix 3.

Description of the receiving environment

A summary of the main baseline aspects is included in Table B, with more detail included in Section 10 of the report.

Table B: Summary of the Profile of the Receiving Environment

Aspect	Description
Socio-economic	The proposed new mining area is located within the jurisdiction of the Ehlanzeni District Municipality and the Local Municipality of Thaba Chweu. The mining footprint are falls within Ward 13. Thaba Chweu is located in the north-western region of the Mpumalanga province. The escarpment divides the district into eastern and western sections. The western section (Lydenburg area) is dominated by agricultural and farming activities, while forestry is the main economic activity of the eastern section (Sabie/Graskop area). The total population of the TCLM grew from 98,387 in 2011 to 101,895 in 2016, an average annual rate of 3.4% per annum. The population growth in the municipality as a whole exceeded national population growth rates. This is partly due to in-migration into TCLM as a result of increased mining activities in the Lydenburg, Burgersfort and Steelpoort areas since 2011. Ward 13, which is a typical rural area without large settlements represents less than 3% of the total TCLM population (2,584 in 2011). 66% of the ward's population (1,721 individuals) were living in the town of Pilgrim's Rest in 2011 - 68 persons per km^2, 630 households and an average household size of 2.6. It is estimated that, in 2019, between 1,500 and 2,300 people lived in the new township Newtown/Schoonplaas and in Darks Gully close to the old town. A small number (200- 300 people) stay in the old historic part of the town. While the larger mining sector dominates in the larger TCLM economy, the economy of Pilgrim's Rest town (historic and Newtown/Schoonplaas) is dominated by tourism related activities including accommodation, restaurants/taverns and arts and craft shops. The town currently employs around 250 people including unskilled staff at formal

	businesses, managers/entrepreneurs as well as hawkers and informal traders. 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. There was however some positive signs in the local economy in 2019 as a number of the vacant premises became occupied again. The impact of COVID-19 is however expected to hit the South African tourism sector very hard and it might take several years for the international tourism sector (the main group visiting Pilgrim's Rest) to recover.
Climate	The climatic conditions for this region are typical of that of the eastern Mpumalanga region, very hot summer days and cool to cold winters. Rainfall occurs during summer thunderstorms, which are accompanied by lightning and occasional hail. The project is located in a high rainfall area, with a MAP of 940 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
Topography	The proposed Iota Pit and WRDs is mostly drained in an easterly direction towards the Blyde River. Elevation varies from 1 500 mamsl at the west of the Iota Pit, to 1 235 mamsl along the Blyde River. The area is dominated by hilly to steep slopes. The proposed Browns Pit and Wishbone WRD are drained in a north-westerly direction by non-perennial drainage lines. Elevation varies from 1 385 mamsl at the south of the Browns Pit, to 1 342 mamsl along the Blyde River to the north. At the Wishbone WRD, elevation varies from 1 433 mamsl in the south-east, to 1 238 mamsl in the north, where the non-perennial drainage line discharges into the Blyde River. The Browns Pit is dominated by hilly slopes, whilst the Wishbone WRD is dominated by steep to very steep slopes The proposed Theta Main Pit and B Pit are drained in a westerly direction, whilst the Theta Small North Pit is drained in a north-easterly direction. Elevation varies from 1 575 mamsl to the east of the Theta Main Pit, to 1 440 mamsl on the south-western side of the pit. Elevation at the Theta Small North Pit varies from 1 580 mamsl on the western side, to 1 520 mamsl along the north-eastern side. The Theta Main Pits steep slopes, whilst the Theta Small North Pit, is dominated by steep to very steep slopes
Geology	The Sabie-Pilgrims Rest goldfield is situated in eastern Mpumalanga, overlying the preserved eastern rim of the early Proterozoic Transvaal basin. This north-south trending, shallow westerly dipping, metallogenic province (goldfield) extending for approximately 140 km in a north-northeasterly direction, over a maximum width of 30 km along the Great Escarpment of Southern Africa. Gold mineralisation occurs on the eastern margins / rim of the early Proterozoic Transvaal Basin, marked by the Drakensburg escarpment. The mineralisation occurs within sedimentary host rocks of the late Archaean to early Proterozoic Transvaal Supergroup. The Sabie-Pilgrims Rest Goldfield stratigraphic succession, younging upwards, includes Achaean basement granite, as well as, minor volcano-sedimentary succession of Godwan Group and Wolkberg Group clastic sediments that uncomformably overlie the basement rocks. The Transvaal Supergroup is separated from the Wolkberg Group by an angular unconformity.
Land use, land capability and soils	The current land use activities associated with the Focus Area and surrounding areas are largely dominated by wilderness, forestry, grazing, residential as well as some mining operations. No commercial agricultural activities were observed occurring within the study area and the immediate (at least within a 3 km radius) surrounding areas except forestry.

	The study area resembles a Lithic and Anthropic catena, with Mispah/Glenrosa and Witbank (Anthrosols) being the dominant soil forms within the total surveyed area. Lithic soils such as Mispah/Glenrosa are regarded as shallow soils, attributed to their shallow pedogenic and effective depth. These soils constitute approximately 72.7% of the total Focus Area, whilst Witbank (Anthrosols) soils occupy approximately 2.69% of the total investigated Focus Area. The shallow nature of the dominant soil forms can be largely attributed to limited rock weathering or rejuvenation through natural erosion on steeper, convex slopes. Witbank soils have been extensively disturbed such that no recognisable diagnostic soil morphological characteristics could be identified, corresponding to Anthrosols in the international soil classification terminology. The remainder of the Focus Area comprises Dundee (Alluvial soils) soil form which occupy approximately 3.47%, and residential areas, mining and associated structures (i.e. mine plant complex, WRD, office areas, roads) which collectively occupy approximately 21.14% of the total investigated area.
Biodiversity	The focus area is floristically diverse, and a broad range of floral SCC are present, some occurring in abundance in certain areas of the focus area. The desktop assessment indicated that the focus area covers four vegetation types as per Mucina and Rutherford (2018 database, Section A – Figure 10), encompassing grassland and forest biomes. The focus area therefore falls within the ecotone of these four vegetation types, leading to the potential for a complex and diverse floral species composition associated with the focus area - this was confirmed for all remaining natural vegetation within the focus area during the field assessment. The vegetation communities distinguished during the field assessment are described under four broad habitat units, namely: **Mountain outcrops**: • Cliff faces with associated Forest-like Thickets; • Dolomite/quartzite outcrops. **Montane Grassland**, encompassing rocky grasslands along mountain slopes with species represented by all three grassland vegetation types indicated for the focus area by the Mucina and Rutherford (2018 database), i.e. Long Tom Pass Montane Grassland, Northern Escarpment Quartzite Sourveld and Northern Escarpment Dolomite Grassland; **Freshwater Habitat**: • Riparian vegetation associated with drainage lines; □ • The Blyde River. **Riparian Habitat & Forest Remnants:** • Riparian vegetation associated with drainage lines and the Blyde River (freshwater resources); and • Forest Remnants – including indigenous forest and degraded forest which typically occur adjacent to the Riparian Habitat. **Degraded Habitat**, including transformed/built-up areas and AIP-dominated vegetation. Although all habitat units have been affected by anthropogenic activities to some degree, the severity of the impacts differs significantly. Apart from the Degraded Habitat unit, all other habitat units remain largely intact and their habitat integrity is only slightly compromised due to existing roads (i.e. habitat fragmentation) and some AIPs encroaching into natural areas. The potential for the various habitat units to support floral SCC also differ with the Mountain Outcrops harbouring the highest abundance and diversity of floral SCC, followed by the Montane Grasslands. One tree species protected under the NFA was recorded within the Forest Remnants during the field assessment, i.e. Pittosporum viridiflorum. Suitable habitat is available for several additional species within the forest-like thickets associated with Mountain outcrops, as well as within the woody drainage lines associated with Riparian Habitat and within the Indigenous Forest Remnants. Several floral SCC listed in the

	Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998) (MNCA) were recorded within the focus area (coordinates provided in Appendix 6). The majority of SCC were found within the Mountain Outcrops, mostly concentrated on Theta Hill. The Montane Grasslands further harboured several floral SCC. The Degraded Habitat only supported a few SCC due to the disturbed conditions that are present within this habitat unit. Before any construction activities can take place, a detailed walk-down of the area is necessary, during which all SCC must be marked and either considered for rescue and relocation or, if planning to destroy or move these species, permits would be required from relevant authorities. As the MBSP Handbook (2014) and Ferrar and Lotter (2007) point out, the large number of rare and endangered species in grasslands is a particular problem for EIAs because these plants are mostly small, have a very localised distribution and are only visible for only a few weeks in the year when they flower – which means that they can easily be missed with once-off field assessments. It is expected that the floral SCC encountered on site is not a complete representation of the floral SCC associated with the focus area and many more are expected to occur, especially within the sensitive Mountain Outcrops, Montane Grasslands and Riparian Habitat and Forest Remnants (where still indigenous). To ensure saturation of data considering the floral SCC occurring within the focus area, marking of such species will need to take place during specific times of the year, across several seasons, under the guidance of an MTPA approved, suitably qualified and experienced specialist. The focus area had several sections where AIPs have severely proliferated and this includes the riparian zone of the Blyde River and immediate surrounding habitat. The main sources of introduction, and cause of spread, identified for the focus area includes the commercial plantations and anthropogenic disturbances (primarily mine-related activities). It is evident that AIP management (if any) is currently not adequate and these species have been allowed to spread profusely. The presence of AIPs was highest within the Degraded Habitat, Riparian Habitat and Forest Remnants (where degraded), although the Mountain Outcrops and Montane Grasslands are not devoid of AIPs. If AIPs are not prevented from further encroaching into the Riparian Habitat, severe downstream impacts can be expected – resulting in potential decreases in water yields and overall loss of niche habitat for floral species adapted to moisture-rich or inundated soil conditions. Due to the extent of AIPs within the focus area (and beyond), it is of utmost importance that strict control of AIPs located on the mine's property, especially areas associated with increased disturbances, be undertaken on a regular basis as part of maintenance activities. For all species listed within the NEMBA: Alien and Invasive Species Regulations, GN R864 of 2016, their control, as stipulated within the regulations, should be implemented.
Faunal Ecology	The Five habitat units were defined within the Focus Area from a faunal perspective included the Mountain Outcrops, Montane Grassland, Forest Remnants (Divided into AIP Dominated Forest Remnants and Indigenous Forest areas), Riparian Habitat and Degraded Habitat Unit. Three faunal SCC were recorded within the focus area, namely Pelea capreolus (Grey Rhebok, NT), Rhinolophus smithersi (Smithers Horseshoe Bat, NT) and Rhinolophus blasii (Blasius's Horseshoe Bat, NT); Montane Grassland habitat unit offers ideal habitat for a diversity of faunal species including mammals, reptiles and avifaunal SCC such as Eupodotis senegalensis (White-bellied Korhaan, VU), Falco peregrinus (Peregrine Falcon, VU), Geronticus calvus (Southern Bald Ibis, VU); The Mountain Outcrops habitat unit extends throughout the focus area. The distinguishing characteristic of this habitat unit is the composition of

	prominent rock features that support a diversity of faunal and floral species. The Mountain Outcrops habitat unit offers ideal habitat for numerous reptile SCC and arachnid species which will take advantage of the crevices for shelter such as Amblyodipsas concolor (Natal Purple-glossed Snake, VU), Bradypodion transvaalensis (Northern Dwarf Chameleon, VU). There is also an increased likelihood that Panthera pardus (Leopard, VU) would occur in and utilise this habitat unit; The Forest Remnants have been split into 2 sub-habitats, namely AIP dominated Forest Remnants located within portions of the Iota footprint area and Indigenous Forest located south of the Iota footprint as well as in the Theta Wishbone WRD. These areas provide increased habitat for avifaunal species whilst also serving as areas of refuge for several other faunal species; The Blyde River and associated riparian habitat runs through the centre of the focus area and is considered of increased sensitivity and ecological importance. Several smaller drainage lines were also observed, all feeding into the Blyde, providing habitat for a diversity of faunal species. The Riparian Habitat, notably the Blyde River, has an increased potential of providing habitat to several SCC, including avifauna and amphibians. In addition, this habitat provides a permanent and important source of water to specie sin the region; and The Degraded habitat unit comprises of areas where indigenous vegetation has been cleared for mining and forestry purposes, with surrounding areas dominated by Alien Invasive Plants (AIP). This habitat unit supports several common and widely occurring faunal species but is unsuitable for SCC due to the levels of habitat degradation.
Heritage Resources	During the survey, the following sites, features or objects of cultural significance were identified, only some of which are deemed to be conservation/documentation worthy: Currently, the Theta Pit boundary approaches the fort to within about 22m. It is recommended that a buffer zone of at least 15m is created around the outer edges of the fort and that this is formalised with a suitable, permanent fence (with an access gate). Cocopan track and bridge: A section of the remaining cocopan track will be impacted on due to the proposed construction of a pollution control dam (PCD). "Built" adits (situated outside the development footprint, and avoid if possible). However, the Cocopan track is located on old mining waste and old mining depositions. TGME would like to use the Iota PCD, and would need to apply for a permit to temporarily remove the track. Various Burial sites and Cemetery (situated outside the development footprint, and avoid if possible) If any of the identified structures is to be demolished, it must be fully documented – mapped, photographed and described – beforehand. A section of the track will be impacted on by a proposed new haul road. Should archaeologically important sites or graves be exposed in other areas during decommissioning phase, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.
Aquatic Ecology	Numerous watercourses, including the highly sensitive Blyde River, the Peach Tree Stream and the Pilgrims Creek, as well as numerous smaller ephemeral drainage lines with riparian vegetation draining into the Blyde River, were identified within and in the vicinity of the three study areas, i.e. Browns Pit, Theta Pit, and Iota Pit. The various watercourses were found to be of high ecological importance and sensitivity, ecologically important and sensitive, and to provide intermediate to moderately high levels of various ecological services such as biodiversity maintenance (especially in the upper reaches of systems [with special mention of the Blyde River] where disturbances were fewer), flood attenuation, assimilation of nutrients and toxicants

	and streamflow regulation. As a result of the increased ecological integrity and the degree to which ecoservices are provisioned, all systems were deemed to be of moderate to high ecological importance and sensitivity The aquatic assemblages of the various rivers and streams assessed were defined as being extremely sensitive to water quality changes as well as changes in flow regimes, with these two aspects also considered to be the most important ecological parameters in the Blyde River system (affected by both natural seasonal variation as well as existing anthropogenic impact) with more significant influence from the changes in flow regime. Two species of concern, the Treur River Barb (Enteromius cf treurensis) (Critically Endangered) and the Marico Barb (Entromius motebensis) (Near Threatened) were observed within and in the vicinity of the proposed project in the January 2020 assessment. Special mention is made of the Treur River Barb, which is isolated to a single population in the upper reaches of the Blyde River catchment. The temporal and spatial results of the aquatic ecological assessment indicate that the integrity of the Blyde River, while still largely classified overall as an Ecological Category B along the entire portion of the Blyde River assessed, *has begun to decline in a downstream direction* over time. This decline may be largely related to the surrounding land-use activities, including forestry, illegal mining activities, seepage and runoff from historical mining areas, increasing urbanization and proliferation of alien and invasive species (resulting in altered surface runoff into the river and changes to the stream bed characteristics), and the ingress of sewage related to the Pilgrims Rest WWTW. The illegal artisanal mining activities observed has resulted in severe sedimentation in some areas and may potentially have contributed to blanketing of benthos and algal proliferation in a downstream direction, which has begun to compromise the habitat integrity and water clarity of the Blyde River in a downstream direction.
Surface water and Hydrology	The project is located in the upper Blyde River catchment, within quaternary catchment B60A, in the Olifants WMA (Figure 42). 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, flowing 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.
Groundwater	The Sabie-Pilgrims Rest goldfield is situated in eastern Mpumalanga, overlying the preserved eastern rim of the early Proterozoic Transvaal basin. This north-south trending, shallow westerly dipping, metallogenic province (goldfield) extending for approximately 140 km in a north-northeasterly direction, over a maximum width of 30 km along the Great Escarpment of Southern Africa. The primary reefs that are present in the studied area are as follows: • Shale Reefs; • Bevetts Reef; • Upper Rho Reef; • Lower Rho Reef; • Upper Theta Reef; • Lower Theta Reef; • Beta Reef. The region is structurally complex. Two prominent faults dissect the study area, forming a geological feature referred to as the Frazer-Morgan Graben. The eastern boundary of the Browns Hill orebody is the Fraser Fault and the western boundary of the Theta Hill orebody is the Morgan Fault (see figure 49). Karstic aquifers associated with the Malmani

	Dolomites are underlying the Theta Project mining sites. Karst is a topography formed from the dissolution of soluble rocks such as limestone, dolomite, and gypsum. It is characterized by underground drainage systems with sinkholes and caves. An area currently or formerly undergoing karstification, and thus characterized by karst landforms, is said to be karstified. Geohydrological. 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. Karstic aquifers associated with the Malmani Dolomites are underlying the Theta Project area.
Visual	Historic mining infrastructure such as old mining shaft infrastructure, PCDs and waste rock dumps are present in the area, forming part of the heritage and tourism attraction of the Pilgrim's Rest area. These areas have been decommisioned, and vegetation has been allowed to re-establish, therefore appearing similar to the surrounding natural areas from a visual perspective. No active mining is currently taking place within the TGME Theta Hill Project Area. The proposed Theta Hill Project will result in a shift of the mining activities from predominantly underground and artisanal mining to opencast mining activities, where three prominent hillside slopes will be mined, which will be visible to a larger area. It can be argued that some tourists visiting Pilgrim's Rest might be interested in experiencing the different mining methods i.e. historic artisanal mining compared to industrial mechanised modern-day mining activities however this remains untested. Based on the findings of this study, it was determined that the TGME Theta Hill Project will have a high visual impact on the receiving environment due to the proposed project situated within such close proximity to the town of Pilgrim's Rest that is declared a National Monument and heritage site. With the revised layout (Layout 3, July 2020) of the TGME Theta Hill Project, the visual impact on the town of Pilgrim's Rest has increased. The main contributing factor for the increased negative visual impact is the increase in extent of the pits and WRDs as well as the increased heights of the WRDs. This has led to the proposed TGME Theta Hill Project being visible from more vantage points in the surrounding area. Based on the findings from both the desktop and the field assessments it is evident that the TGME Theta Hill Project Area is located within a semi-rural mountainous area, with gentle to steep undulating terrain, which form distinguishing topographical features in the form of prominent hills and outcrops that are dominated by grassland, commercial plantations and forests interspersed with watercourses, most notably the Blyde River, villages, the small town of Pilgrim's Rest and historic mining infrastructure. Furthermore, the R533 road, otherwise known as the Bonnet Pass, is the main road leading into Pilgrim's Rest from Graskop and the Vaalhoek Road (gravel road) is situated within the vicinity of the TGME Theta Hill Project Area. Even though both the R533 and Vaalhoek Road are considered tourist routes, the Vaalhoek Road is used infrequently, with the majority of tourists utilising the R532 main road to get to Bourke's Luck Potholes and Graskop and the R533 to get to Pilgrim's Rest. The visual receptors present within a 10km radius comprise the small town of Pilgrim's Rest, farmers, and several nature reserves of which the Mount Sheba Private Nature Reserve (NR) and its hiking trails are of importance due to some of the hiking trails having a clear line of sight towards the TGME Theta Hill Project Area.

	The R532, R533, Vaal Hoek Road and several gravel roads are present within the vicinity of the TGME Theta Hill Project Area. Permanent residents of the town of Pilgrim's Rest and hikers and people lodging in the Mount Sheba Private NR and Motlatse Canyon Provincial NR are considered highly sensitive receptors, while people at their place of work are moderately sensitive receptors, as they are likely to focus on the activities at hand and not the surrounding environment. Motorists and tourists traveling on the scenic roads are considered moderate to highly sensitive receptors, since tourists' attention are focused towards the panoramic scenic landscape. Since the town of Pilgrim's Rest is a popular tourist destination for both local and international tourists, the tourist attractions (Pilgrim's Rest, God's Window etc. are considered exceptionally highly sensitive receptor areas.
Noise	The following are noise sources in the vicinity of and the boundaries of the study area: • Domestic type activities; • Traffic noise along the feeder roads; • Insects; • Birds; • Wind noise.
Climate Change and Green House Gas (GHGs)	The greenhouse gas emission impacts of the Theta Project are analysed in terms of both South Africa's national greenhouse gas (GHG) emission inventory and climate change, as well as the global inventory and climate change. The impact on South Africa's inventory is the departure point for this assessment because the inventory is one of the tools which government uses to determine national and sectoral GHG mitigation targets, which are set within the context of the global emissions inventory and climate change. Emissions from the consumption of grid-based electricity (energy indirect emissions) during operations accounts for the majority (48%) of the project's lifetime emissions. The bulk of the other indirect emissions (scope 3) arise from purchased goods and services (35%). This category refers to the emissions that arise from goods and services such as concrete, steel, water, cyanide and lime. Steel makes up the bulk of these emissions
Illegal Mining within the study area	Several areas within and around the focus area are currently impacted by illegal mining and small-scale agricultural practices. These areas are typically left disturbed and as a result are extensively encroached by alien and invasive plant (AIP) species – although not all AIP proliferation is associated with mining activities. The presence of illegal mining was seen during the January 2020 site visit. Physical disturbance to the Blyde river has also resulted from illegal mining activities where a section of the river has been diverted (see SAS 219038, 2020). This has a direct impact on water quality and sediment loads to the stream and the subsequent impacts on aquatic life. At the time of the assessment, impacts associated with these illegal mining activities were relatively limited, with some recovery of the system observed further downstream of these activities, however, should the scale of this unregulated illegal artisanal mining expand, the impacts to the Blyde River and its associated tributaries could increase (with special mention of impacts related to sedimentation, loss of habitat, and impairment of water quality).

Identification of Impacts

The EIA phase of the application aims to identify the potential positive and negative biophysical, socio-economic and cultural impacts that may be associated with the proposed project. Anticipated impacts that were identified by the project team and through the stakeholder engagement process are summarised in Table B.

Table B: Summary of Potential Environmental Impacts Associated with the Proposed Development.

Element of Environment	Potential Impact Descriptions
Socio-Economic	Possible job opportunities during the construction and operation
Mine Rehabilitation and Closure	Possible impact on the end land-use
Topography	Changes in the topography in the area
Hydrogeology	Possible impact on groundwater contamination
Surface water	Possible impact on surface water contamination
Air Quality	Possible impact on Air Quality in the area
Climate Change	Possible contribution to climate change through emission of Green House Gases
Economic Impact	Potential impact on existing economic activities in the area
Noise	Possible generation of noise during construction and operation
Visual	Visual impact associated with the mine infrastructure and operation
Soils/Land Use/Land Capability	Loss of soil resource and change in land capability and land use
Biodiversity	Disturbance and loss of biodiversity, especially Species of Conservation Concern (SCC)
Aquatic ecology	Possible loss, sedimentation and contamination of the Blyde River.
Heritage	Possible impact on heritage and cultural resources in the area
Cumulative Impacts	Cumulative Impacts

These impacts have been further refined and assessed according to the quantitative impact assessment methodology in Section 12; the results are presented in Section 13 and Appendix 18.

Specialist Studies

Specialist studies referenced in the Scoping Report's plan of study was conducted to assess the anticipated impacts. The relevant specialist studies assessed the potential impacts (including cumulative impacts) of each proposed activity/aspect in relation to the construction, operational, closure and decommissioning phases and developed appropriate mitigation measures that can be implemented to reduce or eliminate the potential impacts identified and to enhance the positive impacts associated with the application.

Quantification of Impacts

The anticipated impacts associated with the proposed project were assessed according to Batho Earth's standardised impact assessment methodology which is presented in Section 12. This methodology has been utilised for the assessment of environmental impacts where the consequence (severity of impact, spatial scope of impact and duration of impact) and likelihood (frequency of activity and frequency of impact) have been considered in parallel to provide an impact rating and hence an interpretation in terms of the level of environmental management required for each impact.

Summary of the Impact Assessment Process /Key Findings

Key Positive Impacts After Mitigation

Socio-economic impacts:

These impacts were determined to have a positive impact, either directly or through the derivatives generated by the development and operation of the proposed Theta Project.

- In terms of local economy, there is the potential for multiple significant benefits to both local and regional businesses, as well as local employment opportunities. This would be highest during the construction phase, due to the requirement of significant contractor numbers (for services and materials).
- It should be noted that the mine's involvement in the local economy through their social funds and Social and Labour Plan and local procurement programmes could result in certain positive opportunities for economic diversification.
- The launch of additional tourism related ventures focusing on the historical and existing mining activities within the Pilgrim's Rest area, together with the training of tourism guides to be involved in these ventures;
- Other positive cumulative impacts to be realised include the increased opportunities for training and skills development, increased household income and standard of living as well as the potential for the creation of local business opportunities that have the capacity to stimulate the local economy.
- Through the rehabilitation plan, it is anticipated that the benefits of the project can be prolonged should the rehabilitation process consider sub-projects that would involve unskilled and semi-skilled local labourers e.g. a nursery where local labourers could be employed.
- The negative economic impacts of the COVID -19 pandemic is expected to be experienced for at least another two years. South Africa's economy is forecasted to decline by between 3 and 5 % in 2020 and only partially making for the lost in 2020. In this context, the proposed project will make a significant positive contribution in providing much needed jobs and tax income not only for the local but also for the larger regional and national economy.

Impacts of Illegal Mining

- The flow of the river is being changed by their activities and have introduced significant sedimentation into the river system. At this stage, the illegal mining activities cannot be controlled. Should the project not proceed, the illegal mining activities are anticipated to significantly increase, with dire consequences for the local and downstream environment. If the project is authorised, it is anticipated that TGME could assist in controlling and possibly eradicating the illegal mining activities through their security measures to be put in place. Adherence to environmental regulations and guidelines can then be managed and audited through the formal processes.

Key Negative Impacts After (Post) Mitigation

The assessment found that there are potential negative impacts expected as a result of the Theta Project. The most significant impacts identified were on the biodiversity (both fauna and flora) habitat units, socio-economic impacts on the area, visual intrusion, and impact on the watercourse situated within the study area and their associated functions.

Biodiversity (fauna / flora)

- Based on the results of the floral assessment, it is the opinion of the specialist that this project after/post mitigation measures have been implemented, will still have a negative impact on the floral ecology within the focus area and potentially on a local scale.
- The project will lead to habitat and species diversity loss, in addition to potential faunal SCC.
- The focus area is considered ecologically sensitive and important for floral communities, thus from a biodiversity perspective the focus area is of high conservation value.
- The focus area had several sections where AIPs have severely proliferated and this includes the riparian zone of the Blyde River and immediate surrounding habitat. The main sources of introduction, and cause of spread, identified for the focus area includes the commercial plantations and anthropogenic disturbances (primarily mine-related activities). It is evident that AIP management (if any) is currently not adequate and these species have been allowed to spread profusely
- The rehabilitation phase, if well-planned and implemented, may restore some ecological function; however, the current floral communities, especially in terms of floral species of conservation concern, are unlikely to return to a pre-mining condition.
- An appropriate biodiversity offset and compensation plan, as well as appropriate funding of this initiative is considered essential. TGME is currently undertaking an offset compensation plan to investigate the suitability of a biodiversity offset, including the calculation of potential biodiversity losses and required offset quantum, for the proposed Theta Project.

Freshwater Ecology

Numerous freshwater and aquatic resources (all classified as watercourses as defined in the NWA) were identified within the study areas and within 500m thereof. The quantic specialist indicated that no naturally occurring wetlands were identified in the study areas. These watercourses (Blyde River and associated tributaries) with associated riparian habitat were assessed and found to be in a good condition ecologically, of high importance and sensitivity, particularly in the upper reaches where anthropogenic disturbances are limited.

- Based on the findings of this study, it was determined that the various project components pose varying degrees of risk based on the distance of each operation from the watercourses in the region. Numerous watercourses (Blyde River and associated tributaries) are situated downgradient of the various study areas, and therefore there is potential for the systems to be impacted on by the proposed mining activities, particularly in terms of sedimentation and impacts on water quality.
- It is therefore considered imperative that during the detailed design phase, very careful consideration be given to the locality and layouts of surface infrastructure, to ensure that watercourses and their associated zones of regulation (in terms of

both GN704 and GN509 as they relate to the National Water Act 1998 (Act No. 36 of 1998)) are avoided as much as possible.

- Due to the sensitivity of the watercourses in the region, if the project is authorised to proceed, a very high level of mitigation, aligned to the mitigation hierarchy will be required to ensure that the sensitive and important receiving environment is not unacceptably impacted. Implementation of such mitigation measures along with general ecologically sensitive mining and construction methods are deemed essential to ensure that the ecological integrity of the highly important and sensitive freshwater resources in the vicinity of mining activities is not compromised to such a degree that the Resource Quality Objectives for these drainage systems cannot be met, there is a change in EcoStatus and that long term and/or irreversible impacts on the watercourses of the area occur. Consideration may need to be given to offsetting residual impacts likely to be associated with the project, although it should be noted that some impacts, such as impacts on water quality for example cannot be offset.
- In the lower reaches where historical mining and agricultural activities have occurred, the systems are considered to have been exposed to limited and low levels of modification with impacts occurring only to a limited extent. However, during the January 2020 assessment of the Blyde River and its tributaries, the Peach Tree Stream and the Pilgrims Creek, an emerging impact in terms of illegal artisanal mining on the Blyde River was observed in the vicinity of the proposed project. should the scale of this unregulated illegal artisanal mining expand, the impacts to the Blyde River and its associated tributaries could increase (with special mention of impacts related to sedimentation, loss of habitat, and impairment of water quality).

Visual Intrusion

- Based on the findings of the visual impact assessment study, it was determined that the Theta Project will have a high visual impact post mitigation on the receiving environment due to the proposed project being situated within such close proximity to the town of Pilgrim's Rest. With the revised layout of the Theta Project, the visual impact on the town of Pilgrim's Rest have been reduced, particularly for the WRD associated with the Theta and Browns Pits (Wishbone WRD).
- Should the project be authorised to proceed, all mitigation measures as stipulated in this report should be adhered to. Said mitigation measures would need to include concurrent rehabilitation throughout the construction and operational phases, consideration of vegetating berms and stockpiles to reduce soil contrast in the landscape as well as effective management of dust generation.
- The Wishbone WRD will be visible from certain vantage points within the town of Pilgrim's Rest, along the R355 and the Lost City Hiking Trail within the Mount Sheba Private NR, The visibility and visual intrusion of the Iota WRD 1 and 2 is more significant on the town of Pilgrim's Rest, the R355 and the Lost City Hiking Trail.
- It must be noted that even with mitigation the visual impact of the proposed Theta Project will be high and limited mitigatory measures are available, especially in the operational phase of the proposed mine. Post decommissioning and closure phase impacts are likely to be permanent should rehabilitation efforts fail to create a hillside slope similar in visual character to the surrounding mountainous landscape.

Socio-Economic environment

There are however, a number of potential socio-economic impacts on the local community that needs to be flagged as medium to high risks. These risks can be mitigated as summarised below:

- Job Creation and project timeframe: The short operational period, combined with the large scale of the project could result in real challenges for the community in terms of job losses and the decline in local economic development funds after mine closure (rated as high risks). It is however noted that this project could unlock further underground mining opportunities in the area in future.
- Project Induced formal and informal influx into Pilgrim's Rest: High levels of formal and informal population influx into Pilgrim's Rest (rated a medium to high risk) is highly probable and is rates a high risk. It is also a difficult risk to mitigate.
- Brown's Hill Settlement: The proposed mining activities would be in very close proximity to Brown's Hill. Although the impacts on the Brown's Hill Community are rated as medium, the location of the settlement requires resettlement.
- Tourism: In terms of the mine's potential impact on Pilgrim's Rest's tourism industry, there is conflicting views on the actual nature of the impact. While nature-based tourist activities in Pilgrim's rest, like Mount Sheba Resort are at a high risk to experience negative economic impacts from the mining project, other businesses (including the general dealer, petrol station and some tourist businesses in the historic town) could experience positive impacts. The risk however remains that the net impact of the mining project on the tourist sector could be some out-crowding of eco-based long-term tourism jobs while offering only short-term benefits to the town. The risk is rated medium.

Groundwater

The potential impact of ground and water contamination resulting from the project that could have dire consequences not only for Pilgrim's Rest but also for the downstream regional economy was assessed by the specialist. The probability of this impact materialising was rated as low (after mitigation), based on the findings of the geohydrology report. However, it is critical to avoid any possible environmental pollution e.g. sedimentation and erosion around the existing watercourses and the Blyde River.

The waste classification indicated that there are some elements that exceed the total concentration threshold and as a result the waste is not totally inert. What is important though is the leachability of these elements and the characteristics of the barrier between the waste body and the groundwater. A geochemical model was developed to assess the risk of leachate from the waste material developing and reaching the groundwater. The geochemical modelling concluded the following:

- In terms of geochemical risk, the main source term in the waste rock material in general are sulphide minerals. These minerals contain trace elements and other components which are released upon dissolution.
- The geochemical assessment, modelling results and interpretation identified metal(loid)s, specifically arsenic, mercury, chromium and nickel as potential contaminants, however due to adsorptive processes provided by clay and iron oxide minerals these constituents may be reduced in concentration or completely immobilized.
- The geochemical modelling indicated that the risk of the development of acid mine drainage conditions are highly unlikely as enough neutralisation capacity is available within the WRD facility and pit backfill material to buffer the pH of the systems.
- Contamination of the shallow soil below any on-surface WRD facilities is likely, although the contaminants will be immobilized through adsorptive processes and will therefore not reach the groundwater table.

- This impact will be restricted to the footprint of the WRD.

Numerical groundwater modelling was undertaken to assess the possibility of contaminated groundwater, should that occur, reaching down-gradient receptors. The aquifer systems are not only a potential transport medium for potential contaminants but should also be viewed as a sensitive receptor from a groundwater use perspective. The Blyde River should also be considered as a sensitive receptor to mine waste drainage as mine waste leachate may have adverse effects on especially the low-flow quality of the receiving stream.

- The numerical groundwater model indicated that if contamination enters the groundwater it will not reach the Blyde River in the next 100 years.

Due to the low risk posed by the waste material and the mining in general there are currently no additional management requirements, other than groundwater monitoring. The planned rehabilitation of the WRD will further protect the underlying groundwater resource. The proposed rehabilitation includes shaping to prevent water ponding on the WRD, capping and vegetation that will reduce infiltration into the waste material.

Surface Water

- The impact assessment on surface water quality indicated that during the construction phase, the exposure of soils due to vegetation clearance and the construction of the Blyde River bridge crossing, will pose high risks if mitigation measures are not adhered to. Implementation of the recommended mitagory measures reduces this risk to medium.
- During the operational phase, open pit mining through, and the deposition of waste rock within non-perennial drainage lines, will need to be mitigated as far as possible, to reduce high impacts from occurring. Furthermore, runoff from these facilities must be captured and contained in a closed system, to prevent negative impacts on water quality. During the post mine closure phase, erosion of the rehabilitated area, as well as the filling up and overflowing of the remaining pit voids and PCDs, were considered high risks before mitigation measures are implemented and rated as medium after mitigation measures were implemented. However, these items can be sufficiently addressed via the TGME aftercare and maintenance programme. Successful mitigation would reduce this risk from High to Medium.
- It will be crucial that erosion and sediment control, as well as dirty water containment and management, are top priority during the construction and operational phases of the project. Post mine closure, rehabilitation must ensure that erosion prevention is adequate for the long-term.

Soil, land use and land capability

- The proposed mining and related infrastructure is not anticipated to result in a significant loss of agricultural land capability since the majority of the soils where mining and associated infrastructure is to occur are shallow and disturbed in most instances.
- Heavy equipment traffic during construction and mining operation activities is anticipated to cause soil compaction. The severity of this impact is expected to be low due to the low clay content of the soils and the resistance offered by the underlying, relatively shallow, bedrock.
- All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is considered to be medium-high for all identified soils, largely depending on the nature, volume and/or

concentration of the contaminant of concern. Therefore, strict contamination (i.e. accidental spill and leakages) and waste management protocols and activity-specific Environmental Management Programme (EMP guidelines should be adhered to during all phases of the project.

Air Quality

- The resultant environmental air quality risks for sensitive receptors were ranked Low during the construction and operational phases, with mitigation in place.
- It is expected that the alternative of using the EIA phase mining layout will have an improved outcome, on air quality impacts as, the pit shells were reduced in size creating a reduction of dust, PM10 and PM2.5 generation compared to the proposed Scoping Phase mining layout plan. Noise

Noise

- The environmental noise impact during the construction and decommissioning phases will be insignificant provided that the mitigatory measures will be adhered to at all times. The noise intrusion levels during the construction phase at the Iota, Brown's and Theta Hill pits will be different depending on the distance between the activities and the abutting residential properties.
- The noise impact will change during the operational phase where the noise intrusion could be moderate to high when open cast mining will be done. This is based on the threshold values of 3.05mm/s to 6.10mm/s for ground vibration at historical properties (British Standards BS 738525) which will be exceeded. The potential environmental noise intrusion levels can however be controlled by means of approved acoustic screening measures, proper noise management principles and compliance to the Noise Control Regulations, 1994. The environmental noise management plan must be in place during all the phases of the open cast pit activities so as to identify any noise intrusion and/or ground vibration increase on a pro-active basis and to address the problem accordingly.

Climate change

The proposed Theta Mining project will produce greenhouse gas emissions that will contribute to anthropogenic climate change and its ensuing impacts. The extent, duration and probability of the mine's greenhouse gas emissions impacts on climate change will be low-medium in the context of South Africa's available carbon budget. Furthermore, the overall significance from the mine's single-source impact during construction and operational phases on global emissions and thus climate change, is rated as low to medium. This is however subject to the consideration of community vulnerability and long-term rehabilitation within the context of further mine planning.

Closure and Decommissioning

The residual risk associated with the proposed project will largely relate to water management and rehabilitation following the operational phase.

The rehabilitation of the mining area will need to be managed to prevent any residual impact in the years following decommissioning. These monitoring requirements have been addressed in the EMPr.

The main impacts that will result from the closure phase will relate to possible ineffectiveness of the construction and operational phases to eradicate alien vegetation, which will ultimately result in the loss of indigenous fauna and flora. This can very easily be managed with a dedicated alien and invasive species management plan

The decommissioning activities may further impact on the established vegetation in the area, resulting in the loss of biodiversity species, habitats and ecological structure. All the impacts that may result from the decommissioning activities of the proposed project have been effectively addressed in the impact assessment in Section13 (Appendix 18), as well as in the EMPr.

In addition, a detailed rehabilitation plan (attached as Appendix 16) was developed for the Theta Mine study area, in order to ensure that the end-land use of the area is acceptable

Environmental Management Programme

An EMPr has been developed as part of the EIA process to ensure that the proponent has made suitable provisions for mitigation. It is anticipated that it will be possible to mitigate the environmental impacts to acceptable levels and the implementation will be monitored and audited to determine the effectiveness of the measures implemented.

Even with mitigation the visual impact of the proposed Theta Project could be high and limited mitigatory measures are available.

Residual management measures in the form of a biodiversity offset plan to mitigate the ecological sensitivity of the study area was introduced. TGME is currently undertaking an offset investigation to investigate the suitability of a biodiversity offset, including the calculation of potential biodiversity losses and required offset quantum, for the proposed Theta Project. The investigations to determine the viability of offsets undertaken to date has demonstrated proof of concept and indicates that the offset and biodiversity compensation has a high potential of being viable and successful. In the next phase of the project the offset mechanism/s will be refined, and the detailed execution plan will be developed to aid in the roll out of a successful offset initiative.

As part of the EIA application the various mitigation measures have been provided for as part of the requirements for authorisation, in order to ensure appropriate implementation of a offset concept.

The EMPr must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for the life cycle phases of the project is considered to be vital in achieving the appropriate environmental management objectives as detailed for this project.

The EMPr is considered a starting point for environmental management however practices will improve through auditing and review and as improved operational practices are developed in the industry. TGME will be responsible for ensuring that all environmental obligations pertinent to the proposed project are met. The implementation of the EMPr and the meeting of the environmental objectives and targets is also the responsibility of TGME.

Conclusion and Recommendation

Batho Earth has undertaken the EIA and EMPr for the proposed Theta Project in accordance with the requirements of the NEMA and (NEM:WA). This has included a comprehensive stakeholder engagement process which has sought to identify stakeholders, provide these parties with an adequate opportunity to participate in the project process, and guide technical investigations that have taken place as part of the Impact Assessment Phase of this study. Specialist input has been included for all key environmental aspects that were identified during the scoping phase of the process.

Various specialist studies were undertaken during the EIA Phase, with the objective of identifying and weighing anticipated impacts and risks associated with the proposed mining activities as well as in accordance to relevant legislative requirements.

The results indicated that the most significant risk is related to the ecological sensitivity of the site, together with the sensitivity of freshwater and aquatic resources (Blyde River) which dissects the proposed project area. The proposed site also borders the historical mining town of Pilgrims Rest.

The findings of the impact assessment have shown that the proposed project could have adverse impacts on the receiving environment should adequate measures and solutions not be implemented. The potential impacts could include:

- Negative impact on several threatened vegetation types and ecosystems;
- Loss of floral SCC individuals as the success of rescue and relocation is uncertain for many species;
- Loss and fragmentation of habitat of faunal SCC and direct loss of fauna which will be expected to move from the area as a result of increased anthropogenic activities;
- There is significant potential for the freshwater and aquatic resources (Blyde River) systems to be impacted on by the proposed mining activities should mitigation measures not be put inplace, particularly in terms of sedimentation and impacts on water quality;
- The following proposed infrastructure falls within the 1:100 year floodlines:
    - Iota PCD;
    - Wishbone PCD;
    - Wishbone WRD;
    - River crossing bridge;
    - Browns Pit;
    - Section of Haul road;
    - Other linear infrastructure (pipelines, electrical lines, smaller access roads and clean and dirty stormwater measurers).
- The scale and impact of unregulated illegal artisanal mining has expanded, in the study area and the impacts to the Blyde River and its associated tributaries have drastically increased
- It must be noted that even with mitigation the visual impact of the proposed Theta Project will be high.
- Nuisance noise: although expected to be low to inaudible in most areas, some areas close to the mining operations will experience negative impacts which will require mitigation;
- Impacts on Socio-Economic activities:
    - Income generation via direct and flow-on employment (positive);
    - Local and regional spending (positive);
    - Tax revenue for local and national governments (positive);
    - High levels of formal and informal population influx into Pilgrim's Rest (rated a medium to high risk) is highly probable due to the size of the required workforce (negative);

Where possible, mitigation and management measures, no-go option, as well as further recommendations have been provided by specialists which will lead to a reduction in the significance of these impacts to medium-high, including:

- Biodiversity offset and compensation plan, which has already been developed for the project, in consultation with MTPA. It is recommended that the Biodiversity offset and compensation plan be on the bases that there will be compensation for lost habitat in accordance with National and Provincial Offset Guidelines (preferably as a like for like offset). According to the DEA (2017) and the DEA&DP (2011), offsets need to be undertaken according to various ratios based on the ecological importance and sensitivity and vulnerability of the ecosystem:
- Additional summer assessments are deemed essential and must take place across all seasons. Summer, autumn and spring assessments have taken place and MTPA recommends additional surveys in winter and in the rainy season (November / December). This will allow for a fully saturated species lists to be developed as part of the study and to ensure the EMP is comprehensive in the management of floral SCC and robust to ensure appropriate execution.
- Stormwater management plan was developed for the project and will be implemented during the implementation of the project. This includes the design of clean and dirty water channels, roads and berms to achieve optimal channelling and separation of clean and dirty water;
- Detailed Rehabilitation plan was developed and will be implemented. Rehabilitation will be conducted in tandem with construction and operational phases of the project;
- Re-vegetation of the rehabilitated areas with indigenous species;
- The current state of alien and invasive species within the proposed project area and beyond already poses an unacceptable risk to the local biodiversity. Due to the extent of AIPs within the focus area (and beyond), it is of utmost importance that strict control of AIPs located on the mine's property, especially areas associated with increased disturbances, be undertaken on a regular basis as part of maintenance activities. For all species listed within the NEMBA: Alien and Invasive Species Regulations, GN R864 of 2016, their control, as stipulated within the regulations, should be implemented.
- Develop and implement a biodiversity management plan;
- A Resettlement Action Plan needs to be developed for the Brown's Hill Community
- Concerns pertaining to the current illegal mining activities within the study area is a reality with direct impacts already noted within the Blyde River. The mine needs to implement the necessary security measures to control illegal mining activities.
- Monitoring plans, which should be implemented throughout the life of the mine, have also been provided to ensure that adverse impacts are reduced, and continuous improvements made.

Based on the above impacts the mitigation hierarchy has been exhausted and the only appropriate mitigation is the implementation of a biodiversity offset and compensation plan, including appropriate funding of this initiative, is considered essential. If the project is approved, a substantial suite of offset and compensation mechanisms will be required to counterbalance the impacts. A range of carefully constructed mitigation conditions of authorisation to give effect to the offset compensation, and implementation safeguards are provided for consideration by the competent authority.

It is therefore considered critical that should the proposed mining project be authorised, very strict adherence to cogent, well-developed mitigation measures must take place throughout the life of the project, with specific mention of planning, separation of clean and dirty water, and sedimentation of the receiving environment as well as, during closure, rehabilitation of affected areas.

INTRODUCTION TO THE ENVIRONMENTAL ASSESSMENT PROCESS

An Environmental Impact Assessment (EIA) is defined as the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made. The aim of the EIA is to prevent substantial damage to the environment. The objectives of this study are:

- To comply with the requirements of NEMA and NEM:WA and associated Regulations;
- Identify and assess the environmental (biophysical, socio-economic, and cultural) impacts of the construction, operation and closure of the proposed project. The cumulative impacts of the proposed development will also be identified and evaluated;
- Identify and evaluate potential management and mitigation measures that will reduce the possible negative impacts of the proposed development and enhance the positive impacts;
- Compile monitoring, management, mitigation and training needs in the EMPr;
- Provide the decision-making authorities with sufficient and accurate information in order to make a sound decision on the proposed development and set conditions that must be adhered to.

An EIA is conducted in two phases. The first is the Scoping phase (*submitted to the DMRE in Aug 2019*) and the second is the EIA phase (*current status*). The objectives of the EIA phase are in line with Regulation 2, Appendix 3 of GNR 982 published in terms of NEMA as listed in the report.

Stakeholder engagement is a key element of the environmental decision-making process, and stakeholder engagement formed part of the Scoping Phase and formed part of the Impact Assessment Phase as described in **Section 9**. Figure 1 provides an illustration of the proposed EIA process that is being followed.

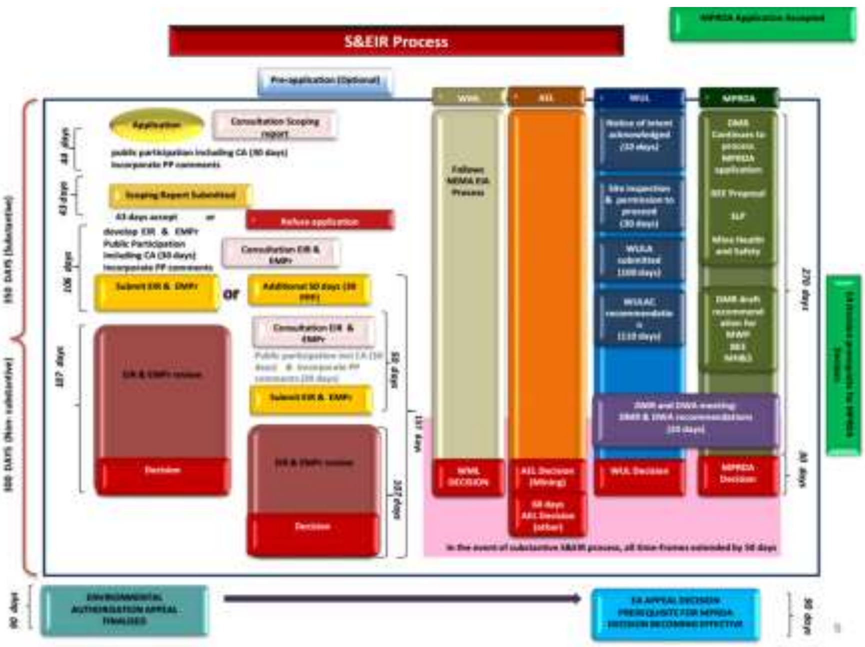

Figure 1. Overview of the Environmental Impact Assessment Process

STRUCTURE OF THE REPORT

This document has been prepared in accordance with the DMR&E EIA/EMPr Report template format and was informed by the guidelines posted on the official DMRE website. Regulation 2, Appendix 3 of GNR 982 published in terms of NEMA stipulates the minimal requirements and issues that need to be addressed in the EIA. This report strives to address all these requirements as per regulations.

For ease of reference we have noted in the table below where this required information can be found. Table 1 below indicates the regulations that have been addressed and the section of the EIA where these requirements can be found.

Table 1. Content of an EIA/EMPr Report According to 2014 NEMA EIA Regulations

2014 EIA Regulations	**Description of EIA Regulations Requirements for Scoping Reports**	**Location in the EIA/EMPr**
Appendix 2, Section 3 (a)	Details of – (i) The EAP who prepared the report; the expertise of the EAP; (ii) The expertise of the EAP, including a curriculum vitae.	Section 3.1 Appendix 1
Appendix 2, Section 3 (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, coordinates of the boundary of the property or properties	Section 4 Appendix 2
Appendix 2, Section 3 (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.	Section 5.3. Figure 15 Appendix 2
Appendix 2, Section 3 (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	Section 5 3 and Section 6
Appendix 2, Section 3 (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	Section 6
Appendix 2, Section 3 (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.	Section 7
Appendix 2, Section 3 (g)	A motivation for the preferred development footprint within the approved site	Section 8

2014 EIA Regulations	Description of EIA Regulations Requirements for Scoping Reports	Location in the EIA/EMPr
Appendix 2, Section 3 (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including - (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (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; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (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; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Sections 8.3 Section 9
Appendix 3 (i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including- a description of all environmental issues and risks that were identified during the EIA process; an assessment of the significance of each issue and risk and an	Section 13

2014 EIA Regulations	Description of EIA Regulations Requirements for Scoping Reports	Location in the EIA/EMPr
	indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	
Appendix 3 (k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	Section 13 Section 14 Section 17
Appendix 3 (l)	An environmental impact statement which contains- i. a summary of the key findings of the EIA; ii. a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; iii. a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives	Section 18.1
Appendix 3 (m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.	Section 14 Section 18.3 Section 33.9
Appendix 3 (n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.	Section 20
Appendix 3 (o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	Section 21
Appendix 3 (p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.	Section 22
Appendix 3 (q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	Section 23
Appendix 3 (r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised	Section 24
Appendix 3 (s)	An undertaking under oath or affirmation by the EAP in relation to- (i) The correctness of the information provided in the report; (ii) The	Section 41 Appendix 1

2014 EIA Regulations	Description of EIA Regulations Requirements for Scoping Reports	Location in the EIA/EMPr
	inclusion of the comments and inputs from stakeholders and interested and affected parties; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; (iv) Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties.	
Appendix 3 (t)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.	Section 35 Appendix 16
Appendix 3 (u)	An indication of any deviation from the approved scoping report, including the Plan of study, including- v. any deviation from the methodology used in determining the significance of potential; vi. environmental impacts and risks; vii. a motivation for the deviation.	n/a
Appendix 3(v)	Any specific information that may be required by the competent authority.	Section 40
Appendix 3(w)	Any other matter in terms of Section 24(4)(a) and (b) of the NEMA	n/a

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LIST OF ABBREVIATIONS

AAGR	Average Annual Growth Rate
ABA	Acid Base Accounting
ABET	Adult Basic Education and Training
ADU	Animal Demography Unit
AIPS	Alien Invasive Plant Species
AMD	Acid Mine Drainage
BA	Basic Assessment
BEE	Black Economic Empowerment
BoD	Board of Directors
CA	Competent Authority
CAGR	Compounded Annual Growth Rate
CPR	Competent Persons Report
CRR	Comments and Responses Report
DM	District Municipality
DMRE	Department of Mineral Resources and Energy
DMS	Dense Media Separation
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Economically Active Population
EAP	Environmental Assessment Practitioner
EC	Electric Conductivity
ECO	Environmental Control Officer
EMPr	Environmental Management Programme
e-WULAAS	electronic Water Use Licence Application and Authorisation System
FEL	Front-End Loader
FRAI	Fish response assessment index
FOB	Free on Board
FTE	Full Time Equivalent
GHG	Green House Gases
GNR	Government Notice Regulations
GPS	Global Positioning System
GVA	Gross Value Added
HDPE	High-Density Polyethylene-Lined
HDSA	Historically Disadvantaged South Africans
ICP	Inductively Coupled Plasma
IDP	Integrated Development Plan

IHI	Index of Habitat Integrity assessment
IPP	Independent Power Producers
IHAS	Invertebrate habitat assessment system
IRP	Integrated Resource Plan
IWUL	Integrated Water Use Licence
KOP	Key Observation Points
LED	Local Economic Development
LM	Local Municipality
LOM	Life of Mine
MAR	Mean Annual Runoff
MHSA	Mine Health and Safety Act, 1996 (Act 29 of 1996)
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)
MQA	Mining Qualifications Authority
MRA	Mining Right Application
MVA	Megavolt Amperes
MWP	Mining Works Programme
NAAQS	National Ambient Air Quality Standards
NAG	Net Acid Generation
NDC	Nationally Determined Contribution
NEA	Not Economically Active
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NFA	National Forest Act, 1998 (Act 84 of 1998)
NPV	Net Present Value
NWA	National Water Act, 1998 (Act 36 of 1998)
PAIA	Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)
POC	Potential of Occurrence
PCD	Pollution Control Dam
PES	Present Ecological Status
PFC	Power Factor Correction
PNR	Private Nature Reserve
PO	Points of Interest
PPE	Personnel Protective Equipment
QDS	Quarter Degree Square
RD	Relative Density
RDL	Red Data Listed
REC	Recommended Ecological Category
ROM	Run of Mine
SCC	Species of Conservation Concern

S&EIA	Scoping and Environmental Impact Assessment
SACAD	South African Conservation Areas Database
SAMREC	South African Mineral Reporting Codes
SANAS	South Africa National Accreditation System
SANS	South African National Standards
SAT	South Africa Tourism
SDF	Spatial Development Framework
SDP	Skills Development Plan
SETA	Sector Education and Training Authority
SEZ	Special Economic Zone
SHE	Safety, Health and Environmental
SLP	Social Labour Plan
SMMEs	Small, Medium and Micro Enterprise Businesses
SOPA	State of Province Address
SRTM DEM	Shuttle Radar Topography Mission Digital Elevation Model
TDS	Total Dissolved Solids
TMU	Terrain Morphological Units
TOPS	Threatened or Protected Species
VEGRAI	Riparian Vegetation Response Assessment Index
WAP	Working Age Population
WML	Waste Management Licence
ZOI	Zone of Influence

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

PART A

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

DMR REFERENCE NUMBER (MP) 30/5/1/2/3/2/1/ (83) EM

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).

NAME OF APPLICANT	Transvaal Gold Mining Estates Limited (TGME)
TEL NO	013 768 1271/3
FAX NO	013 768 1272
POSTAL ADDRESS	PO Box 21, Pilgrim’s Rest, Mpumalanga 1290
PHYSICAL ADDRESS	Grootfontein Farm, Pilgrim’s Rest, Mpumalanga 1290
FILE REFERENCE NUMBER SAMRAD	(MP) 30/5/1/2/3/2/1/ (83) EM

1. IMPORTANT NOTICE

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

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

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

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

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

2. OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

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

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

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

(d) determine the—-

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

(ii) degree to which these impacts—

(aa) can be reversed;

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

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

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

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

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

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

3. Contact Person and correspondence address

Batho Earth Social and Environmental Consultants (Batho Earth) has been appointed by Transvaal Gold Mining Estates Limited (TGME) as the independent Environmental Assessment Practitioner (EAP) to undertake the necessary environmental authorisation process and associated stakeholder engagement process to meet the requirements of NEMA and NEM:WA.

3.1. Details of EAP who prepared the report

Name of the Practitioner: Ms. **Diana Verster**

Company: **Batho Earth Social and Environmental Consultants**

Tel No.: 073 157 7362

Fax No.: 087 807 4536

E-mail address: diana@bathoearth.co.za

Physical address: 43 Pollen Close, Rietvlei Ridge, Pretoria 0047

Postal address: Postnet Suit 415, Private Bag x8, ELARDUSPARK, 0047

3.2. Expertise of the EAP

3.2.1. The qualifications of the EAP

Educational qualifications (evidence attached as *Appendix 1*):

- BA (Geography and Environmental Management), Rand Afrikaans University (RAU) – 2001, Johannesburg, South Africa
- BA Hons (Geography and Environmental Management), Rand Afrikaans University (RAU) – 2002, Johannesburg, South Africa
- MA (Environmental Management) Rand Afrikaans University (RAU) – 2003, Johannesburg, South Africa
- <u>Registered Environmental Assessment Practitioner Number: 2020/997</u>

3.2.2. Summary of the EAP's past experience.

Full project Experience is attached as *Appendix 1*:

Batho Earth is a dynamic Social and Environmental consultancy business offering practical support, assistance with planning applications and developer advice on a range of social and environmental issues to clients throughout South Africa. The company, which is located in Gauteng, was established in 2009 and the principal consultants have over 20 years' collective experience in the Social and Environmental consulting profession.

Diana Verster who has worked within the Environmental sector for many years has previously been involved with a wide range of environmental organisations and projects as project manager and environmental practitioner. She has more than 15 years' experience undertaking full EIA's, and Basic Assessment Applications.

3.3. Details of the Applicant

The Transvaal Gold Exploration Company was first formed in 1883, but following a name change and merger the company was reconstituted as Transvaal Gold Mining Estates Limited (TGME) on 16 May 1895, making it the oldest gold mining company in South Africa. Gold was mined continuously by TGME until 1971 and again from 1986 until 2015. The metallurgical plant is currently on care and maintenance pending the next project development phase. The metallurgical plant, which has not produced commercial quantities of gold since 2015, remains connected to the national electricity grid, with all other existing infrastructure in place including tailings storage facility, water resource access and an accessible road network.

Table 2. Details of Applicant

Project Applicant:	Transvaal Gold Mining Estates Limited		
Registration No (if any):	1895/000997/06		
Trading name (if any):	N/A		
Responsible Person	Director		
Contact Person:	Mr George Jenkins		
Physical Address	Portion of 562kt Grootfontein. Pilgrims Rest		
Postal Address	PO Box 21, Pilgrim's Rest, Mpumalanga 1290		
Postal Code	1290	Cell	082 441 8298
Telephone	013 768 1271/3	Fax	013 768 1272
E-mail	thetaproject@stonewallmining.co.za		

TGME, to which the existing Greater TGME mining right (83MR) was granted and registered, is currently owned by Theta Gold Mines Limited (Australia) through a wholly owned South African Subsidiary. Please refer to the figure below (Figure 2). Theta Gold Mines Limited (TGM) is an Australian Securities Exchange listed company (ASX: TGM).

Theta Gold Mines owns 100% of Stonewall Mining (Pty) Ltd which in turn owns 74% of the TGME Project. The remaining 26% is held by a Black Economic Empowerment (BEE) company (TGME Empowerment Company). The empowerment company is then made up of various trusts and a black entrepreneur. This structure was directed to the company by the Department of Minerals and Energy (DMRE) during the initial MR83 application process and signed off by the DMRE at that time.

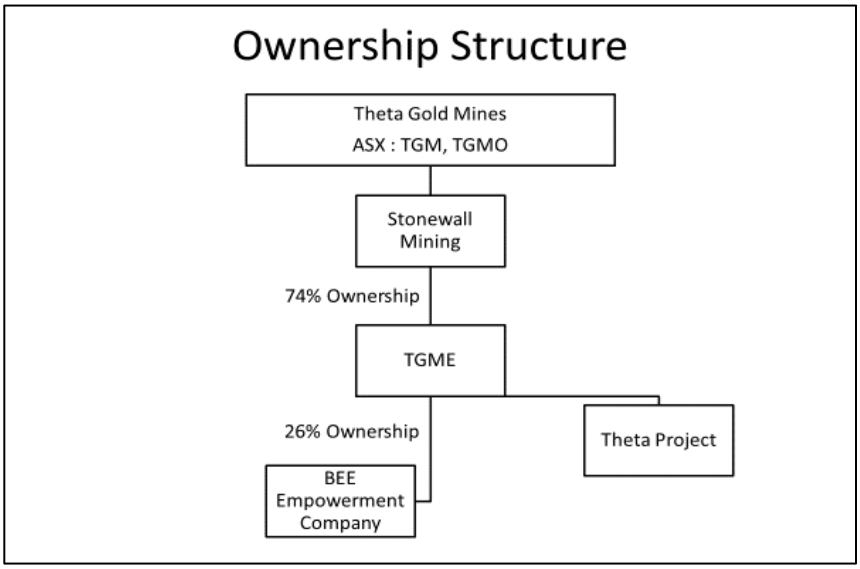


Figure 2. TGME Organogram.

The TGME Project portfolio includes more than 43 historical mines across a large rights area of 62,000 hectares. In addition to the 6.0Moz in resources, the area has several underexplored old mines and shallow exploration targets containing gold-bearing ore left over from nearly 150 years of mining. An estimated 6.7Moz of Gold has been recovered in the area since discovery in 1873, and the Town of Pilgrims Rest is in existence as a result of this rich mining history.

3.4. Existing 83 (MR) Environmental Authorisations

GCS (Pty) Ltd ("GCS") an independent environmental company was appointed by TGME in 2005 to undertake the 83 MR Environmental Impact Assessment (EIA) process. The mining right application was submitted for the farms: Frankfort 509KT; Krugershoop 527KT; Morgenzon 525KT; Peach Tree 544KT; Ponieskrans 543KT; Van Der Merwe's Reef 526KT. The Mining Right Application (MRA) was accepted by the DMRE, and as part of the process of approval an EIA and an EMP was required to incorporate all current and proposed operations.

The EMPR for the MP 30/5/1/2/2/83MR application was approved by the DME on *16 October 2013*. The authorisation is valid for 10 years.

As of 8 December 2014, and as part of the approval process for a mining right, the MPRDA calls for an application for, and approval of, an Environmental Authorisation in terms of the One Environmental System. Included in this is the approval of a complete Environmental Management Programme Report (EMPR), incorporating an EIA and Environmental Management Programme (EMP).

TGME, through an engineering scoping study and a feasibility study, has identified the opportunity to mine gold bearing reefs via opencast mining and this has triggered the need to amend its current Mining Works Programme (in terms of Section 102 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)) to include the new mining sections.

As part of the Section 102 application, an Environmental Authorisation (EA) application is required. The proposed project, referred to as The Theta Project, triggers activities listed in terms of Listing Notices 1 (Activities 9, 11, 12,13, 19,24,25, 27, 28, 30, 56), Listing Notice 2 (Activities 6, 15, 16 and 17) and Listing Notice 3 (Activities 4, 10, 12, 14 and 18) of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) (as amended) and will require an EA from the DMRE, Mpumalanga Province.

The project also triggers activities listed in Government Notice Regulation (GNR) 921 of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM:WA) (Category A: activities 12, Category B: activities 11) and will require a Waste Management Licence (WML) from the DMRE.

A separate application for an Integrated Water Use Licence (IWUL) will also be submitted to the Department of Water and Sanitation (DWS), Mpumalanga Province.

4. Project Location

4.1. Description of the property.

4.1.1. Regional Setting

Transvaal Gold Mining Estates Limited (TGME) is situated in the Pilgrim's Rest/Sabie goldfields area of Mpumalanga. The distance from TGME (existing plant area) to the neighbouring towns of Graskop to the east is 19km, Sabie to the south east is 30km and Mashishing (previously known as Lydenburg) to the south west is 58km (Figure 2). The existing plant is situated adjacent to Pilgrims Rest. The proposed mining operation is located in the jurisdiction of the Ehlanzeni District Municipality and the local Municipality of Thaba Chweu.

The area falls within the Olifants Water Management Area in the B60A quaternary sub-catchment. The catchment is classified as a class B catchment as identified in the GN466 Dated 22 April 2016 "Classes and Resource Quality Objectives of Water Resources for the Olifants Catchment, the classification for the study area is a B-classification, which is defined as a B primary drainage region for the Olifants River System within the content of the study area.

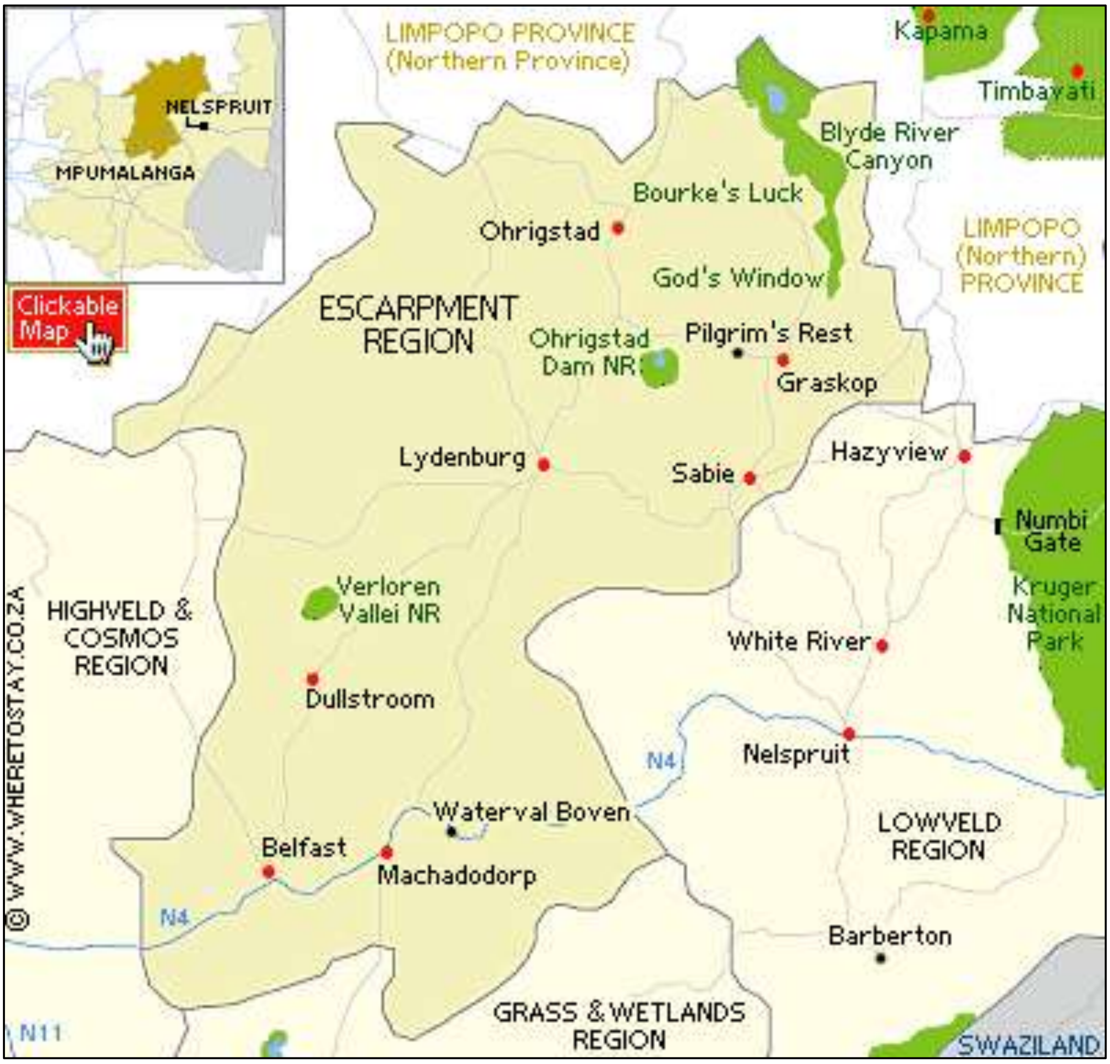


Figure 3. Regional map of the study area.

4.1.2. Local Setting

TGME has an existing and approved mining right in the Pilgrim's Rest area referred to as 83MR, with DME reference MP 30/5/1/2/2/83MR. This right allows the mining of gold ore, silver ore, copper ore and stone aggregate. The total 83MR area encompasses the following farms and cover a total area of some 9,413.3366 ha (Figure 4).:

- Frankfort 509KT: RE, Ptn 1, Ptn 2, Ptn 3, Ptn 4, Ptn 5;
- Krugers Hoop 527KT;
- Van der Merwes Reef 526KT: RE, Ptn 1;
- Morgenzon 525KT RE, Ptn 1, Ptn 2;
- Peach Tree 544KT and
- Ponieskrans 543KT: RE, Ptn 18, Ptn 42, Ptn 43, Ptn 44.

TGME, through an engineering scoping study and a pending feasibility study, has identified the opportunity to mine gold bearing reefs via modified terrace mining and this has triggered the need to amend its current Mining Works Programme (through the submission of a section 102 application) to include the new mining sections. These new activities also triggers additional NEMA and NEM:WA listed activities, and hence an application for environmental authorisation has been lodged.

Please refer to the following table for the registered name, administrative jurisdiction and summary of location of the land. The map showing the affected property is provided in Figure 4.

Table 3. Table 3: Property Information

Farm Name	Farm Frankfort 509 KT (Remainder) Farm Frankfort 509 KT (Portion 1) Farm Frankfort 509 KT (Portion 2) Farm Frankfort 509KT (Portion 3); Farm Frankfort 509KT (Portion4), Farm Frankfort 509KT (Portion 5) Farm Krugers Hoop 527KT; Farm Van der Merwes Reef 526KT: (Remainder); Farm Van der Merwes Reef 526KT: (Portion 1); Farm Morgenzon 525KT (Remainder); Farm Morgenzon 525KT (Portion 1); Farm Morgenzon 525KT (Portion 2) Farm Peach Tree 544KT; Farm Ponieskrans 543KT: (Remainder); Farm Ponieskrans 543KT (Portion 18); Farm Ponieskrans 543KT (Portion 42); Farm Ponieskrans 543KT (Portion 43), and Farm Ponieskrans 543KT (Portion 44)
Application area (Ha)	Total mining right area: 9,413.3366 ha Farm Ponieskrans Portion 42 (Total Infrastructure Footprint – 306 ha – total of the battery limit required for mining): • Browns Pit – 17.3 ha • Theta Pit – 20.54 ha • Iota Pit – 25.6 ha • Theta PCD – 1.32 ha • Iota PCD – 27.23 ha • Strategic Ore Stockpile – 3.27 ha • Topsoil Stockpile – 10.5 ha
Magisterial district:	Ehlanzeni District Municipality and the Local Municipality of Thaba Chweu.
Distance and direction from nearest town	The proposed mining area is 2.5km southwest of the town of Pilgrim's Rest, centred on the following co-ordinates: - • Latitude: 24° 55' 06" S • Longitude: 30° 45' 22" E
21 digit Surveyor General Code for each farm portion	Farm Frankfort 509 KT: • T0KT00000000050900000 • T0KT00000000050900001

	• T0KT00000000050900002 • T0KT00000000050900003 • T0KT00000000050900004 • T0KT00000000050900005 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

4.2. Locality map

4.2.1. Location of the project Area of Influence

The proposed area of influence will be situated on Portion 42 of the farm Ponieskrans 543KT. Please refer to Figure 5 (locality map) of Ponieskrans. A copy of the locality map is provided in Appendix 2. The area of influence referred to as part of this application is the area where the proposed infrastructure (listed NEMA activities are triggered) will be located and were the actual mining operations will take place.

The proposed mining operation is located adjacent to the existing TGME metallurgical plant, which is situated 2.5km southwest of the town of Pilgrim's Rest Mpumalanga Province. Access to the current plant and proposed mining area is off the R533 at Pilgrims Rest, then past the caravan park and onto an existing gravel road which then leads to the existing TGME offices.

Three mining areas were identified based on exploration and evaluation work done within the study area. The three areas are referred to as:

- Theta Pit;
- Browns Pit;
- Iota Pit.

The aim of the application is to apply for approval to mine various reefs as *open pit mining* operations using modified terrace mining as the preferred mining method. The project is referred to as the Theta amendment application.

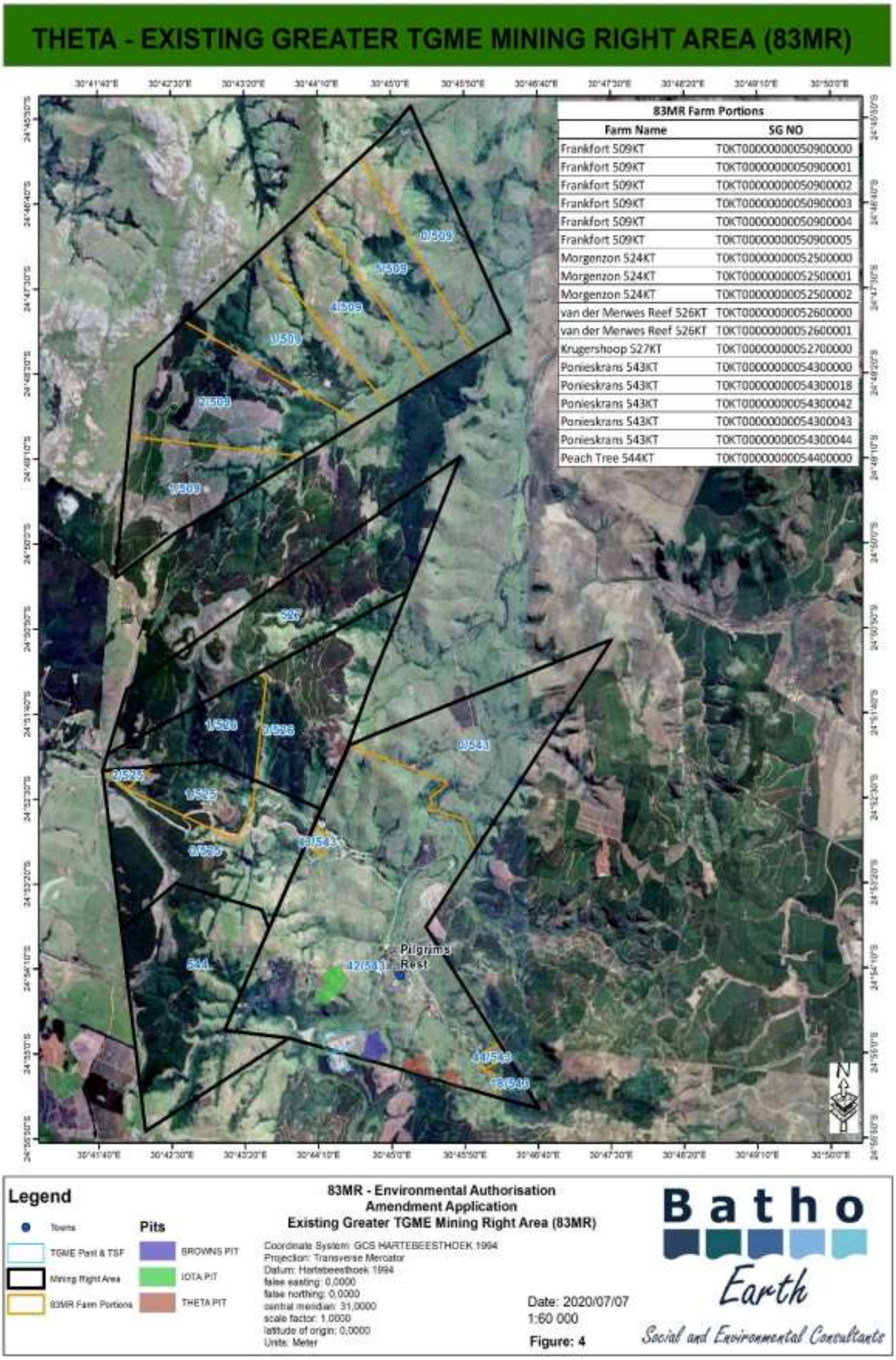


Figure 4. Existing Greater TGME Mining Right Area (83MR)

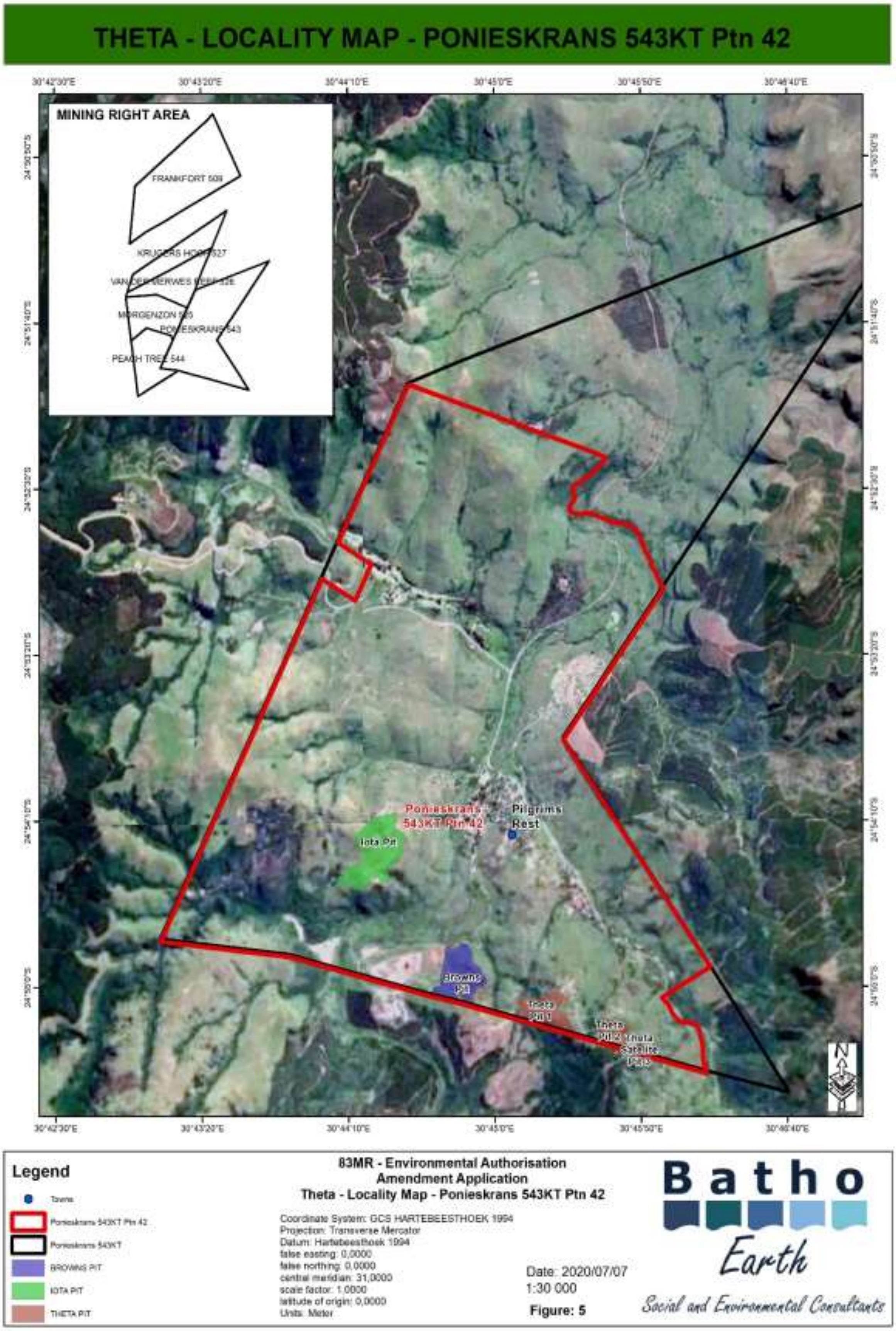


Figure 5. Locality map of Portion 42 Ponieskrans

4.2.2. Property Ownership

TGME holds the mining rights for the farms: Frankfort 509KT; Krugershoop 527KT; Morgenzon 525KT; Peach Tree 544KT; Ponieskrans 543KT; Van Der Merwe's Reef 526KT. The surface rights for the said farms are owned by various organs of state, private companies and communal property associations. As part of the public participation process consultation with all the affected landowners and adjacent landowners will be arranged in order to obtain inputs and comments. Please refer to Figure 6 which provides a visual presentation of the landowners and adjacent landowners within the study area. The property details for the *landowners* are presented in the following table:

Table 4. Landownership

Mining Right	Farm	Portion	Owner	Title Deed
83MR	Frankfort 509KT	RE	Maorabjang Communal Property Association	T3313/2015
83MR	Frankfort 509KT	Ptn 1	Republic of South Africa but leased by SAFCOL	T32393/1975
83MR	Frankfort 509KT	Ptn 2	Republic of South Africa but leased by SAFCOL	T32393/1975
83MR	Frankfort 509KT	Ptn 3	Republic of South Africa but leased by SAFCOL	T32393/1975
83MR	Frankfort 509KT	Ptn 4	Maorabjang Communal Property Association	T3313/2015
83MR	Frankfort 509KT	Ptn 5	Maorabjang Communal Property Association	T3313/2015
83MR	Krugers Hoop 527KT	Farm	Republic of South Africa (RSA) but leased by SAFCOL	T33148/2002
83MR	Van der Merwes Reef 526KT	RE	(RSA) but leased by SAFCOL	
83MR	Van der Merwes Reef 526KT	Ptn 1	(RSA) but leased by SAFCOL	
83MR	Morgenzon 525KT	RE	Leased by SAFCOL	
83MR	Morgenzon 525KT	Ptn 1	Unknown	
83MR	Morgenzon 525KT	Ptn 2	Unknown	
83MR	Peach Tree 544KT	Farm	Republic of South Africa but leased by SAFCOL	T58018/2005
83MR	Ponieskrans 543KT	RE	Maorabjang Communal Property Association	T3313/2015
83MR	Ponieskrans 543KT	Ptn 18	Provincial Government of Mpumalanga	T14100/1984
83MR	Ponieskrans 543KT	Ptn 42	Republic of South Africa	T6421/1984
83MR	Ponieskrans 543KT	Ptn 43	Provincial Government of Mpumalanga	T30901/1987
83MR	Ponieskrans 543KT	Ptn 44	Provincial Government of Mpumalanga	T30901/1987

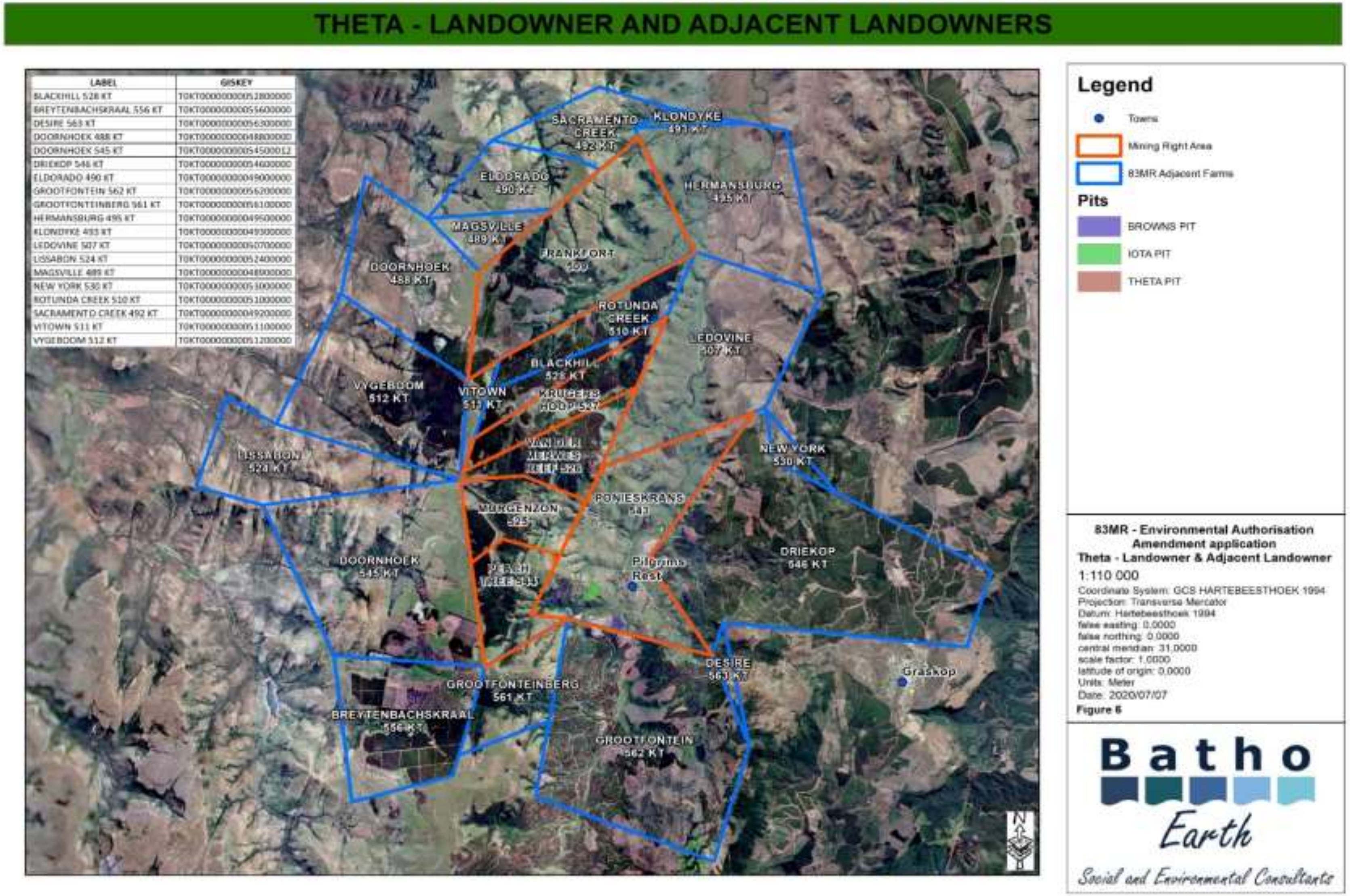


Figure 6. Landowner and Adjacent Landowners Map

5. Project Description

The aim of the *third updated* application is to obtain authorisation to mine three main pit areas (Browns, Theta and Iota) as opencast pits. The area is currently vacant and was historically mined as underground mines. The project duration is 5 years and will produce an average of 600 ktpa of ore. A total of 234,063 oz, or 7,280 kg of gold will be produced over the life of mine ("LoM"). This is achieved by mining the gold resources via an open cast mining method, executed by the establishment of the Theta, Browns and the Iota Pits.

5.1. Modified Terrace Mining

5.1.1. Basic overview of the mining method.

The mining method selected for this project is referred to as modified terrace mining. This mining method is suited to the mountainous profile of the current topography. The ore deposit is considered stratified and inclined. To overcome the steeply dipping orientation the ore will be extracted on a flat surface whereby all the reefs are extracted on the horizontal plane via a surface miner or conventional load and haul techniques.

The modified terrace mining method incorporate the systematic backfilling of the waste material. The planned mining strategy is to utilise space in the mined-out areas for backfilling of waste, which will ultimately reduce the waste rock dump footprint.

Once mining has progressed and enough area has been created in the pit some overburden / waste material will be backfilled into this space.

The mining method as explained is illustrated in the simplified diagram in Figure 7. The scheduling strategy is to target sufficient total tonnes to ensure enough ore tonnes are produced to maintain a live ore stockpile (<2 months of ore) which could feed the processing plant at 600 ktpa.

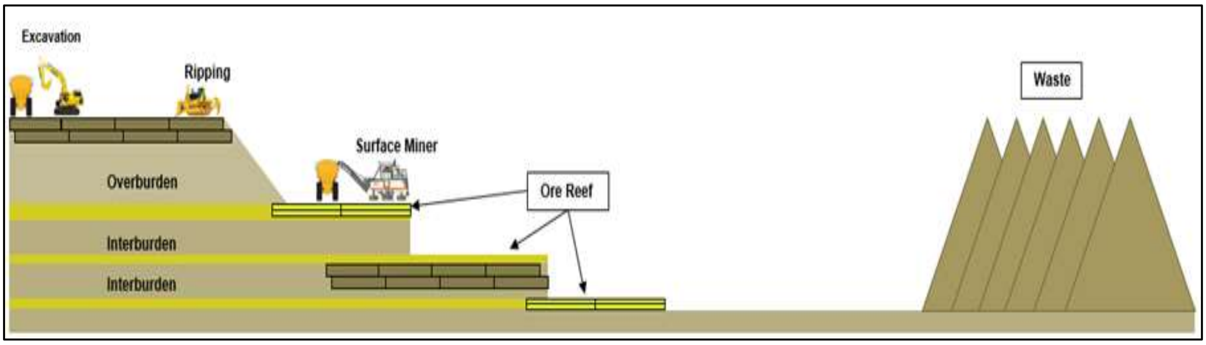


Figure 7. Example of Modified Terrace Mining

The mining method requires the removal of topsoil which will be stockpiled to be utilised for rehabilitation purposes. The topsoil stockpile will also be utilised as a berm to divert runoff water, and will be situated close to the mining area to enable short hauling for the rehabilitation of the backfilled areas. Topsoil will be removed as an ongoing process as the open pit progresses.

The overburden or waste material will be removed with a combination of excavators and trucks with the assistance of ripping via a dozer or eccentric rippers. Material requiring no breaking will be free dig and will be removed with a truck and shovel combination as illustrated in Figure 8.

Figure 8. Overburden Removal with Truck and Shovel

5.1.2. Ore Mining

The waste material will require some breakage prior to the loading. This will be achieved by non-explosive breakage by ripping with a dozer or eccentric rippers as illustrated in Figure 9. The primary method of breaking rock on the project will be by means of Dozer ripping. Ripping is a method of loosening material by means of a pulling a ripper shank attached to the back of a tracked dozer through densely packed material. In areas where the planned dozer may not be capable of ripping the material an eccentric ripper will be used as the secondary method of breaking rock.

The ripping of the waste material will increase the simplicity of the operation as well as the safety implication and slope stability compared to conventional drill and blast.

Once the material is broken by ripping, it is loaded with the same truck and shovel fleet.

Figure 9. Overburden Removal with Ripping

Once material has been broken sufficiently via ripping the material will be loaded into dump trucks with excavators and hauled via dedicated haul roads to the run of mine (ROM) pad.

Waste material will be mined in a similar fashion to that of the ore. Broken waste will be loaded onto haul trucks by an excavator and hauled to a waste storage facility keeping (waste rock dumps) in mind the overall strategy remains to minimise to overall waste rock dump footprint.

During the early stages of mining there will be limited space available to backfill waste back into the pits and this material will have to be placed on a waste rock dump.

5.1.3. Backfilling

As mining progresses waste removed from the pit will be hauled directly to dedicated areas within the pit, this is very similar to roll-over mining. The dedicated areas for backfilling are selected based on available area and over all slope angles to ensure safe placement of waste material in the pit.

Once a pit is mined out there will be a void remaining – this void is a function of the initial material placed in waste rock dumps and other constraints limiting complete backfill. The philosophy is to not re-handle any waste material.

The backfilling process is illustrated in Figure 10.

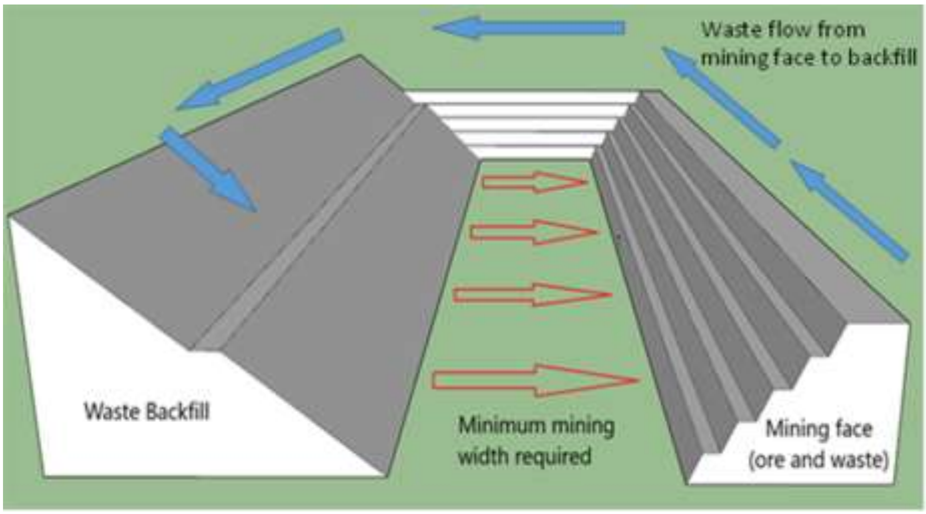


Figure 10. Back-Filling Method.

Browns Hill open pit will not be backfilled as the pit will be used for future tailings capacity and the waste will be dumped onto a waste rock dump situated nearby. Theta Hill and Iota Pit will be partially backfilled and waste that is not backfilled will be dumped onto a waste rock dump situated at the Browns / Theta Hill and Iota Pits respectively (Minxcon, 2018). It is also planned that a waste water dam is situated within Browns Pit.

5.1.4. Pit Design

The pit was designed based on the following design criteria:

- Overall slope angle: 45°;
- Face angle: 68°;
- Berm width: 3 m;
- Bench height: 5 m; and
- Ramp gradient: 10%

The optimal pits for the Project Area were selected for the pit designs.
The final pit design for Theta Hill, Browns Hill and Iota is shown in Figure 11, Figure 12 and Figure 13 respectively.

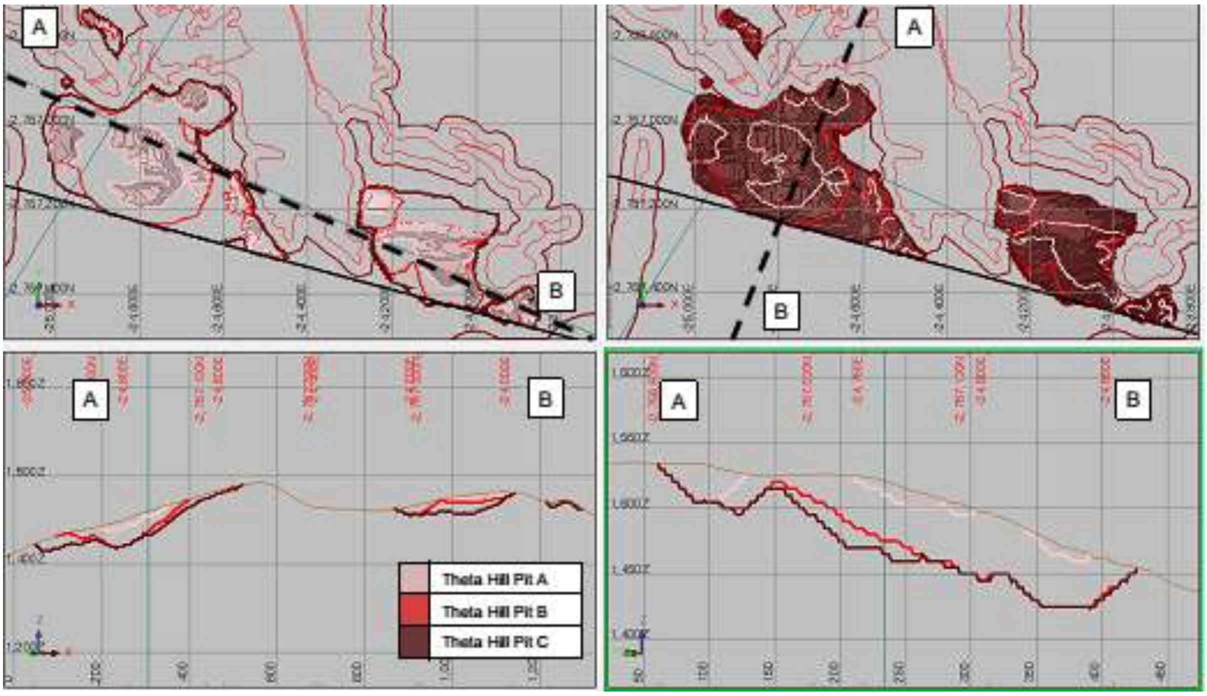


Figure 11. Theta Hill pit design.

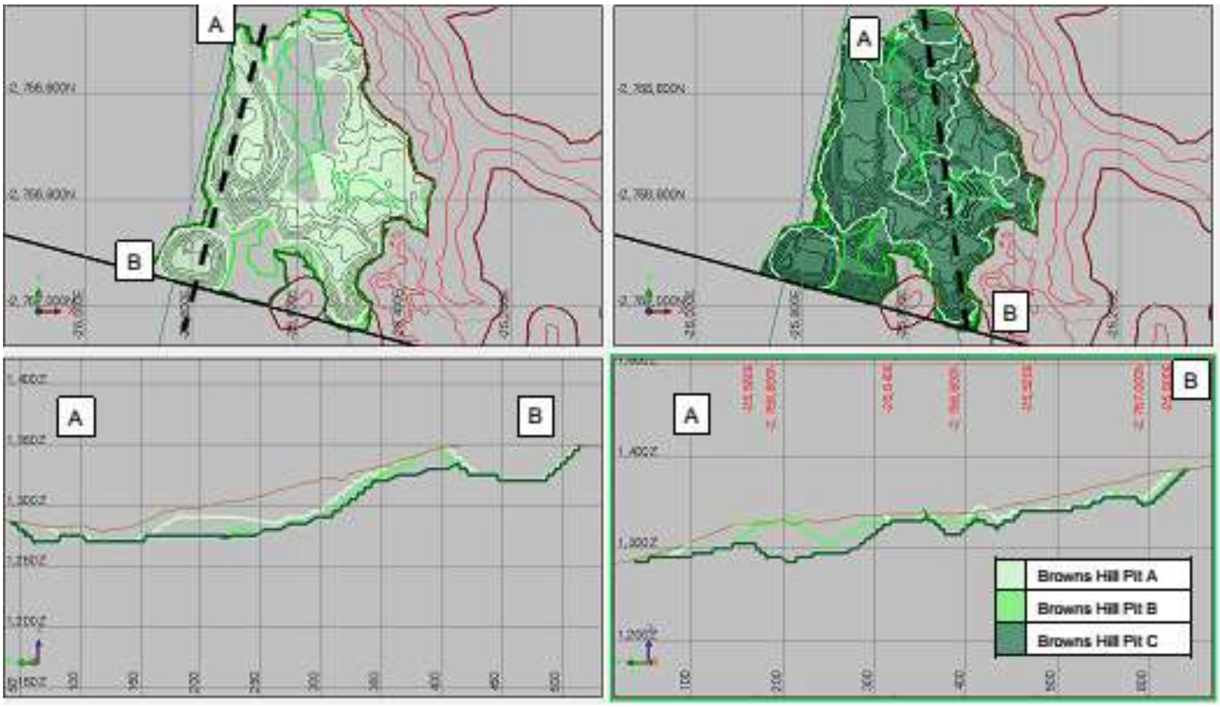


Figure 12. Browns Hill pit design.

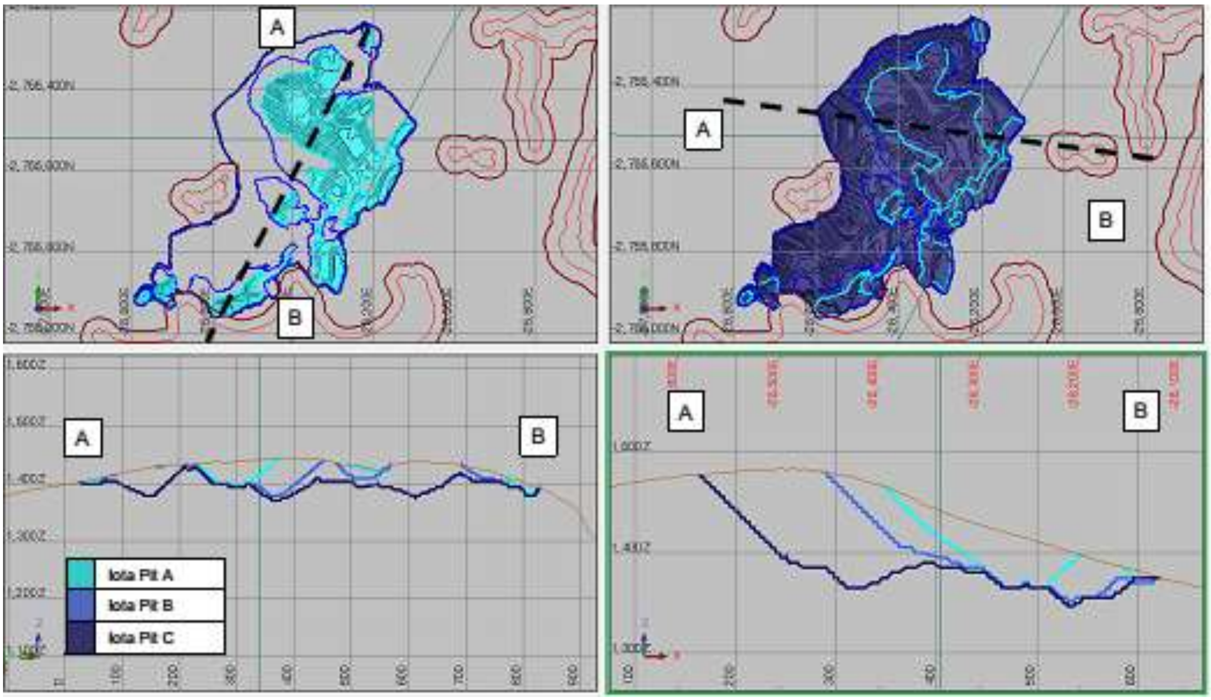


Figure 13. Iota Pit Design

5.1.5. Timing /mine schedule

The aim is for the construction phase of the project to take approximately 10 months and the life of the mine is designed at 5 and a half years. Mining will commence in phases. The Iota Pit will be mined from months 1 to 29, with the Browns pit being mined from months 29 to 53. The Theta Pit will be mined from months 29 to 64. Although phased, all three pits will be mined continuously. With the contour strip mining method, mining commences at the outcrop and progresses into the hillside; this results in lower average stripping ratios, increasing towards the end of the life.

The scheduling strategy is to target sufficient total tonnes to ensure enough ore tonnes are produced to maintain a live ore stockpile (<2 months of ore) which could feed the processing plant at 600 ktpa. Please refer to Table 5 below.

Table 5. Data on the Proposed Mining Operations

Features	**Details**		
Target commodities	Gold -Au		
Mineable Resources	3,665 kt – Total Project		
Opencast Mining			
Open Pits	Theta Pit	Browns Pit	Iota Pit
Location	24°55″03.27″ S 30°45′20.84″ E	24°54′57.83″ S 30°44′50.95″ E	24°54′19.57″ S 30°44′18.54″ E
Size of the mining area	(2 main pits and 3 satellite pits in total) 198,074 m2 (19.8ha)	17.2 ha 172,879 m2	25.51 ha 255,184 m2
Mining Rate (per month)	27.6 ktpm ore 440.3 ktpm waste	26.8 ktpm ore 352.4 ktpm waste	61.3 ktpm ore 727.2 ktpm waste
Pit depth	Theta Main 1395 mamsl	1270 mamsl 120 m depth from original surface level	1355 mamsl 145 m depth from original surface level

Features	Details		
	Theta small 1460 mamsl Main - 190 m Small – 130m depth from original surface level		
Mineable resource (tonnes)	1,073kt	716kt	1,877kt
Mining duration (including concurrent rehabilitation, season dependent)	35 Months Month 29 to 64 mining Year 4 - 6 backfilling / rehabilitation	24 Months Month 29 to 53 mining Year 4 - 6 backfilling / rehabilitation	29 Months Month 1 to 29 mining Years 1 - 4 backfilling / rehabilitation
Final rehabilitation duration	Year 2-3-year backfilling / rehabilitation	Year 2-3-year backfilling / rehabilitation	Year 2-3-year backfilling / rehabilitation
Temporary waste rock dump volume (The Rock Dumps will be permanent not temporary)	Wishbone WRD – 5,796,129 m³		Iota WRD 1 – 3,184,093 m³ (Includes the area that will be covered on top of the backfilled pit.) Iota WRD 2 – 1,326,605 m³
Temporary waste rock dump height (The Rock Dumps will be permanent not temporary)	1,486 mamsl		Iota WRD 1 – 1508 mamsl Iota WRD 2 – 1375 mamsl

5.2. Infrastructure Required

All the required infrastructure for the proposed project will be established on Portion 42 of the farm Ponieskrans 543KT, which is located adjacent to the existing TGME metallurgical plant. The project layout plan is provided in Figure 14.

In order to effectively establish the open pit mining operation, several infrastructure items will be required. The required infrastructure will include:

- additional owners and mining contractor's offices as well as a boardroom;
- fuel storage area (with a capacity of 45m^3);
- mining changing facilities and laundry;
- earth moving vehicle workshop and wash bay;
- mining and engineering stores;
- first aid station;
- control room;
- mining waste sorting /management and salvage yard;
- sewage handling facilities;
- allowance for a water treatment facility;
- additional power distribution transformers;
- additional power supply overhead line from the Eskom consumer substation;
- mine haul roads;
- site security and access control;
- PCDs (storm water and pollution control dams);
- stockpiles (Strategic Ore and Topsoil) and Waste Rock Dumps (WRD).

The general mining site infrastructure will include offices, change houses and laundry facilities, control room, first aid station, stores and laydown yard, salvage yard and waste sorting area, fuel storage facility, refuelling bay, wash bay, workshops, brake test ramp and parking areas. This area is anticipated to be located to the north of the existing plant, please refer to figure 15.

The size of the total infrastructure footprint area is 286ha. An access control point will be required along the access road into the project. This will assist in controlling movement of people and vehicles to the project and will limit unauthorised movement on the project area. The access control point will consist of a mobile office unit, two boom gates and guards patrolling the area.

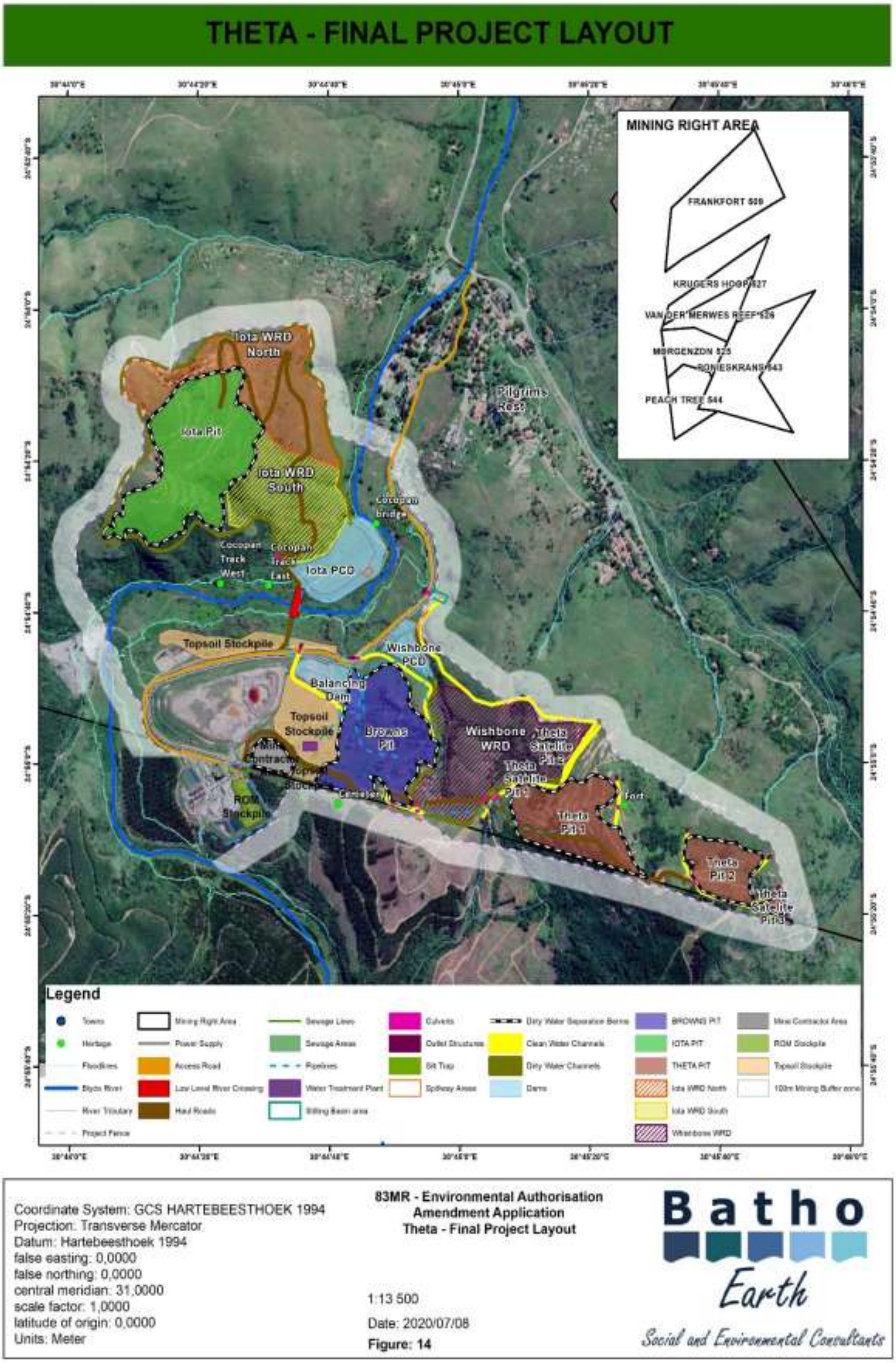


Figure 14. Theta Final EIA Phase Project Layout Plan

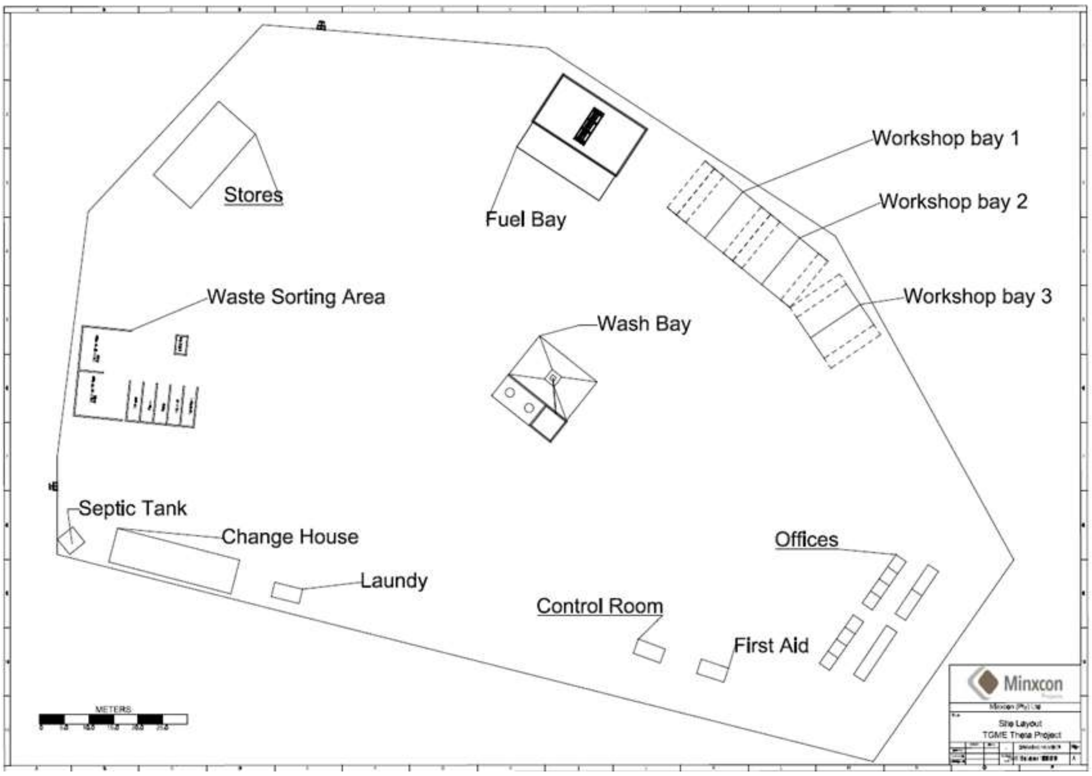


Figure 15. Mining Site Infrastructure Layout

For this project, strategic ore can be defined as all ore between the grade of 0.2 g/t to 2 g/t. Strategic ore will be stockpiled and utilised for blending into the plant feed with Run of Mine (RoM) ore as and when required and during periods of mining difficulty e.g. high rainfall periods. The exact footprint and height will vary as it will always be a live stockpile; however, overall height is not expected to exceed 10m. Please refer to Table 6 and Figure 16 below for the detailed specifications on the stockpile infrastructure required.

Table 6. Stockpile Specifications

Description	**Height**	**Size**	**Capacity**
Topsoil Stockpile	3 m	50,432 m²	139,997 m³
Topsoil Stockpile (South of haul road)	10 m	23,261 m²	60,000 m³
Theta Browns (Wishbone) WRD	208 m	241,285 m²	5,796,129 m³
Iota WRD1 (North)	210 m	441,449 m²	3,184,093 m³
Iota WRD1 (South)	58 m	159,692 m²	1,326,605 m³

Figure 16. Stockpile areas.

5.2.1. Power Supply

There is an existing 6.6 kV line supplying power to the operation from the existing Eskom consumer substation. This line will be upgraded as part of the plant refurbishment as it has been in place since the mid 1980's. The upgrade will entail a new 22 kV overhead line from the Eskom consumer substation.

5.2.2. Water Supply

Staff Water Requirements

Water requirements for use by the mine staff is calculated at 120 litres per person per day. Raw water will be supplied via an existing raw water tank located within the metallurgical plant area and will be fed to water tanks situated at the respective mining areas via pipelines. From there water will be treated to potable standards as and when required.

Surface Run-Off Water

It is proposed that upslope clean water runoff is diverted around the pits, WRDs and stockpiles, and that dirty water runoff from these facilities is captured, contained and used to supply the metallurgical plant with process water.

Clean water diversion channels are proposed to divert upslope clean water runoff around the Wishbone WRD. The clean water diversion channels will be grassed, with the excavated soil from the channel placed on the downslope side, to form a separation berm between clean and dirty areas. The berms will be vegetated to prevent erosion. Dirty water from the Wishbone WRD will run off to the Wishbone PCD. An annual programme of silt removal will be put in place, to ensure that the design capacity of the PCD is not compromised as a result of sediment build-up. Silt traps are recommended at the entrance to the PCD.

For the Iota WRD, dirty water channels are proposed along the periphery, with berms on the downslope side of the channels. The purpose of the dirty channels will be to capture runoff from the WRD, and to convey it to the Iota PCD. An annual programme of silt removal will be put in place. Silt traps are proposed at the entrance to the PCD, in order to ensure that the design capacity of the PCD is not compromised as a result of sediment build-up.

5.2.3. Water Management

Dirty water runoff from the mine operation will be captured and managed as required by GN704 regulations, with provision for flood conditions. Dirty water will preferentially be used as process water in the metallurgical plant, to minimise the need for make-up water. Clean water - such as rainwater - will be diverted away from dirty areas, and into the nearest watercourse. Separate systems will be constructed to manage dirty and clean water; these will include separate dams and run-off channels.

5.2.4. Access Roads

Access to the current metallurgical plant and proposed mining area is off the R533 before Pilgrims Rest, past the caravan park and onto an existing gravel road which then leads to the existing TGME offices. The existing access road will be upgraded to accommodate the requirements posed by the proposed activities.

The width of the main access road will remain largely unchanged and will be repaired to a standard appropriate for the traffic load. These roads will be equipped with all the required storm water systems and structures to prevent any possible flooding. Dust from these roads will be controlled by applying road binders and regular watering with water tankers.

Haul roads will be utilised for the transport of ore from the mining areas to the various stockpiles and the WRDs located on the project area. The haul roads will be constructed to cater for continuous two-way traffic of fully loaded articulated dump trucks except where there are physical or environmental constraints. The position of the new haul roads is depicted on Figure 14. The total length of the proposed Theta / Browns haul road is approximately 2.375 km and the total length of the proposed Iota haul road is approximately 3.346 km.

5.2.5. Plant and Tailings Facility

The existing TGME Processing Plant lies some 500m due west-northwest of Browns Hill. The Tailings Facility (TSF), as well as two lined return water dams are located on the farm Ponieskrans 543 KT. For the process plant to successfully treat the additional 600 ktpa from the Theta Project, reconditioning and upgrades will be required to the existing TGME gold ore process plant (Mixcon, 2018). The future reconditioning and upgrades to the processing plant are not included in the current study.

The existing TSF will need to be recommissioned. The facility is deemed to be structurally sound, but refurbishment will be required to allow for tailings deposition and return of water to the plant. The future TSF extensions are not included in the current study

5.2.6. Sewage Treatment and Management

Sewage from the offices, change houses and plant will be treated at a proposed Sewage Treatment Plant (STP). The STP is included in the Integrated Water Use License Application (IWULA). Treated effluent will be used as process water at the plant.

5.2.7. Waste Classification

Waste envisioned to be generated from the operation will include domestic, industrial and hazardous waste. Domestic waste will comprise 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, amongst others.

Industrial waste is expected to be generated from the workshop operations including machine maintenance. Hazardous waste will include all discarded fuels, oils, lubricants, paints solvents and other chemicals. These items will not be able to be disposed of on site and will have to be removed from site to a licensed waste handling facility.

Waste rock from the mining operation will be deposited onto the proposed new WRDs. The waste classification study concluded that the waste rock poses a low risk of contamination. The location of the WRDs has been refined based on inputs from the EIA process and the specialist studies conducted.

5.2.8. Waste Sorting and Salvage Yards

The mine operation is proposing a waste sorting and salvage yards. These areas will be utilised to sort all generated waste into the above-mentioned groups/categories.

These areas will have concrete slabs and bunded areas to ensure no soil contamination can occur. Dedicated compartments will be equipped with colour coded waste collection bins to assist with the waste sorting process. The Hazardous waste compartment will be bunded and equipped with a roof. This will minimise the risk of run-off rain water being contaminated. Medical waste will be containerised in enclosed bins and appropriately disposed of.

Subsequent to sorting, waste will be collected by an appointed contractor and disposed of at a suitable facility in the area.

5.2.9. Employment and Housing

The Mine will require approximately 400-450 full time equivalent employees once operational. Local labour would be sourced where possible, and will be dependent on skills and other personnel engagement requirements. No project or mine housing is expected to be provided during construction and operational phases; however, the company expects to place temporary accommodation facilities in the caravan park during the construction phase which may eventually form part of longer-term accommodation available for hire.

5.2.10. Operating Hours

The operational phase for the mining activities is expected to be run on a 6-day working week with a two-shift system of 10 hours per shift, Monday to Saturday - 26 days a month. It should however be noted that there may be a requirement to run a 24 hour per day and 7 day per week system for the mining operations and this should be considered in the review process. The process plant will run on a 24 hour per day, 7 day per week basis.

5.2.11. Mine Closure

A Rehabilitation and Closure Plan was developed for the project. The conceptual closure strategy provides a framework for developing an approach towards closure and rehabilitation requirements over the entire life-of-mine. The strategies are largely dictated by the potential impact on biodiversity, the sensitivity of the Blyde River system and the potential loss in localised ecosystem services as a result of the proposed mining practices.

The rehabilitation hierarchy (adopted from the Queensland Government Department of Environment and Science (2014), illustrated in the rehab and closure reports, describes different levels of rehabilitation from a do-nothing approach, to an avoid-any-disturbance approach. The avoidance scenario had been explored extensively during the mine design phase, and it resulted in partially protecting certain Critical Biodiversity Areas (CBA). However, certain activities within the CBAs are simply unavoidable if feasible mining were to take place.

It is acknowledged that the proposed terrace mining activity will transform many of the biophysical characteristics of the landscape at a local scale. The most noteworthy will be the topography which will alter the surface hydrology, soils and geology for example. With backfilling and profiling only being viable over a part of the project, some areas will remain open cuts in the mountain side. These will result in a permanent rearrangement of the biophysical elements.

Partial reinstatement of an altered biophysical scenario can be accomplished through careful mine planning/design, with closure in mind. The success of this closure strategy can only be accurately assessed during a detailed monitoring period.

5.2.12. Closure Objectives

The overarching closure vision for the TGME Theta mine application is to initiate the recovery of the disturbed areas and accelerate an ecological trajectory/pathway towards a pre-defined reference condition within an achievable timeframe. This requires a reconstructed system that aims to be functional, resilient and regenerative with respect to its species composition (biodiversity), structural integrity (geotechnical, erosional and geochemical stability) and reintegration with the larger context, while creating the potential to promote ecosystems, livelihoods and local industries.

Objectives for mine closure should be suited to its context, practically achievable based on best practices, and fit within the regulatory framework. As a minimum, four general closure objectives should be achieved namely:

- The post mining landscape should be safe for humans and animals over a long term;
- The post mining landscape should be stable (geotechnically, erosional and geochemically) and offer long-term resistance to normal environmental stresses and disturbances;
- Residual impacts, as a result of the mine, should not cause harm or pollute the environment in and around the mining footprint;
- The post mining landscape should be able to sustain an agreed post-closure land use or restore pre-determined land capabilities.

5.2.13. Post Mining Land-use objective

The post mining land-use objective relates to the rehabilitation hierarchy illustrated in the rehab and closer report (Appendix 16). Complete avoidance or full restoration are not considered achievable objectives for the post mining landscape. Rather, a combination of the following can be implemented namely:

- Developing an alternative outcome with a higher or equal land capability;
- Re-vegetation with suitable species and
- Developing a lower value land use or land capability.

These objectives may adapt based on the practical implementation and knowledge, or research outcome at the time. For these land-uses to realise, the four primary closure objectives should be met (refer to Section 6). Specific objectives for each of the categories are described below:

- All surface infrastructures and their footprints shall be rehabilitated to a condition where:
    - All structures and their foundations are dismantled and removed;
    - The infrastructure sites are free of pollutants or sources of residual or latent environmental impacts;

- Create a surface condition that is suitable for vegetation establishment and establish a vegetation cover with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition; and
- The rehabilitated sites interact with adjacent ecosystems in terms of organism migration, nutrient cycles and hydrological connections.
- The perimeter fence and security features (specifications unavailable at the time of reporting) should remain intact and active until all the terrace cuts/pits and WRDs are declared safe for humans and animals and until such time the Applicant does not require the security or access control. At the point when the above criteria are met, all features of the fence should be removed, and the disturbed surfaces rehabilitated through:
- Preparation of the soils to form a seed bed; and
- Create a surface condition that is suitable for vegetation establishment and establish a vegetation cover with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition.
- Approximately 5.5km haul roads (11.35ha) and an indeterminate length of internal roads will be constructed in the mining area. All rehabilitated roads shall be:
- Profiled to restore the natural topography and hydrological patterns; and
- Capped with a suitable growing medium and vegetated with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition.

- Those roads that will remain after closure as a result of pre-closure negotiations with landowners and stakeholders, shall be sufficiently upgraded to minimise the impacts of erosion and sedimentation on local water courses via the implementation of adequate stormwater management systems. Transfer of maintenance agreements with regards to the road surface and stormwater management infrastructure, should be formalised. Residual impacts and environmental risks should be assessed at that time to have the best basis for decision making, especially for those transport infrastructures that traverses sensitive ecosystems;
- The low water bridge over the Blyde River shall be removed and rehabilitated to:

  - Restore the natural flow path of the river;
  - Prevent scouring of the river profile at that particular point and downstream; and
  - The river embankments shall be revegetated with indigenous aquatic and riparian species that is representative of the vegetation in the river system.

- Pre-closure negotiations with landowners/stakeholders may find a beneficial use for the low water bridge. The health and integrity of the aquatic ecology and hydrological system should be considered as the primary stakeholder when making a final decision. This will require scrutiny of all the monitoring information and interpretation of the data by a qualified professional;
- Pumps and pipelines (dewatering and supply pump columns) are some of the equipment that will be installed at PCDs, pits etc., to manage water levels and balances across the site. Pumping equipment that manages potentially polluted water, should remain active after decommissioning until all risk of pollution is abated. Ultimately, when relinquishment criteria with regards to sediment loads, water quality and -balances have been achieved, this equipment shall be removed, and the sites rehabilitated by taking the necessary action to:

- Demolish structures such as pump mountings etc. and remove foundations;
- Restore the topography to blend in with the natural surroundings;
- Capped with a suitable growing medium and vegetated with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition.

- An overhead 22kV powerline shall be erected from the existing substation near Pilgrims Rest to the existing processing plant. This section of approximately 2.5 km will typically consist of gum pole structures supporting the power cables (detail design to be completed). Removal of the conductors, poles, foundations and other ancillary components shall be initiated when the powerline becomes redundant in terms of its use.
- The waste rock dumps (WRD) will be permanent landforms and must be designed and constructed with closure in mind. Structural profiling and contouring should occur in-situ as far as practically possible to minimise earthworks at a later stage. This approach should develop a landform that:

    - Blends with the natural topography by avoiding sharp corners, straight lines and unnatural intersections with the landscape;
    - Provides geotechnical, erosional and geochemical stability;
    - Manages surface water in an effective way to facilitate long-term functionality;
    - Is capped with a cover system that consists of a growth medium that can support a healthy vegetation cover;
    - Is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition; and
    - Reduce the necessity for extended aftercare and maintenance actions by ensuring long-term stability and establishing a regenerative and self-sustaining ecology.

- The mine design suggests that partial backfilling will occur in parts of the pits. Some areas may remain as open cuts and pits that should be rehabilitated to achieve the following core objectives:

    - The terrace cut, in specific the high wall, must be made safe and stable as far as practically possible, minimising risks to the health and safety of humans and animals;
    - Where in-filling is suggested, the slopes should be stable and at a gradient that is accessible for equipment to perform rehabilitation;
    - Minimise the scale and height of the high wall through profiling, partial backfilling and by implementing sound stabilisation methods;
    - Profile the landform within reasonable and practical limits to merge with the natural terrain. A landform design should inform the operational phase to minimise actions at the closure phase;
    - Surface water should not accumulate in voids unless it can be demonstrated that it is beneficial to the environment, stakeholders or local industries and that no environmental impact may originate from it for example salinization, unacceptable catchment interference or a safety hazard. Retention of water should be subjected to the approval of the necessary licences;
    - Is capped with a cover system that consists of a growth medium that can support a healthy vegetation cover;

  - Is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition;
  - Reduce the necessity for extended aftercare and maintenance actions by ensuring long-term stability and establishing a regenerative and self-sustaining ecology.

- All pollution control dams, balancing dams and associated surface water management structures (including diversion channels, silt traps etc.) shall remain actively monitored and maintained during the operational and closure phases and may only be decommissioned once all risk of pollution from the terrace cuts/pits and WRD are effectively dealt with. Once residual and latent risks have been sufficiently managed, the dams, diversion channels etc. shall be decommissioned and rehabilitated by:

  - Removing all structures such as silt traps, foundations, pump mountings, liners, etc., and dam walls;
  - Profiling and restoring the natural topography and hydrological patterns as far as practically possible, thereby reinstating a natural functioning and free-draining system that provides ecologically stable environments;
  - Cap with a suitable growing medium that is resistant to erosion in the early stages of vegetation establishment; and
  - Is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition;

- Three topsoil stockpile areas (12.5 ha in total) and strategic ore stockpiles (location and size unknown at the time of reporting) are proposed. All topsoil stockpiles should be used in rehabilitation by spreading it over disturbed areas and vegetating it. It is assumed that strategic ore stockpiles will be sold or processed, leaving the footprint to be rehabilitated. All stockpile footprints shall be rehabilitated to a condition where:

  - The shaping and profiling are done to blend with the natural topography;
  - The rehabilitated sites are resilient to normal ranges of environmental stresses and or disturbances;
  - The rehabilitated sites can sustain itself structurally and functionally;
  - The surface is capped with a cover system that consists of a growth medium that can support a healthy vegetation cover;
  - The surface is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition; and
  - The rehabilitated sites interact with adjacent ecosystems in terms of organism migration, nutrient cycles and hydrological connections.

5.3. Listed and specified activities

TGME is applying for approval to mine various reefs as modified terrace mining operations. The various reefs are situated on Portion 42 of the farm Ponieskrans 543KT.

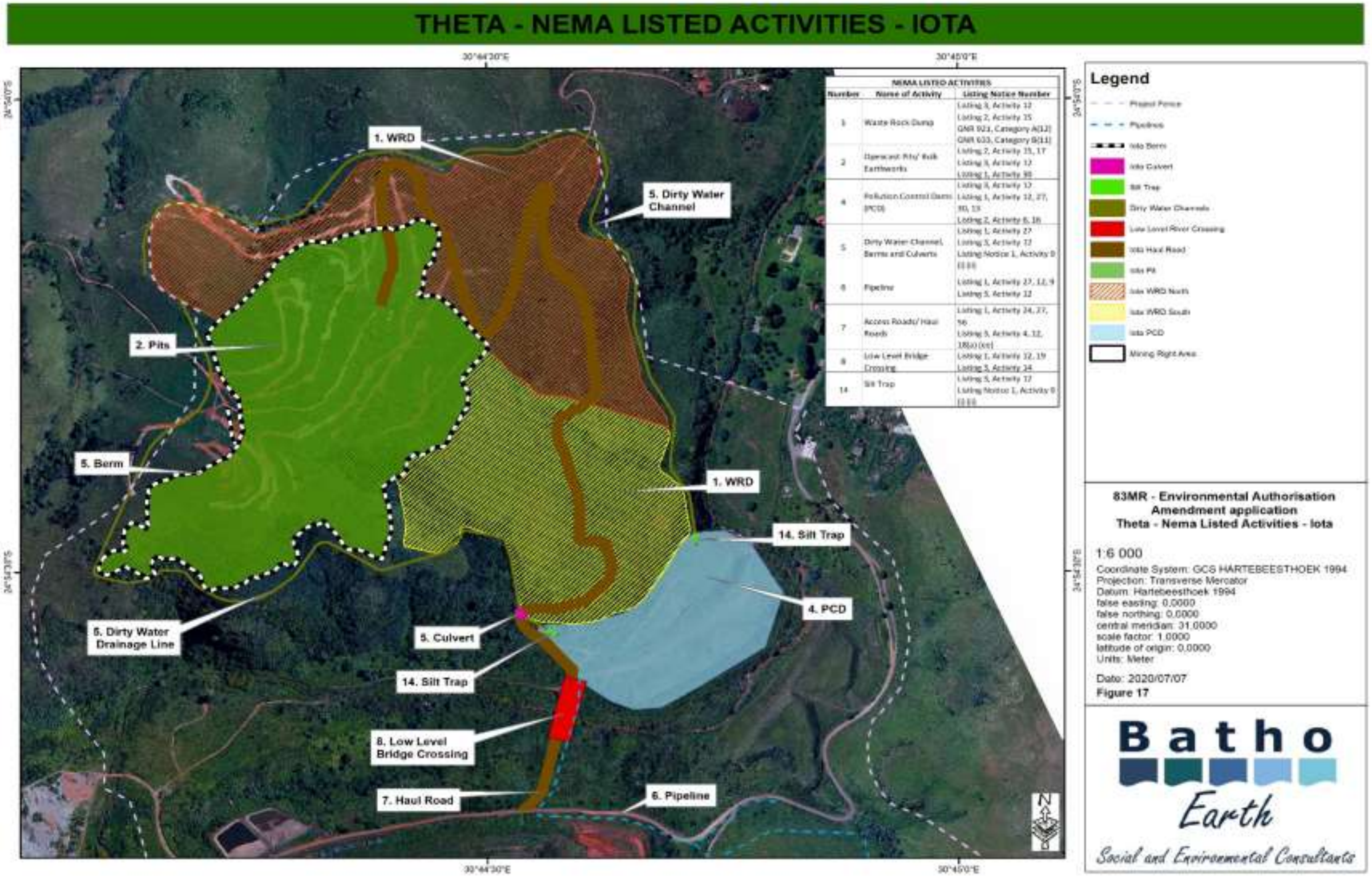
TGME is currently the holder of what is referred to as the existing MP 30/5/1/2/2/83MR mining right (83MR). In order to incorporate modified terrace mining into the operational plan, the existing Mining Works Programme had to be amended, which triggered a Section 102 amendment application.

The map depicted in Figure 4 shows the plan contemplated in Regulation 2(2) of the MPRDA, illustrating the land to which the application relates. This Section 102 Amendment Application for the 83MR Theta Project therefore just relates to the farm and farm portions under consideration within the existing MP 30/5/1/2/2/83MR mining right, in the Pilgrims Rest area, Mpumalanga Province.

The incorporation of modified terrace mining also triggers new NEMA listed activities, for which an environmental authorisation is required. The associated metallurgical processing facility is existing and approved and does not form part of this EIA application.

The maps showing the areas triggering NEMA Listed Activities, and extent of all proposed activities is provided in Figure 17, Figure 18 and Figure 19 below. A copy of the listed activities map is included in Appendix 2.

Due to the Integrated Environmental Process which the proposed Theta Project application will follow, all relevant activities which require authorisation in terms of NEMA and NEM:WA have been included in Table 7.



NEMA LISTED ACTIVITIES

Number	Name of Activity	Listing Notice Number
1	Waste Rock Dump	Listing 3, Activity 12 Listing 2, Activity 15 GNR 921, Category A(12) GNR 633, Category B(11)
2	Opencast Pits/ Bulk Earthworks	Listing 2, Activity 15, 17 Listing 3, Activity 12 Listing 1, Activity 30
4	Pollution Control Dams (PCD)	Listing 3, Activity 12 Listing 1, Activity 12, 27, 30, 13 Listing 2, Activity 6, 16
5	Dirty Water Channel, Berms and Culverts	Listing 1, Activity 27 Listing 3, Activity 12 Listing Notice 1, Activity 0 (i) (i)
6	Pipeline	Listing 1, Activity 27, 12, 9 Listing 3, Activity 12
7	Access Roads/ Haul Roads	Listing 1, Activity 24, 27, 56 Listing 3, Activity 4, 12, 18(a) (xx)
8	Low Level Bridge Crossing	Listing 1, Activity 12, 19 Listing 3, Activity 14
14	Silt Trap	Listing 3, Activity 12 Listing Notice 1, Activity 0 (i) (i)

Figure 17. Areas triggering NEMA Listed Activities at Iota Pit

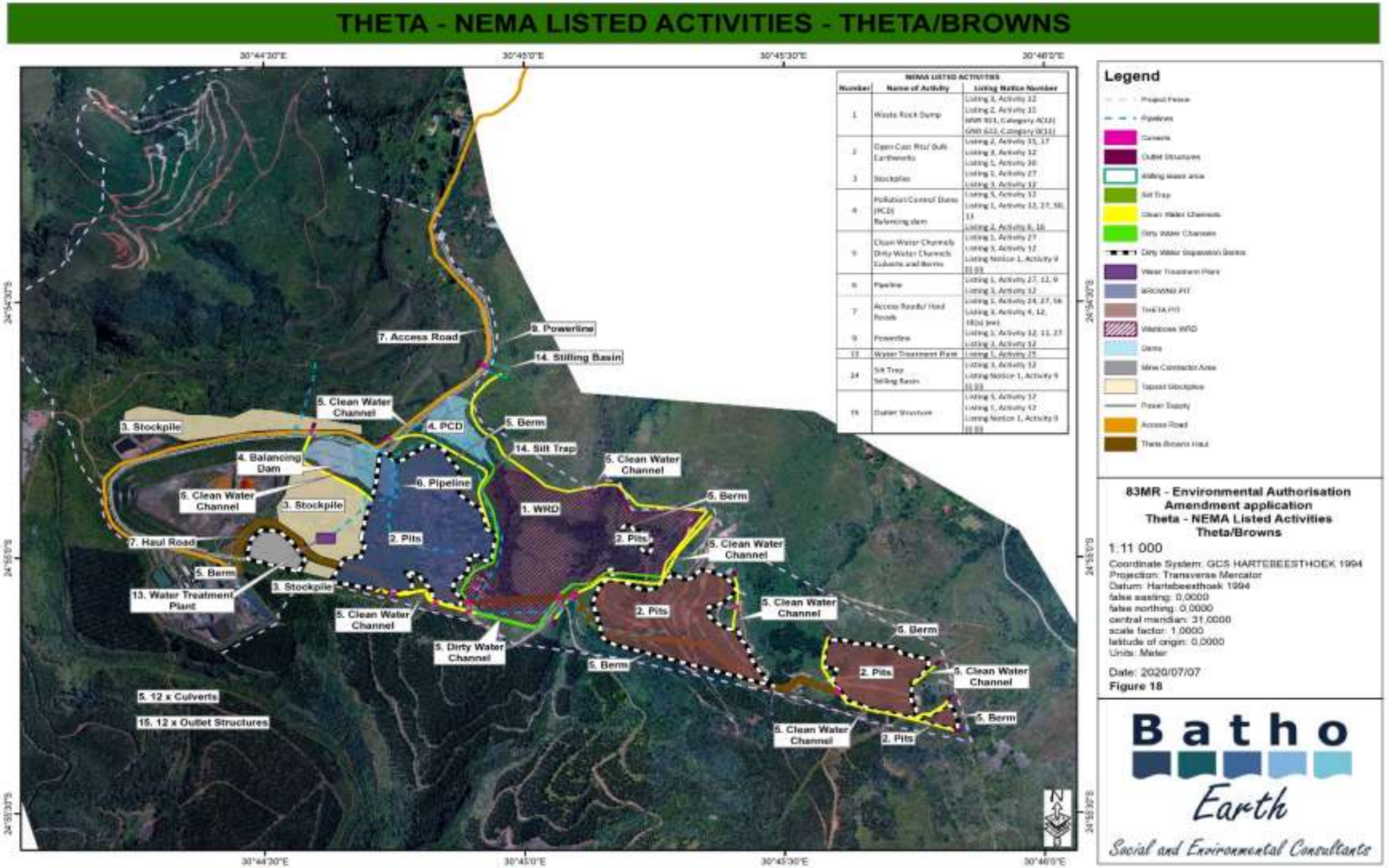


Figure 18. Areas triggering NEMA Listed Activities at Brown and Theta Pit

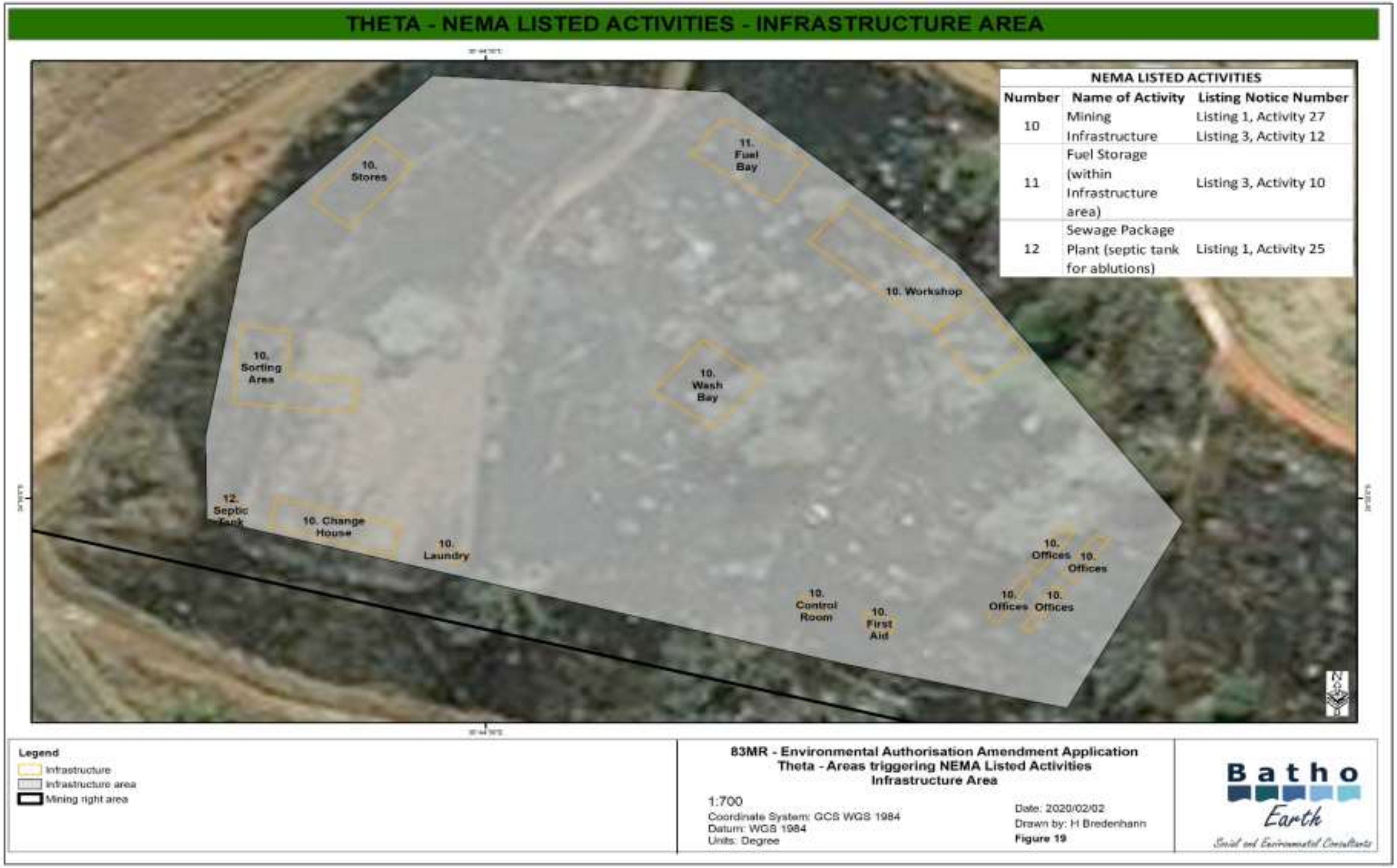


Figure 19. Areas triggering NEMA Listed Activities at the site Infrastructure Area

Table 7. Applicable Listed Activities

Name of Activity	**Aerial extent of the Activity (Ha or m²)**	**Listed Activity (Yes = "x")**	**Applicable Listing Notice (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325) or Listing Notice 3 (GNR 324)[1]**
Excavations / Project Fence Area	306 ha (extent of the area required for mining)		
Vegetation Clearance / Excavations	Total Infrastructure Footprint – 306 ha (total footprint of the battery limit of the mining area)	x	• Listing 2, Activity 15: The clearance of an area of 20 hectares or more of indigenous vegetation. • Listing 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation. (Mpumalanga: within critical biodiversity areas) • Listing 1, Activity 30: Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004) • Listing 1, Activity 28: Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: • (iii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;
Waste Rock Dumps	Wishbone WRD size = 23.65ha Iota South WRD = 16.66ha *Iota North WRD = 44.15ha *(includes the area that will be covered	X	• Listing 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation. (Mpumalanga: within critical biodiversity areas) • Listing 2, Activity 15: The clearance of an area of 20 hectares or more of indigenous vegetation. • GNR 921 Category A (12): The construction of a facility for a waste management activity listed in Category A

[1] Note that Listing Notice 3 is applicable in this event as the activities will be located in a CBA Category 1 area, as well as certain areas in critically endangered ecosystems.

Name of Activity	Aerial extent of the Activity (Ha or m²)	Listed Activity (Yes = "x")	Applicable Listing Notice (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325) or Listing Notice 3 (GNR 324)[1]
	on top of the backfilled pit.)		• GNR 633 Category B (11): The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, in terms of the MPRDA.
Open Cast Pits / Bulk earthworks	Total Infrastructure Footprint – 306 ha – total of the battery limit required for mining): Browns Pit – 17.3 ha Theta Pit – 20.54 ha Iota Pit – 25.6 ha	X	• Listing 2, Activity 15: The clearance of an area of 20 hectares or more of indigenous vegetation. • Listing 2, Activity 17: Any activity including the operation of that activity which requires a mining right [section 22 of MPRDA], including infrastructure, structures and earthworks, directly related to the extraction of a mineral resource. • Listing 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation. (Mpumalanga: within critical biodiversity areas) • Listing 1, Activity 30: Any process or activity identified in terms of section 53(1) of the National Environmental • Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
Stockpiles	Topsoil Stockpile =12.83ha	X	• Listing 1, Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation • Listing 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation. (Mpumalanga: within critical biodiversity areas)
Pollution Control Dams	Wishbone PCD = 2.45ha Iota PCD = 8.33ha Balancing Dam = 3.35ha Balancing Dam - Max size of 330,796 m3		• Listing 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan. • Listing 1: Activity 12: The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; • Listing 1, Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation • Listing 1, Activity 30: Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).

Name of Activity	Aerial extent of the Activity (Ha or m²)	Listed Activity (Yes = "x")	Applicable Listing Notice (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325) or Listing Notice 3 (GNR 324))[1]
			• Listing 2, Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding extraction and primary processing of a mineral or petroleum resource. • Listing 1, Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014 • Listing Notice 2, Activity 16: The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 meters or higher or where the highwater mark of the dam covers an area of 10 ha or more.
Diversion Trenches / Catchment Trenches /Culverts and Beams / Silt traps / Stilling Basin Outlet Structure	2392 m (more than 1ha total clearance needed) Clean Water Channels = 4448m Dirty Water Channels = 5066m Berms = 9.279m Culverts = 0.24ha	X	• Listing 1, Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation • Listing 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation. (Mpumalanga: within critical biodiversity areas) • Listing Notice 1, Activity 9: The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water (i)with an internal diameter of 0,36 metres or more; or (ii)with a peak throughput of 120 litres per second or more;
Pump Column	Internal diameter bigger than 0,36 metres	X	• Listing 1, Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation • Listing 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation. (Mpumalanga: within critical biodiversity areas) • Listing 1: Activity 12: The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse;

Name of Activity	Aerial extent of the Activity (Ha or m²)	Listed Activity (Yes = "x")	Applicable Listing Notice (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325) or Listing Notice 3 (GNR 324)[1]
			• Listing Notice 1, Activity 9: The development of infrastructure exceeding 1000 metres in length for the bulk • transportation of water or storm water • (i)with an internal diameter of 0,36 metres or more; or • (ii)with a peak throughput of 120 litres per second or more;
Access Roads / Haul Roads	Width of Haul Roads = 20m Total Haul Road Length = 5980m Total Access Road Length = 3463m	X	• Listing 1: Activity 24: The development of a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres. • Listing 1, Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation • Listing 1, Activity 56: The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre • (i) where the existing reserve is wider than 13,5 meters; or • (ii) where no reserve exists, where the existing road is wider than 8 metres; • Listing 3, Activity 4: The development of a road wider than 4 meters with a reserve less than 13,5 meters. • cc) Mpumalanga: sensitive areas • Listing 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan • Listing 3, Activity 18 (a) (ee): The widening of a road by more than 4 meters; or the lengthening of a road by more than 1 kilometre (a) In Mpumalanga • (ee) Within a critical biodiversity area as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.
Low level Bridge Crossing	As per the design approvals	X	• Listing 1: Activity 12: The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists,

Name of Activity	Aerial extent of the Activity (Ha or m²)	Listed Activity (Yes = "x")	Applicable Listing Notice (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325) or Listing Notice 3 (GNR 324)[1]
			within 32 metres of a watercourse, measured from the edge of a watercourse. • Listing 1, Activity 19: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse. (possibly depending on the outcomes of specialist studies) • Listing 3, Activity 14: The development of (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs(a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.
Powerline	22 kV line supplying power Distance of 2350m will be required. Clearance of more than 1ha needed.		• Listing 1: Activity 12: The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; • Listing 1: Activity 11: The development of facilities or infrastructure for the transmission and distribution of electricity: (i) outside urban areas with a capacity of more than 33 but less than 275 kV. • Listing 1, Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation • Listing 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan
Fencing	Total area of development – more than 20ha		• Listing 2, Activity 15: The clearance of an area of 20 hectares or more of indigenous vegetation.
Mining Site Infrastructure (including buildings, workshop, wash bay, parking, change house, laundry,	1.84 ha	X	• Listing 1, Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation • Listing 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan

Name of Activity	Aerial extent of the Activity (Ha or m²)	Listed Activity (Yes = "x")	Applicable Listing Notice (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325) or Listing Notice 3 (GNR 324)[1]
salvage yard, control room, first aid, stores.			
Fuel Storage (within the infrastructure area)	45 cubes	X	• Listing 3, Activity 10: The development and related operation of facilities or infrastructure for the storage or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic meters.
Sewage Package Plant (septic tank for ablution) Inclusion of a Water Treatment Plant	Less than 1ha	X	• Listing 1, Activity 25: The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2000 cubic metres but less than 15000 cubic metres.

6. Policy and Legislative Context

Below is the 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.

Table 8. Legal Context

Legislation	Description and Relevance	Authority
The Constitution of South Africa (No. 108 of 1996)	Chapter 2 – Bill of Rights Section 24 – Environmental Right The proposed activities shall be conducted in such a manner that significant environmental impacts are avoided, where significant impacts cannot all together avoided be minimised and mitigated in order to protect the environmental rights of South Africans.	N/A
Promotion of Access to Information Act (Act No. 2 of 2000) (PAIA)	The Promotion of Access to Information Act (Act No. 2 of 2000) (PAIA) recognises that everyone has a right of access to any information held by the state and by another person when that information is required to exercise or protect any right. The purpose of the Act is to promote transparency and accountability in public and private bodies and to promote	N/A

Legislation	Description and Relevance	Authority
	a society in which people have access to information that enables them to exercise and protect their rights. The EIA/EMPr process to be undertaken in terms of the NEM:WA, NEMA and NWA, where the associated stakeholder consultation process has been aligned with the PAIA in the sense that all I&APs have been provided an opportunity to register as an I&AP prior to the initiation of the project and all registered stakeholders, will in turn be provided a fair opportunity to review and comment on any reports submitted to the competent authorities for decision making.	
Minerals and Petroleum Resources Development Act (MPRDA) (No. 28 of 2002)	The MPRDA makes provision for equitable access to and sustainable development of South Africa's mineral resources. The MPRDA requires that the environmental management principles set out in NEMA shall apply to all mining operations and serves as a guideline for the interpretation, administration and implementation of the environmental requirements of NEMA. The MPRDA requires that a reconnaissance permission, prospecting right, mining right, mining permit, retention permit, technical corporation permit, reconnaissance permit, exploration right, production right, prospecting work programme; exploration work programme, production work programme, mining work programme, environmental management programme, or an environmental authorization issued in terms of the NEMA, as the case may be, may not be amended or varied (including by extension of the area covered by it or by the addition of minerals or a share or shares or seams, mineralized bodies, or strata, which are not at the time the subject thereof) without the written consent of the Minister MPRDA read with the NEMA and the terms and conditions of 83MR, TGME lodged an amendment application in terms of section 102 of the MPRDA ("Amendment Application") to specifically amend the MWP and consequently the EA and SLP attaching to 83MR	The Department of Mineral Resources and Energy Mpumalanga Regional Office
National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and the EIA Regulations of April 2017 (Government Notice (GN) 326, 327, 325 and 324), as amended	The EIA Regulations (GNR 326) were promulgated in terms of Sections 24 of the NEMA, to manage the process, methodologies and requirements for the undertaking of an EIA. The GNR 326 stipulates that the applicant for activities listed under GNR 327, 325 or 324 must appoint an independent EAP to manage the EIA process. Listed Activities are activities identified in terms of Section 24 of the NEMA which are likely to have a detrimental impact on the environment, and which may not commence without an EA from the Competent Authority (CA). EA required for Listed Activities is subject to the completion of either a Basic Assessment (BA) process or full Scoping and Environmental	Department of Mineral Resources and Energy, Mpumalanga Regional Office

Legislation	Description and Relevance	Authority
	Impact Assessment (S&EIA) with applicable timeframes associated with each process. The EA must be obtained prior to the commencement of those listed activities. The project triggers activities listed in GNR 327, 325 and 324 and will require an EA from the DMRE. According to GNR 326 of the NEMA, activities listed in GNR 325 require that a full S&EIA be undertaken. The applicable listed activities that are triggered by the project is provided in Table 8.	
Department of Environmental Affairs (DEA) Integrated Environmental Management Guideline Series, Guideline 5: Assessment of the EIA Regulations, 2012 (Government Gazette 805)	Environmental impacts that will be generated throughout the Life Of Mine have been assessed as part of the application for the proposed project (Section 13).	
Integrated Environmental Assessment Guideline Series 11, published by the DEA in 2004 Review in Environmental Impact Assessment, Integrated Environmental Management, Information Series 13, Department of Environmental Affairs and Tourism (DEAT), Pretoria	An Environmental Assessment is required for the proposed project as activities are triggered under GNR 327, 325 or 324.	
DEA Integrated Environmental Management Guideline Series, Guideline 7: Public Participation in the Environmental Impact Assessment Process, 2012 (Government Gazette 807)	Public participation is a requirement of the Scoping/EIA Process and has been conducted for the proposed project as stipulated in Chapter 6 of the NEMA.	
National Environmental Management; Waste Act, Act 59 of 2008 (NEMWA)	The NEM:WAste Act (NEMWA) was accented to on 10 March 2009 and came into effect on 01 July 2009. This Act repeals the sections in the Environment Conservation Act, Act 73 of 1989 that previously dealt with the licensing of general and hazardous waste storage	DMRE and DMR Mpumalanga, through the integrated

Legislation	Description and Relevance	Authority
	facilities. The Act was established to regulate waste management for the protection of human health and the environment. The Act aims to consolidate waste management in South Africa, and contains a number of commendable provisions TGME will be required to apply for a Waste Licence due to the following listed activities, Category A (12), Category B (11) and Schedule 3 listed activity	application process.
National Water Act, 1998 (Act 36 of 1998) (NWA)	The project will require a Section 21 (a, c&i, g and j) IWUL The following water uses will be licensed in terms of section 40 of the NWA. Section 21 (a) Taking water from a water resource. (*Storm water ingress into the Pits*) Section 21 (c) Impeding or diverting the flow of water in a watercourse (diverting the flow of a drainage line around the proposed waste rock dumps, diverting flow of a drainage line at the Theta Hill and Iota open cut pits) Section 21(i) Altering the bed, banks, course or characteristics of a watercourse, (impact of the proposed waste rock dumps on a drainage line; low level river crossing over the Blyde River; access road to the area as well as haul roads within drainage lines); Section 21(e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1); (*Irrigation of waste water to vegetation on rehabilitated areas*) Section 21(f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; (*Possible discharge to the Blyde River as a result of a positive water balance*) Section 21(g) Disposing of waste in a manner which may detrimentally impact on a water resource. (3xWaste rock dumps (Iota 1&2 and Wishbone WRD), 2xPollution Control Dams; Browns Pit waste water dam; All stockpiles; Berms and diversion trenches; Open cast pits; SBR Sewage Treatment Plant, Dust suppression Section 21(j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people. (*Ingress of rainwater into the pit and possible groundwater*)	Department of Water and Sanitation (DWS), Mpumalanga

Legislation	Description and Relevance	Authority
	Maleka Environmental Consulting was appointed by TGME to undertake the required Integrated Water Use License Application (IWULA) in terms of Section 40 of the NWA and Integrated Water & Waste Management Plan (IWWMP).	
National Environmental Management: Air Quality Act (No. 59 of 2008)	Air quality management Section 32 – Dust control. Section 34 – Noise control. Section 35 – Control of offensive odours. An Air Quality assessment was conducted as part of the EIA, which determined that an Air Emissions Licence (AEL) will not be required. The principles of the NEM: AQA, focusing on minimisation of pollutant emissions will also be taken cognisance of in the development of the EMPr.	Department of Environmental Affairs and Thaba Chweu Local Municipality
The National Forestry Act, 1998 (Act No. 84 of 1998) (NFA)	The NFA protects against the cutting, disturbance, damage, destruction or removal of protected trees. A permit has been issued to MM from the Department of Agriculture, Forestry and Fisheries (DAFF) which authorises the removal and transplantation of trees for activities associated with the various mining areas and infrastructure A biodiversity assessment was conducted as part of the EIA, which identified protected trees which are affected by the Theta project. It is expected that TGME will apply for the required permit for the removal and/or relocation of the trees.	Department of Agriculture, Forestry and Fisheries (DAFF)
The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA)	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of NEMA, as well as the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources. The Act provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered, endangered, vulnerable or protected During the EIA process, biodiversity hotspots and bio-regions were investigated to determine the potential impacts that the project may have on the receiving environment. The management and control of alien invasive species on the impacted areas during all the phases of the project will be governed by the NEM: BA. The NEM: BA ensures that provision is made by the site developer to remove any alien species, which have been introduced to the site or are present on the site.	Department of Environmental Affairs

Legislation	**Description and Relevance**	**Authority**
Mine Health Safety Act, 1996 (Act No. 29 of 1996) (MHSA)	The Mine Health and Safety Act (Act No. 29 of 1996) (MHSA) aims to provide for protection of the health and safety of all employees and other personnel at the mines of South Africa. The proposed project is located within a mining area and TGME will therefore need to ensure that employees, contractors, sub-contractors and visiting personnel, adhere to this Act and subsequent amendment regulations on site.	Department of Mineral Resources and Energy
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	Control measures for erosion Control measures for alien and invasive plant species The EMPr includes measures to control and manage alien invasive plant species.	Department of Agriculture, Forestry and Fisheries (DAFF)
National Heritage Resources Act (No. 25 of 1999)	Section 34 of the NHRA deal with structures that are older than 60 years. Section 35(4) of the NHRA deals with archaeology, palaeontology and meteorites. Section 36 of the NHRA, deal with human remains older than 60 years. Unidentified/unknown graves are also handled as older than 60 years until proven otherwise. According to Regulation 38 of the NHRA, any development or other activity which will change the character of a site exceeding 5 000m2 in extent requires notification to the South African Heritage Resources Agency (SAHRA). A Phase 1 Heritage assessment was conducted for the proposed Theta project to identify heritage and/or cultural sites affected by the mining infrastructure and activities. The Heritage Impact Assessment (HIA) has determined that no sites, features or objects of heritage significance occur in the study area. However, should there be any heritage and/or cultural resources encountered during the construction phase of the project, a Phase 2 Heritage Study for grave relocation permits shall be conducted.	Mpumalanga Heritage Resource Authority
Restitution of Land Rights Act, 1994 (Act No. 22 of 1994), as amended in 2014.	Land Claims. There are land claims associated with Portion 42 Ponieskrans 543. The information on the status and land claimants were to provide by the Department of Rural Development and Land Reform.	Department of Rural Development and Land Reform
The Hazardous Substances Act, 1973 (Act 15 of 1973) (HSA)	All chemicals transported to and stored on site will be handled in accordance with the HSA and the applicable materials safety data sheets. *A chemical log will be kept and all the necessary signage erected on site.*	Department of Environmental Affairs

Legislation	Description and Relevance	Authority
National Biodiversity Offset Policy (31 MARCH 2017), under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)	The aim of the National Biodiversity Offset Policy is to ensure that significant residual impacts of developments are remedied as required by NEMA, thereby ensuring sustainable development as required by section 24 of the Constitution of the Republic of South Africa, 1996. This policy should be taken into consideration with every development application that still has significant residual impact after the Mitigation Sequence has been followed in the EIA process, and should be applied taking the principles of NEMA into consideration. Due to ecological site sensitivity, and based on the risk assessment outcomes, the only mitigation for these sites are to Secure a biodiversity offset area as compensation for the affected area. TGME has drafted a phase 1 biodiversity offset report (Appendix 17), based on initial discussions with MTPA. TGME will have to apply in accordance with the National Biodiversity Offset Policy	Department of Environmental Affairs
Municipal Plans		
Ehlanzeni District Municipality IDP (2017-2022). IDP alignment with strategic planning instruments.	The IDP states that the following vision for Ehlanzeni District Municipality: • Creation of Jobs • Expanding Infrastructure • Transition to a low-carbon economy • Transformation of urban and rural spaces • Education and Training • Provision of quality Health Care • Building a capable State • Fighting corruption, and • Transformation and Unity The limited availability of skills in the district will require that the economy continue to leverage the natural resources endowed while we shift towards a knowledge-based economy. Therefore, agriculture, construction, mining and tourism must be further developed to provide employment opportunities for unskilled labourers. The IDP further states that opportunities exist within mining as follows: • Growing demand on the global market for commodities (platinum, gold, and chrome); • Beneficiation of minerals (e.g. Umjindi Jewellery making);	Ehlanzeni District Municipality

Legislation	Description and Relevance	Authority
	• Platinum Group Metals mining along the eastern limb of the Bushveld Complex (Reef extents from Limpopo to Mpumalanga through Thaba Chweu); • Chrome: Ferrochrome for steel production as well as export; • New entrants to mainstream industry for Black Economic Empowerment (Mpumalanga Mining Energy Preferential Procurement Initiative); • Small Scale mining; • Strategic alliances for share acquisition through Broad Based Black Economic Empowerment. For these to be achievable, investment and skills development, technology and infrastructure, as well as broadening of the supplier base, will need to be considered. Due to the increased mechanization of mining activities, there has been an overall jobless growth within this sector. Rand volatility of late has not made things easier. The lack of diversification within the industry has led to a mainly commodity export driven industry.	
Thaba Chweu Local Municipality IDP (2017-2022). Project application is situated within the local boundaries of Thana Chweu.	The main economic sectors are forestry, agriculture, mining, business services and tourism. The western half (Lydenburg Town) is dominated by agricultural and farming activities, while forestry is the main economic activity of the eastern half (Sabie and Graskop Towns). As part of the IDP various development objectives were provided such as: Facilitate and coordinate monitoring and compliance to NEMA from mining community To facilitate mining exploration and development in the municipality by 2022 TCLM has in the strategy identified LED projects that are in line with NGP job drivers which should create employment opportunities in these sectors. The job drivers should be tailor made for the Local Municipality to accommodate local resources. LED flagship projects: Enhancement of the Blyde River Cable car and heritage visitor centre Bourke's Luck Tourism Centre and 120 bed lodge Pilgrim's Rest Historical Mining Town Rejuvenation Possible integrated family resort/ relaxation spa at Pilgrim's rest and Sabie Major Adventure Centre	Thaba Chweu Local Municipality

Other guidelines that were made use of include:

- Mpumalanga Provincial Biodiversity Conservation Plan;
- DWS, 2010. Operational Guideline: Integrated Water and Waste Management Plan. Resource Protection and Waste;
- Department: Water Affairs and Forestry, 2007. Best Practice Guideline A2: Water Management for Mine Residue Deposits;
- Department: Water Affairs and Forestry, 2007. Best Practice Guideline A4: Pollution control dams;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline A6: Water Management for Underground Mines.
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G1 Storm Water Management;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G2: Water and Salt Balances;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G3. Water Monitoring Systems;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline G4: Impact Prediction;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline H1: Integrated Mine Water Management;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline H3: Water Reuse and Reclamation;
- DEAT. 2002. Integrated Environmental Management, Information series 2: Scoping. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 3: Stakeholder Engagement. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 4: Specialist Studies. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 12: Environmental Management Programmes. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEA. 2012. Companion to the EIA Regulations 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs;
- DEA. 2017. Guideline on Need and Desirability, Department of Environmental Affairs (DEA), Pretoria, South Africa.

7. Need and desirability of the proposed activities.

Theta Gold Mines is an Australian listed company that owns the gold assets of TGME and Sabie mines in the Pilgrims Rest and Sabie area. The Theta Hill Project provides the applicant with an entry point back into gold production in the area and also provides the opportunity to further expand its gold production profile through opening up further historical mines in the area. An operational project will generate revenues that can be used to realise the significant nett positive impacts to the area, some of which are described below.

Gold mining activities around Pilgrims Rest commenced in 1873 and it is considered to be the first official gold rush area in South Africa. An estimated 6.7 million ounces has been mined in the last 146 years of mining history. The towns of Pilgrims Rest and Sabie both owe their existence to gold mining. Furthermore, it was the mining companies that established the timber industry in the area to provide timber for underground mining and other uses such as housing.

During the past 146 years, the area has suffered some environmental degradation, both as a direct result of the mining activities and from the associated impacts of forestry, human settlement, and farming. In recent years, the socio-economic landscape has deteriorated as a result of the mine no longer being in operation. Other contributing factors to this degradation include the general reduction in tourism revenues as a result of the closure of many businesses over time. The current unemployment rate for Pilgrims Rest and surrounds is estimated at 75%, which is more than double the national average.

The project is expected to provide benefits in the following spheres:

- Environmental remediation;
- Improvement in local socio-economic environment;
- Contribution to improving Pilgrims Rest infrastructure;
- Contribution to the national economy;
- Reduction of local and national unemployment rates.

The largest positive impacts of the project at a local level will be in the creation of jobs in the Pilgrims Rest area as well as a significant economic injection through increased expenditure on goods and services by employees and service providers. It has been clearly demonstrated that the local, and regional economy, benefits from an operational mine and this is expected to be the case once again.

The operational mine is also expected to have a large nett positive environmental benefit to the area through the company’s planned remediation activities.

Environmental remediation

Mining activities have been taking place in the Pilgrims Rest area for the last 146 years, and as a result the area has seen some environmental degradation. In particular, the introduction of timber plantations to support early mining activities has replaced vast tracts of native vegetation. Additionally, the introduction of invasive species, such as wattle, has resulted in these species proliferating and altering the environment. In recent years the mining industry as a whole has seen a significant increase in illegal mining activities. Since the cessation of mining by TGME in early 2015, there has been an explosion of illegal mining activities in the Blyde Valley and surrounds. All these activities have resulted in a degradation of the immediate area surrounding pilgrims Rest and the specialists have observed a degradation of the environment over the last 12 months of them visiting the project area, especially as a result of illegal mining.

As part of the Theta Project, the applicant is proposing two significant improvements to the environmental landscape:

- A significant offset and compensation plan that will result in protecting significantly larger areas than that impacted by the project. In addition, this plan make provision for rehabilitation of areas infested with alien invasive species, including current protected areas that are not being effectively managed resulting in a significant improvement to the environmental landscape;
- A reduction, and preferably total removal, of illegal miners from the rights packages under the control of the applicant. There is a significant introduction of sediment and other undesirable pollutants as a result of these illegal activities.

Implementation of these two offerings will result a large nett benefit to the environment in the Blyde valley however they require financial, human and specialist resources to implement. The commencement of the Theta Project will result in an operation that can generate the revenues needed to roll out these improvement strategies.

Local socio-economic environment

Pilgrims Rest has two main pillars for its economy and employment, tourism and mining.

Tourism in the area has seen a significant decline over time and in 2012 the town took a significant hit when businesses were forced to close. Since then the town has not seen the volume of tourists, particularly local tourists, as in previous years. The recent global Covid 19 Pandemic has also had a significant negative impact on tourism which is not expected to re-open until September 2020, and perhaps even later depending on local and global approaches to containing the pandemic.

Mining has always been the largest employer in Pilgrims Rest and with the mine ceasing operations in early 2015, the towns economy has declined, and the unemployment rate has increased significantly. Unfortunately, incidents of criminal activities rise with rising unemployment and Pilgrims Rest has not been spared this trend.

Given the 146 years of mining history of the Pilgrims Rest area, most of the local population are generational miners with some being up to sixth generation miners. Pilgrims Rest was built by mining and the town and immediate surrounds have co-existed with mining for many years, with the positive effects of an operational mining company clearly demonstrated through multiple mining periods.

The local socio-economic landscape will see a significant improvement once the applicant becomes operational on the Theta Project. Some of the improvements include, but are not limited to:

- Significant reduction in unemployment numbers through direct and indirect employment;
- Significant local, and to a lesser degree regional, economic injection through increased expenditure on goods and services by employees and service providers;
- Injection into the local and regional economy through direct purchases of goods and services by an operational mine;
- Reduction in secondary crime in Pilgrims Rest through the active removal of illegal miners;
- The offset and compensation offering will also provide employment and SMME opportunities into the local economy;
- Opportunity to establish new SMME’s within Pilgrims Rest;

- Implementation of the applicants Social and Labour Plan will result in the delivery on community projects within the Thaba Chweu Municipality Integrated Development Plan;
- Reduction in secondary crime resulting from illegal miners as the company rolls out its specialist illegal mining teams.

There has been a significant increase in illegal mining activities in the area since the mine ceased operations in May 2015. This has led to secondary crime in the area which is directly impacting the local community. While the mine was operational, a specialist team was contracted to deal with illegal miners, and they had successfully eradicated the illegal mining gangs and syndicates. Since the mine's closure and the departure of this team, an estimated 30 illegal smelters have been established in the local communities. The budget for the Theta Hill Project includes the re-engagement of a specialist team to remove the illegal miners in the area.

The applicants corporate and social responsibility activities are well documented including:

- sponsoring 3 teachers and an assistant at a local school
- company providing printing facilities at the local schools
- renovation activities at the schools
- partnering in a feeding scheme for junior school children
- various local event sponsorships including annual National Gold Panning Championships

A revenue generating project will allow ongoing support for these activities and will also enable TGME to expand its SLP and CSR initiatives, particularly with a view to completing projects that can continue beyond the mine's life. These projects are expected to focus on ultimately supporting the tourism and agricultural industries.

Pilgrims Rest infrastructure

Due to the general degradation of the socio-economic environment and the increase in unemployment, the town has seen a significant increase in criminal activities. Theft is the biggest contributor to damage and loss of infrastructure. Illegal mining activities have caused significant damage to the historical reduction works. Significant damage and loss have also occurred at:

- Historical hydroelectric plant;
- Caravan park;
- Buildings and structures in the town;
- Historical graveyard.

The company is in the process of securing the caravan park, golf course and an old house in the village with a view to improving the overall condition of these facilities and re-establishing the caravan park as an operational facility. The company has placed security at the caravan park to limit further losses in the interim.

These initiatives, however, require significant capital which will only be realised should the project become operational.

Pilgrims Rest currently suffers from a lack of government funding to maintain the overall condition of the town. A profitable gold mining operation will enable the company to assist the local town management with various maintenance and improvement initiatives, which will in turn create a more attractive tourism venue and improve the general socio-economic environment.

National economy

The South African economy has been on a steady downward trajectory for the last several years. On 27 March 2020, rating agency Moody's cut South Africa's sovereign credit rating to sub investment grade, meaning the country now has a junk rating from all three major international rating agencies. The downgrade comes on the same day that South Africa entered a 21-day national lockdown in an effort to slow the spread of the coronavirus pandemic. The result of these two significant events is that the country's economy is in a very vulnerable position and is expected to significantly contract which will result in a large increase in the unemployment rate.

The Theta Hill Project provides new jobs and new revenue streams into the economy once it becomes operational and brings in new capital to the country. These contributions are certainly compelling when one considers the current state of the economy in a post Covid19 environment.

The company currently has a total resource base in the area of over 6.0 million ounces, which is almost the equivalent of all the gold that had been mined in the area over the last 146 years. The resource value equates to US$10.2 billion at 1,700 USD/oz, which is R172.9 billion at 16.95 ZAR/USD. This is a significant asset which, when exploited, would contribute significantly to the country's economy. The company also expects to expand the current resource base through the application of modern exploration techniques, and this would further add to the value of the area towards the economy.

The project is expected to require a total capital investment of R532.1m (US$31.4m) which will start flowing into the economy once it has been approved.

This project unlocks the first 260,000 ounces (4%) of the total resource; it will require future capital investment to unlock the remaining ounces. Should the project not proceed, the further unlocking of this portion of the country's resources may not materialise. Further expansion of the current resource base through modern exploration techniques will also not be possible without the project moving into a revenue generating business.

A total of 3.39 billion ZAR in operating cost expenditure and 6.74 billion ZAR in forex is expected to be generated by the project.

Local and national unemployment rates

The current national unemployment rate is 29.0% and the local unemployment rate in Pilgrims rest is estimated at 75%. The country is currently in the grip of the global Covid19 pandemic and coupled with a downgrade of the country's sovereign credit rating to sub investment grade unemployment is expected to rise significantly in 2020.

Treasury forecasts that the impact of the virus, and resulting lockdown period, could lead to job losses of between 690,000 and 1.79 million with a worst-case scenario being presented that unemployment could rise to over 50%.

The project is expected to create between 400 and 450 direct jobs and an estimated 1,200 to 1,400 indirect jobs during its lifetime. These are all new jobs into the economy and as the applicant expands its operations, further new jobs will be introduced into the regional economy.

8. Motivation for the preferred development footprint -Alternatives

The identification and investigation of alternatives is a key aspect during the Scoping & EIA process. All reasonable and feasible alternatives must be identified and assessed during the scoping phase to determine the most suitable alternatives to consider and assess during the EIA phase. There are however some significant constraints that must be taken into account when identifying alternatives for a project of this scope. Such constraints include social, financial and environmental issues, which will be discussed in the evaluation of the alternatives. The preferred option is to be highlighted and presented to the authorities. Alternatives can typically be identified according to:

- Location alternatives;
- Type of activity alternatives;
- Layout alternatives;
- Technological alternatives;
- The No-go option.

For any alternative to be considered feasible, such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts. The alternatives are described, and the advantages and disadvantages are presented. It is further indicated which alternatives are considered feasible from a technical as well as environmental perspective.

Incremental alternatives typically arise during the EIA process and are usually included as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and are not specifically identified as distinct alternatives. This section provides information on the development footprint alternatives, the properties considered, as well as the type of activity, activity layout, technological and operational aspects of the activity.

8.1. The property on which or location where it is proposed to undertake the activity

The location of the proposed project components is constrained to the location of the existing mineral resource. TGME, through an engineering scoping study and feasibility study, has identified the opportunity to mine gold bearing reefs via modified terrace mining and therefore the need to amend its current environmental authorisation linked to 83MR to include the new mining sections to mine near surface material.

Theta Hill and Browns Hill represent historical underground gold mines. The scoping study investigated reopening the sites as open pit mining operations with modified terrace mining as the preferred mining method. The Theta Hill scoping study and subsequent work clearly shows that the historical mines of this goldfield have open cut oxide gold potential.

The Theta Project orebodies, comprising Theta, Browns and Iota are shear hosted quartz-carbonate vein, mesothermal, shallow dipping gold deposits (enriched with sulphide) occurring in “flat” bedding-parallel shears located mainly on shale partings within Malmani Dolomites.

The current mineral resource estimation and geological model included 200 drill holes for the period of 6 December 2017 to 4 September 2018 and the historical data captured by Minxcon from historical plans. The total database consists of 7,227 sample points for the Beta, Upper and Lower Theta Reefs of which a total of 343 sample points is from drill holes.

As such, no property alternatives were considered for the location of the open cast pit area.

8.2. Type of Activity Alternative

An alternative to the type of activity would be livestock farming. The current land use activities associated with the focus area and surrounding areas are largely dominated by wilderness, forestry, grazing, residential as well as some mining operations.

No current cultivated agricultural activities were observed within the study area, except for cattle grazing on flatter areas, and closer to the areas next to the caravan park. The study area resembles a Lithic and Anthropic catena, with Mispah/Glenrosa and Witbank (Anthrosols) being the dominant soil forms within the surveyed area. These soils are not considered to contribute significantly to agricultural productivity on a local, provincial or national scale. The economic injection of the proposed Theta mine to the local and regional economy compared to the agricultural sector was investigated in this EIA phase. The land use alternatives were also investigated in more detail in this EIA phase as the specialist investigations have been completed.

As such the land use alternative of livestock farming were not considered as a feasible alternative.

8.3. Design or Layout Alternative of the Activity

The site layouts changed throughout the course of this study from the Scoping Phase to the EIA Phase. The Layout Alternative section is a portrayal of the progression from an initial to the most resent "updated" site layout related to the Theta Project. Included in this section is a portrayal of the progression from an initial layout (Layout 1) through to the Layout 3 which reflects a balanced layout of the project that takes into consideration the various drivers, including environmental and economic drivers amongst others.

The progression has been significantly influenced by environmental considerations in the first instance, and thereafter engineering, economic and social considerations and is described in detail in the subsequent sections.

8.3.1. Scoping Phase: Layout 1 - Engineering Feasibility Study

During the feasibility study phase of the project, the applicant identified resources that were amenable to modern open cut mining techniques and completed a full evaluation of the resources from identification through drilling and then finalisation of a feasibility study. The three broad mining areas identified and evaluated where:

- Theta Pit;
- Browns Pit; and
- Iota Pit.

In terms of the placement of the related infrastructure, a few design or layout alternatives were considered initialy for the various Waste Rock Dumps (WRD). As part of the operational activities two potential options were proposed for the locations of the associated Waste Rock Dumps (WRD) at both Theta and Iota. These are detailed as follows:

- Theta/Browns Waste Rock Dump Option 1: This option is situated between both Browns and Theta Pit (Figure 20);
- Theta/Browns Waste Rock Dump Option 2: Located to the north eastern side of Theta Pit, incorporates two smaller pockets separated by a tributary (Figure 20);
- Iota Waste Rock Dump Option 1: Located to the north eastern corner of the Iota Pit (Figure 20); and
- Iota Waste Rock Dump Option 2: Is located to the north western boundary of the Iota Pit (Figure 20).

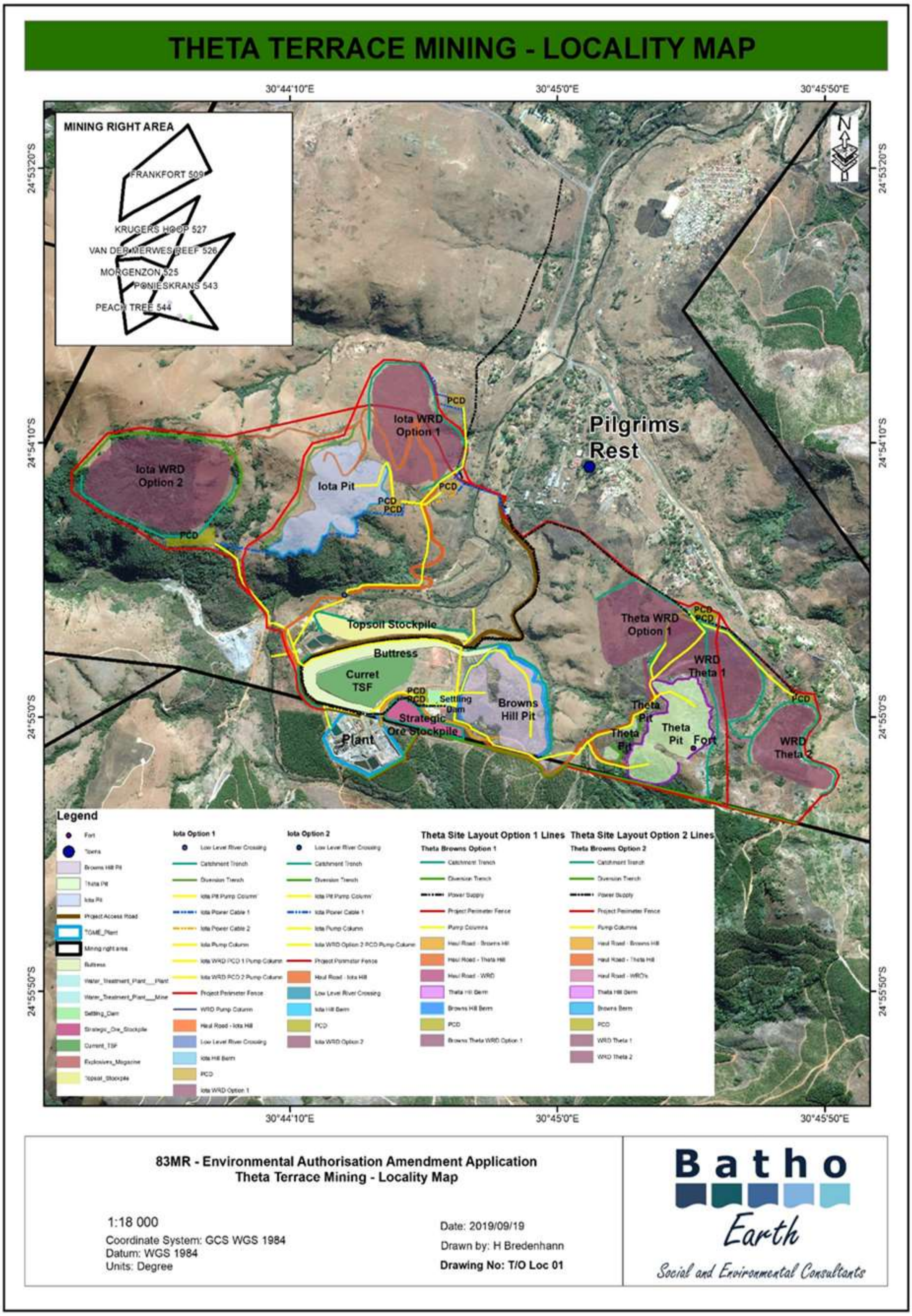


Figure 20. Layout 1 – Scoping Phase

These layouts were passed by the various specialists for consideration in their respective first round assessments. The engineering feasibility study informed the initial site layout plan, which was incorporated in the final scoping report (Layout 1) as submitted to the DMRE (dated 16 August 2019). The Scoping Report made provision for various biophysical and social studies which would determine the baseline conditions at the project site as well as make recommendations related to the feasibility of the proposed localities and alternatives as per the initial site layout plan. Below in Table 9 is a summary of the progression and timeline associated with Layout 1.

Table 9. Scoping Phase (Layout 1) Timeline

Timeline	Progression
10 April 2019: First Draft Scoping Report	TGME commenced with a section 102 process on 10 April 2019 when a draft scoping report was put out for public review. TGME received a letter on 01 June from the DMRE which stated that the offices were closed, and the applicant had to withdraw and resubmit its application.
12 July 2019: Second Draft Scoping Report	Therefore, TGME commenced with a second PPP on the draft scoping report on 12 July 2019 to 12 August 2019.
7 November 2019: Final Scoping Report Accepted	The Final Scoping Report was submitted to the DMRE on 16 August 2019 and accepted by the DMRE on 7 November 2019.

8.3.2. Environmental Impact Assessment Phase: Layout 2

Layout 2, saw significant changes to the sizes of the various pits as well as changes to the locations of the Waste Rock dumps which were all informed by biophysical and social specialist studies.

The plan of study proposed in the Scoping Report determine the baseline conditions at the project site as well as make recommendations related to the feasibility of the proposed localities and alternatives in the initial site layout plan. The outcome of the specialist studies resulted in the identification of substantial environmental and social sensitivities, with specific reference to the ecology of the study area.

The outcome of these biophysical and social studies was used to inform **Layout 2** (draft EIA phase mining layout) (Figure 21), as is common practice in IEM, which is a philosophy that is concerned with finding the right balance between development and the environment. The difference between IEM and an EIA is that IEM is a whole philosophy whereas EIA is just one tool or technique used to gather and analyse environmental information that forms part of the IEM process (Source: Enviropaedia).

These studies returned substantial environmental data as well as social sensitivities and nuances. The initial site layout plan was subsequently altered to reflect revised pit layouts, new WRD locations as well as optimisation of the overall project footprint to arrive at the final EIA Phase layout (Layout 2) plan

Environmental and social management practices are based on following the precautionary principle, which, simply defined, means developing actions on issues considered to be uncertain, for instance applied in assessing risk management.

Several biophysical and social baseline studies were conducted, including terrestrial ecology (fauna and flora), soils and land capability, air quality, noise and vibration, visual impact, socio-economic and health impact, water quality, heritage and rehabilitation objectives. These studies returned substantial environmental and social sensitivities and nuances.

This strategy resulted in a reduction in the pit shell sizes, the relocation of the WRDs and re-consideration of the PCD requirements. The objective was to avoid/minimise the impacts on the ground-truthed portions of highest biodiversity significance, to minimize the extent of areas requiring detailed rehabilitation and to limit the requirements for offsets of residual impacts. The most significant changes made to layout 2 include the following:

- Revised pit layouts, with the Theta Pit being affected most;
- Modification to WRD location to minimise potential environmental impact – here the concept and location of the Wishbone WRD is significant;
- Reduction in the number of PCDs to be constructed;
- Optimisation of the overall project footprint.

Layout 2 is reflected in **Error! Reference source not found.**. Below in Table 10 is a summary of the progression and timeline associated with Layout 2.

Table 10. Draft EIA Phase (Layout 2) Timeline

Timeline	Progression
Draft EIA/EMPr out for public review: 13 November 2019 - 20 January 2020:	Following the approval of the Final Scoping Report, the draft EIAR and EMPr went out for public review from 13 November 2019 to 20 January 2020. Comments received during this PPP from interested and affected parties and advise from the freshwater and ecological specialist (Scientific Aquatic Services ("SAS")), the request and recommendation was that the ecological specialist revisit the site again, and an additional site visit was undertaken
Additional Review Period Updated EIA/EMPr: PPP started on the 3 March 2020 and it was suspended on the 26 March 2020	The findings of the additional site assessment undertaken in January 2020 lead to the amendments of the biodiversity reports and therefore Registered Interested and Affected parties ("I&AP's") were afforded a further opportunity to review the updates in these specialist reports as well as the updated EIAR and EMPr. The "updated" EIAR and EMPr went out for a second round of public review, from 3 March to 3 April 2020. The PPP was suspended on 26 March 2020 as a result of a nationwide lockdown and resultant directions which were published by the Minister of Environment, Forestry and Fisheries ("the Minister") on 31 March 2020 in GNR 439 ("Repealed Directions") effective from 26 March 2020 when the national lockdown was declared. The repealed directions were then replaced on 5 June 2020 by new directions published by the Minister in GNR 660 ("the Directions"). In terms of the directions the time periods remain

	suspended until a public participation plan is agreed between an applicant and the competent authority. Had a national disaster not been declared and the repealed directions not been issued, then the PPP would have concluded on 3 April 2020. As mentioned, TGME had commenced with PPP on 2 March 2020 that was due to be finalised on 3 April 2020. As a result of lockdown and the repealed directions, the public participation process was suspended with 8 days remaining. Therefore, an additional 8-day review period to enable I&APs to submit their final comments on the updated EIA documentation has been afforded. The additional PPP timeline commenced on Friday 26 June 2020 and ended on 6 July 2020.
On the 2 July 2020 a Public Participation Plan was submitted to the DMR&E	TGME submitted a public participation plan to the DMR&E for consideration, under the new directions as published by the Minister in GNR 660 ("the Directions") on 5 June 2020, requesting permission to: 1. Complete Layout 2's remaining 8-day Public participation review period, & 2. Request an extension of time to allow TGME to present Layout 3 to Registered Interested and Affected Parties for their review and comments
On the 2 July 2020 DMR&E granted TGME permission to complete their PPP for Layout 2	On the 2 July 2020, the DMR&E granted: 1. TGME approval to continue the additional 8-day review period from the 26 June – 6 July 2020.
26 June 2020 – 6 July 2020: An additional 8-day review period for Layout 2 was granted	TGME submitted a public participation plan to the DMR&E for consideration, under the new directions as published by the Minister in GNR 660 ("the Directions") on 5 June 2020. In terms of the Directions the time periods remain suspended until a public participation plan is agreed between an applicant and the competent authority. This additional public participation process needed to be finalised for Layout 2 prior to finalizing the Final EIAR & EMPr, in order for Layout 2 to still be considered as an Alternative for the DMR&E to consider as the application process.

8.3.3. Environmental Impact Assessment Phase Draft: Layout 3

Following the submission of Layout 2, further detailed design work was completed on the WRD's and PCD's as part of the existing water use licence application, to ensure that the structures would be stable and able to maximise successful concurrent rehabilitation outcomes. As part of this process, various stability and geotechnical activities were carried out which informed the designs and the design engineers were asked to adapt their designs to avoid various high biodiversity areas within the WRD footprints.

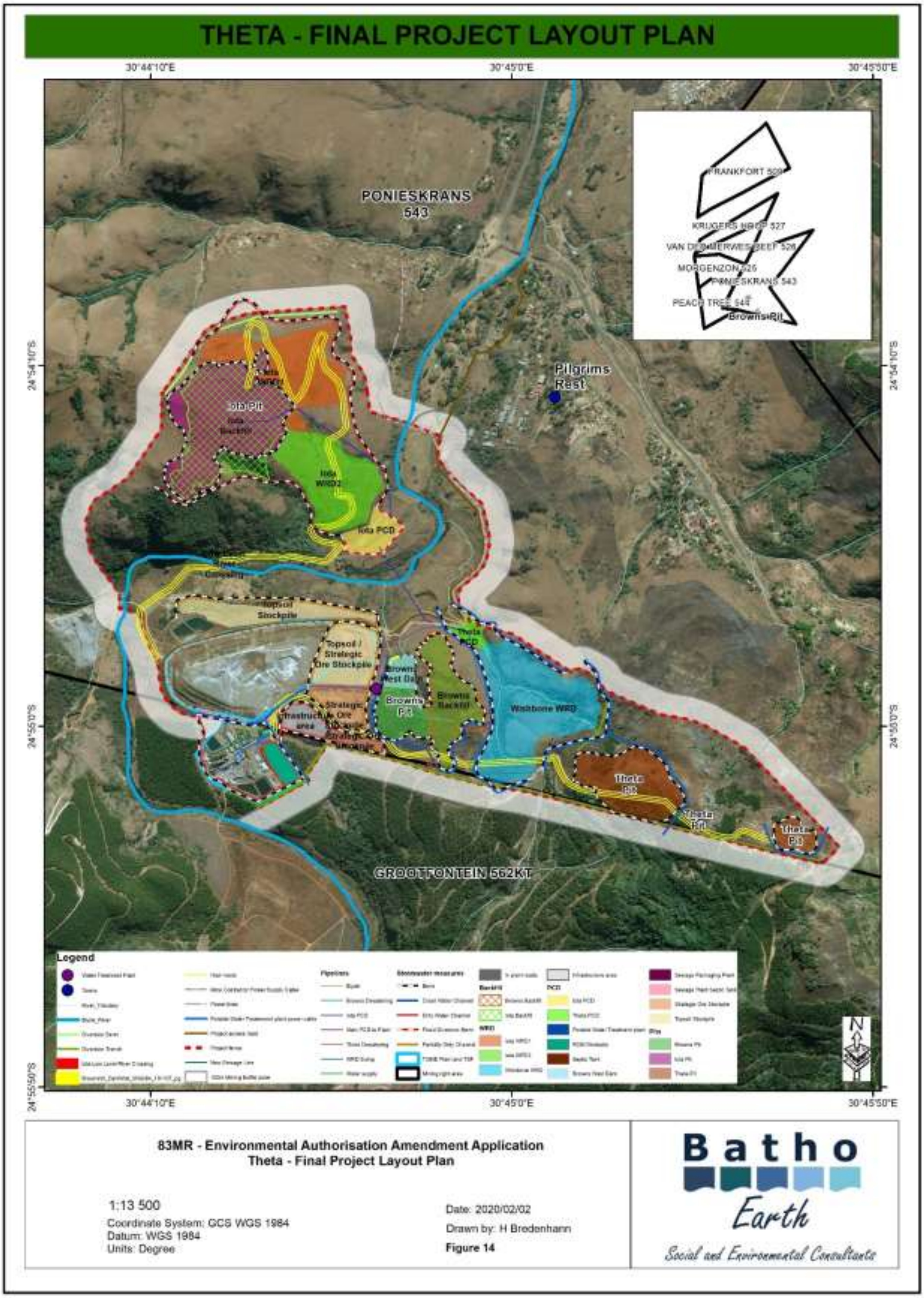


Figure 21. Layout 2: Revised layout (EIA/EMP Phase)

This planning and design is necessary for the development of engineering controls and to remove or reduce potential impacts completely or to an acceptable and sustainable level. These detailed engineering works have resulted in finalisation of the design footprints and it is therefore imperative to present the updated site layout plan (referred to as Layout 3), as well as the updated EIA/EMPr and specialist studies which reflect Layout 3.

The further studies included:

- Structural design engineer assessments: Mining area footprints had to change to ensure stable structures for the waste rock dumps and pollution control dams.
- Ecological Assessment: Due to the change in the mining footprint, an additional site visit was required to assess the sensitive areas. This has led to the change in the mine layout plan to avoid areas of high value such as the protea stand located near the wishbone waste rock dump.
- Mining Engineers study: Additional engineer studies were required to improve mining resource utilization.

During the same period, TGME recognised that significant changes in the global market had resulted due to the Corona virus pandemic. These changes have the potential to impact on the Applicant's project due to, among others, an increase in the gold price and the downgrade of the South African economy to junk status.

To respond to the expected changes in the global economic environment, TGME completed a re-evaluation of the Theta Project (i.e. 83MR) with a view to improving the economic metrics of the project to further enhance the attractiveness to potential funders. This has resulted in a new mine schedule being developed which has changed the sequence of the pits being mined and has also resulted in the pits being made slightly larger to bring in more gold bearing material while still taking cognisance of the environmental conditions in the area.

This EIA/EMPr provides a detailed description of the amended layout plan referred to as **Layout 3** (Figure 14). This layout was identified by TGME as the only feasible alternative, which addressed both the environmental sensitivities and the global economic environment. Below in Table 11 is a summary of the progression and timeline associated with Layout 3.

Table 11. Final EIA Phase (Layout 3) Timeline

Timeline	Progression
On the 2 July 2020 DMR&E granted TGME an-additional Extension by 60-days	On the 2 July 2020, the DMR&E granted: TGME (Theta project under reference 83 MR) an extension by 60 days from the date of the email received, to submit the Final EIAR/EMPr, ending the 1 September 2020.
09 July 2020 – 12 August 2020	TGME has made some changes to the footprints which triggered a further 30-day PPP, over and above the 156-day period prescribed by the Environmental Impact Assessment Regulations, for the submission of the Final Environmental Impact Assessment Report ("EIAR") and Environmental Management Programme ("EMPr"). The reasons TGME requested an extension and requested that the proposed Layout 3 undergo an additional PPP was due to the following two key aspects: 1. Detailed engineering designs for the waste rock dumps, pollution control dams

	and stormwater management following additional geotechnical work have resulted in changes to the layout; and a change to mine schedule and pit sequence to accommodate significant changes in global economic environment has resulted in further changes in Layout 3, including an increase in the pit dimensions.

8.4. The Technology to be used in the Activity

There are no technological alternatives considered for the proposed activities. TGME intends to reopen some of the historical mines and to exploit shallow mineral resources by means of opencast mining. The mining method selected for this project is contour strip mining.

This mining method is suited to the mountainous profile of the current topography. Contour strip mining creates "terraces" along contour elevations where overburden is removed developing a temporary highwall which is then continuously pushed forward while filling the void created in an ongoing rehabilitation process. The EIA application is based on new activities associated with the proposed project activities and methods selected.

As such, no technology alternatives were considered or would be applicable.

8.5. The Operational Aspects of the Activity

As mentioned, the terrace mining activities will be located on Portion 42 of the farm Ponieskrans 543KT, the processing plant is situated within the existing TGME facilities. The operation and maintenance of the processes plant might will be performed by the company's own staff.

The opencast mining activities will be outsourced to a mining contractor and the whole operation will be managed by the applicant's own management team, which will include all statutory positions required. To manage the operation will require the appointment of a Plant Manager whose responsibility will be to ensure the efficient and effective operation of the mine. An Engineer, whose responsibility will be to ensure that all legal requirements of the MPRDA and the Mine Health and Safety Act, 196 (Act 29 of 1996) (MHSA) are complied with, will also be appointed by TGME.

8.6. The Option of Not Implementing the activity

Assessing the No-go Alternative, or the scenario whereof a project does not going ahead, requires that all possible scenarios be taken into account, including the implications of not authorising the project.

As mentioned, the current land use associated with the study area is largely dominated by wilderness, forestry, grazing, residential (Browns Community /Pilgrims Rest) as well as mining activities. The area is also characterised by numerous freshwater (Blyde Rivier) and aquatic resources, deemed sensitive and largely found to be of increased ecological integrity. The Mpumalanga Biodiversity Sector Plan (MTPA, 2014) have categorised the footprint area to be an Optimal and Irreplaceable Critical Biodiversity Area (CBA).

Non-mining (No-Go) Alternative

The floral study report indicates that the focus area contains largely undisturbed vegetation that is representative of the vegetation types for the area; these include endangered vegetation types and an endangered ecosystem. The focus area is floristically diverse, and a broad range of floral SCC is present, including some threatened species and provincially protected flora. If the proposed project is not authorised the natural flora and fauna of the area will not be threatened and disturbed.

The proposed project, if authorised, is likely to result in the loss of near-threatened and critically endangered species from this portion of the Blyde River and potentially further downstream. It also has the potential to compromise the water quality of the Blyde River and impact downstream users of this important resource.

Pursuing the no-go alternative will most likely result in an influx of uncontrolled illegal artisanal miners to the area (i.e. no management from government) and the relatively small-scale activities observed along the Blyde River, which included washing of fines and a partial river diversion, would likely increase exponentially. Should the Theta Project not be approved, the necessary funding and resources required to control illegal miners will not be available, resulting in the ongoing pollution and sedimentation of the Blyde River and tributaries.

Currently the greatest threats to the environment are associated with the surrounding land-uses such as forestry, the ongoing spread of alien and invasive species, illegal mining activities, increasing urbanisation and the influx of people to the area without appropriate water supply and treatment of waste, thus making use of the river to service their basic domestic needs such as washing and sanitation.

If the project does not go ahead, the greatest future threats to the natural environment within the study area will remain the ongoing, unmanaged and uncontrolled illegal mining activities, the ongoing spread of Alien Invasive Plants (AIP) and the displacement of indigenous vegetation.

Should the proposed mining development not take place, it entails that the status quo of the environment *will not change*.

- If the No-go Alternative is pursued, there will be no immediate and/or direct impact on sensitive floral communities within the proposed mine footprint and will thus avoid the loss of CBAs, threatened ecosystems and floral SCC. The No-go Alternative therefore better aligns with the intended land use and the conservation requirements for the region
- The proposed project, has the likelihood of resulting in the loss of not only near threatened and critically endangered species to this portion of the Blyde River and

potentially further downstream, but also has the potential to compromise the water quality of the Blyde River and impact downstream users of this important resource.
- The sensitive Mountain Outcrops ecological habitat units encountered within the footprint areas, will not be under threat, nor impacted on. Floristically, this habitat unit is highly sensitive from both an ecological and conservation perspective, owing its sensitivity to high floral diversity, an abundance.
- The existing threats to biodiversity however remain present.
- Ongoing AIP proliferation along the Blyde River and its tributaries, as well as into Montane Grasslands;
- The current state of AIPs within the focus area and beyond already poses a significant risk to the local biodiversity and many indigenous species have been displaced by AIPs. Of increased concern is the presence of wattle and gum species along the freshwater resources.
- If the Theta Project is not approved, the necessary funding and resources required to control illegal miners will not be available, resulting in the ongoing pollution and sedimentation of the Blyde River and tributaries. Ongoing pressure on Blyde River (and tributaries) from illegal mining activities, resulting in local and downstream impacts on Riparian Habitat and general biodiversity;
- Influx of illegal miners and people to the area with insufficient and/or inadequate municipal infrastructure resulting in increased urbanisation and increased surface water runoff and resulting erosion and incision of the river banks;
- Ongoing illegal mining resulting in sedimentation of the instream habitat, loss of riparian habitat and impaired water quality, which has the potential to result in loss of sensitive aquatic species. Ongoing proliferation of alien and invasive species along the Blyde River and its tributaries resulting in the loss of riparian habitat and altered surface water runoff patterns (causing erosion and incision);
- Negative visual impacts with subsequent possible negative impacts on specific sectors of the local tourism industry and residents would be eliminated;
- The sense of place and historic character (including the two sensitive site near the mining right area) of Pilgrim's Rest would remain unchanged.

Authorised Alternative

TGME intends to reopen some of the historical mines or exploiting shallow mineral resources by means of opencast mining. The gold mining operations investigated in this study forms part of the existing Greater TGME mining rights. Three mining areas were identified based on exploration and evaluation work done within the study area. The three areas are referred to as:

- Theta Pit;
- Browns Pit;
- Iota Pit.

The aim of the authorisation process is to mine various reefs as open pit mining operations using modified terrace mining as the preferred mining method.

Should the proposed mining development be authorised, it entails that:

- The proposed project, if authorised, will result in the loss of not only rare and/or protected plant life, but also primary grasslands with habitat suitable to sustain and support diverse ecosystems. The impacts will be especially significant associated with the Iota Pit, Iota WRDs, Wishbone WRD and Theta Pits.
- Several studies have shown that diverse grasslands such as those associated with the Theta Project are impossible to completely restore following activities such as terrace mining. The proposed rehabilitation plan for the Theta Project is good and

will undoubtably allow some ecological functions to return over time, even allowing for thriving ecosystems to return in the future – if implemented and managed adequately. Obtaining the pre-mined condition, however, is not possible.

- The financial requirements to control and manage the existing, vast population of AIPs associated with the focus area is undoubtably high and will realistically only be adequately managed once the mine is in operation.
- Approximately 400 to 450 jobs will be created;
- A total capital investment of R510m (US$34.3m) into the South African economy will be realized;
- The project unlocks the first 200,000 ounces of a total 6 million ounce resource. Further capital investment to unlock the remaining ounces will be materialize;
- The total resource of 6 million ounces in the project area will be utilised and will add to the improvement of the country's economy (126 Billion ZAR worth of gold at 1,450 USD/oz);
- Further expansion of the state resource of 6 million ounces of gold by the company though exploration will be realized;
- A total of 2.15 billion ZAR in operating cost expenditure over the life of the project will be realized;
- A total of 4.33 billion ZAR in FOREX over the life of the project will be realised for the country's economy;
- Employees will have the opportunity to undergo skills training and capacity building with human resource development whereby transferable skills could be created;
- The various corporate social investment programmes envisaged would be developed and implemented and thus no impacts on poverty alleviation would occur as a result of such programmes.
- Influx of job-seekers to the area with insufficient municipal infrastructure resulting in increased urbanisation and increased surface water runoff and resulting erosion and incision of the river banks;
- Rehabilitation of receiving environment to include revegetation with indigenous species, AIP control and improved habitat connectivity, however, floral ecological functions or processes to continue in a modified, functional way
- Downgradient and downstream freshwater and aquatic resources to be impacted by accidental spills, discharges, sedimentation and erosion – though these will be managed by readily available emergency action plans;
- Potential loss of critically endangered species (with special mention of Enteromius treurensis), potential impacts to water quality, potential loss of habitat as a result of sedimentation though the likelihood and severity may be mitigated to a certain extent; and
- Illegal mining to continue, to a lesser extent and post closure, with some impacts on the Blyde River and its associated instream and riparian habitat still possible

With authorisation comes the inclusion of mitigation measures that the mine would be obligated to implement, adhere to and be audited on. Strict control of mining activities, along with sound engineering designs, where no mine-related activities result in pollution or sedimentation of the Blyde River and downstream habitat, should be the goal.

However, a accidental discharge or spills are always a possibility and can happen, and therefore and this emphasises the necessity for strict adherence to cogent, well-conceived and ecologically sensitive mitigation measures is required, along with readily available emergency action plans (discharge, fires, spillages etc.).

Once in operation, and as resources become available, the mine will be able to implement the necessary security measures to control illegal mining activities. This will have an immediate positive impact on the water quality of the Blyde with the subsequent long-term improvement of riparian habitat.

Whilst Large mining operations can have greater potential for impact than small-scale mining (illegal mining in this case), but they also have a greater capacity and incentives to minimise damage - where artisanal mining practises rarely take responsibility for environmental damage.

The environmental, social and economic impacts have been assessed in detail in this EIA phase to identify and address all negative impacts. In particular, should the project not go ahead, the revenue required to at least partially rehabilitate existing areas impacted by nearly 150 years of mining activity, will not be generated.

9. Details of the Public Participation Process Followed

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

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

- Identify relevant individuals, organisations and communities who may be interested in or affected by the Proposed Project (scoping phase);
- Clearly outline the scope of the Proposed Project, including the scale and nature of the existing and proposed activities (scoping phase);
- Identify viable proposed project alternatives that will assist the relevant authorities in making an informed decision (scoping phase);
- Identify shortcomings and gaps in existing information (scoping phase);
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies (scoping phase);
- To verify that the issues raised by Stakeholders have been considered in the EIA and to further comment on the findings of the environmental assessment (EIA phase);
- Highlight the potential for environmental impacts, whether positive or negative (EIA phase);
- To inform and provide the public with information and an understanding of the proposed project, issues and solutions (EIA phase);
- Following the outcome of the decision-making process by authorities, stakeholders will be informed of the outcome and how and by when the decision can be appealed (decision making phase).

The stakeholder engagement process is conducted in terms of NEMA, which provides clear guidelines for stakeholder engagement during an EIA. Chapter 1 of the NEMA outlines the principles of environmental management, several pertaining to public consultation (e.g. Chapter 1, subsections (2), (3), (4) (f), (g), (h), (k), (q) and (r). Chapter 6, Regulations 39 – 44 of the amended EIA Regulations GNR) 982, promulgated on 8 December 2014, specify the minimum requirements for stakeholder engagement in an EIA process conducted under the NEMA.

In 2017, the Minister of Environmental Affairs published, in terms of Section 24J of the NEMA, Public Participation Guidelines which guide the Public Participation Process (PPP) in order to give effect to Section (2)(4)(f), (o) and 24 (1A)(C) of the NEMA.

This section illustrates the Integrated Stakeholder Engagement Process followed to date, for the proposed project.

9.1. Scoping Phase

9.1.1. Identification and Registration of I&APs

Interested and Affected Parties (I&APs) were identified through:

- Information obtained through deed searches;
- Contacting I&APs telephonically;

- Identification of representatives at relevant government departments and the local municipality;
- Identification of community-based representatives;
- I&APs registering based on information received;
- Responses received from the site notices;
- Inviting I&APs to register through the newspaper advertisement.

The following categories of I&APs were identified:

- Government Departments:
    - Mpumalanga Department of Economic Development and Tourism (MDEDT);
    - Department of Water and Sanitation (DWS);
    - Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA);
    - Mpumalanga Department of Public Works, Roads and Transport (MDPWRT)
    - Mpumalanga Department of Culture and Recreation;
    - Mpumalanga Department of Health;
    - Mpumalanga Department of Finance, Economic Development and Tourism;
    - Mpumalanga Department of Community Safety, Security and Liaison;
    - Mpumalanga Department of Human Settlements
    - Mpumalanga Department of Co-Operative Governance and Traditional Affairs;
    - Mpumalanga Department of Social Development;
    - Mpumalanga Tourism and Parks Agency (MTPA)
    - Department of Agriculture, Forestry and Fisheries (DAFF)
- Representatives of the Thaba Chweu Local Municipality
- Representatives of the Ehlanzeni District Municipality;
- Ward Councillors;
- Non-governmental organisations;
- Community based organisations;
- South Africa Heritage Resource Agency (SAHRA);
- Representatives of Pilgrim's Rest Museum;
- Landowners and adjacent landowners;
- Parastatals / Service providers;
- General Public.

Registered I&AP's were further sourced from responses to the advertisements, site notices and written notification to I&AP's associated with this specific project and the responses were used to update the stakeholder database (please also refer to Appendix 3 for the public participation report). Table 4 provides a list of the adjacent farms owners and farm portions, as included into the stakeholder's database.

The I&AP's register will be maintained for the duration of the study where the details of stakeholders are captured and automatically updated upon communication with the EAP/public participation office. The identification, registration, and comments from I&AP's will be an on-going activity. Please refer to Appendix 3 for a copy of the I&AP register.

9.1.2. Newspaper advertisement

The formal announcement of the proposed project was done by placing an advert in The Lowvelder Newspaper on 05 July 2019. The objective of this newspaper advertisement was to:

- Inform I&APs of the amendment to the Environmental Authorisation;
- Inform I&APs of the EIA procedure and the way in which I&APs could lodge any objections to the proposed development and provide comments;
- Invite I&APs to become involved in the proposed project by registering as I&APs.

The review period of the draft scoping report and the notification of the public open-day was advertised in The Lowvelder on 12 July 2019.

Proof of the placement of the advert is included in: Appendix 3: Newspaper Advertisement.

9.1.3. Site Notices

Sites notice boards (English) notifying stakeholders and I&AP's of the proposed activity were placed at conspicuous places in the project area on 08 July 2019. These areas of placement (figure 20) were determined according to the quantity of potential I&AP's that may pass by.

A copy of the site notices and proof of their placement is provided in Appendix 3. Table 9: Site Notice Location and Coordinates.

Table 12. Site Notice Location and Coordinates

Site Notice	**Location**	**Coordinates**	
		Longitude	**Latitude**
1	Intersection of the R533 Pilgrim's Rest and Vaalhoek Roads	30º45'6.69E	24º53´24.25" S
2	Placed at the site offices of TGME	30º44'23.69E	24º55´0.52" S
3	Placed at the Information Centre and Museum in Pilgrim's Rest (upper town area).	30º54'7.84E	24º54´31.43" S
4	Placed at the former petrol station in Pilgrim's Rest (Down town area).	30º45'7.84E	24º54´2.26" S
5	Placed at the Clewer General Dealer (DownTown Pilgrim's Rest).	30º45'5.82E	24º54´1.08"S

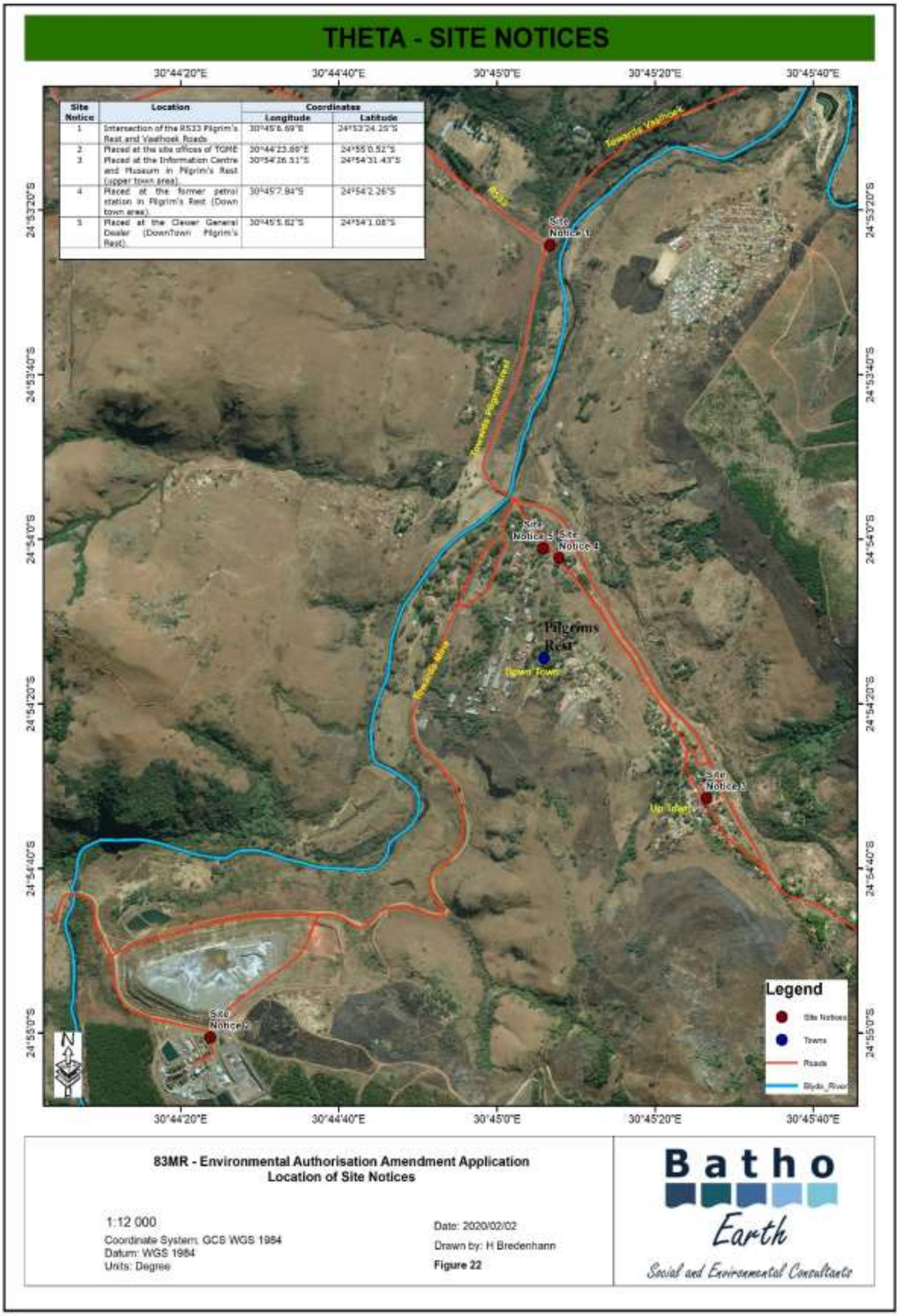


Figure 22. Location of Site Notices

9.1.4. Distribution of BID

A Background Information Document (BID) was compiled. This document was distributed with a locality map to Interested and Affected Parties from the 05 July 2019 and throughout the process as I&APs registered for the project or as additional I&APs were identified.

Refer to Appendix 3 for the BID and for the map distributed with the BID.

9.1.5. Focus Group Meetings

Focus Group Meetings to discuss the initial phase of the project was held during the period 10 April 2019 to 21 August 2019.

Focus Group Meetings (FGM) were held with the following key stakeholders:

- Representatives of the Maorabjang Communal Property Association on 16 March 2019.;
- Department of Water Affairs – Head Office Pretoria on 18 February 2019,
- Representatives of the South African Forestry Companies Limited (SAFCOL) on 12 April 2019;
- Representatives from The Association for Water and Rural Development (AWARD) and Kruger2Canyon (K2C) NGO on 16 April 2019;
- Representatives from the Department of Public Works and Road Transport (DPWRT), Department of Culture and Recreation (DCR) and Mpumalanga Provincial Heritage Resources Authority (MPHRA) ON 17 May 2019;
- Representatives from the Brown's Community in Pilgrims Rest on 17 April 2019;
- Representatives from the Mpumalanga Tourism and Park Agency (MTPA) on 07 May 2019;
- York Timbers (Pty) Ltd.: Telephonic Discussion on 6 May 2019.
- Department of Water Affairs – Mpumalanga Office (Lydenburg) on 07 May 2019;
- Site Visit was also held stakeholders from AWARD, K2C and MTPA on 09 May 2019.

Focus Group Meetings were held with the *local communities* of Pilgrims Rest. The following meetings were held:

- Focus Group Meeting with the community of Schoonplaas and Newtown: 20 August 2019
- Focus Group Meeting with the community of Darks Gully: 20 August 2019
- Focus Group Meeting with the community of Brown's Hill: 21 August 2019

A site visit was held with officials from DAFF, the Ehlanzeni District Municipality and the Thaba Chweu Local Municipality on 31 July 2019. Minutes of these meetings, as well as the attendance registers are included in Appendix 3.

9.1.6. Public Open Day

The project database and all individuals or groups interested in, or potentially affected by the proposed project were invited to attend the public open day that was held on Wednesday 31 July 2019, from 15h00 – 18h00, at the Pilgrims Rest Museum (Information Centre) in Pilgrims Rest.

For a copy of the attendance register of the open-day please refer to Appendix 3.

9.1.7. Availability of draft Scoping Report

The Draft Scoping Report was made available to the public for review from Friday 12 July 2019 to Monday 12 August 2019. All registered I&APs were informed of the availability of the document and the open-day on 12 July 2019. A link to access the documentation was sent with the e-mails informing I&APs of the availability of the documentation.

The Draft Scoping Report was further available at the following locations:

- Pilgrim's Rest Museum;
- Offices of TGME near Pilgrim's Rest;
- Electronic copies can be downloaded from the Batho Earth website: www.bathoearth.co.za.

All registered I&APs were notified of the submission of the Final Scoping Report to the DMR for decision making.

9.1.8. Documenting comments and responses

A summary of comments received has been included in the Comments and Response Report (CRR) attached as Appendix 3 and a summary of the comments from pre-application consultations and scoping phase consultations are included in Appendix 3.

9.2. Environmental Impact Assessment Phase (first review)

The Draft EIA/EMPr was made available to I&APs for a 30-day comment period on the Batho Earth website (www.bathoearth.co.za). Hard copies will also be made available for perusal at the venues listed in Table 10.

Table 13. EIA Review Period Venues

Public Place	Locality	Telephone
Pilgrim's Rest Museum and Information Centre (Pilgrim's Rest);	Main Street, Pilgrim's Rest	Ms. Nondumiso Simelane Tel: 013-768 1471 Operating Hours: Monday to Friday: 08:00 – 16:00
Offices of TGME near Pilgrim's Rest		Ms. Christine Rowe: TGME: Tel: 082 871 9553
Batho Earth Website	www.bathoearth.co.za	Ms Ingrid Snyman 082 779 2750
Pilgrims Rest Primary School	A85 Bester Street, Schoonplaas/Newtown	Mr. Selby Khoza (Headmaster): 082 226 2164 Office hours: 7:30 am until 14:00

An electronic copy will also be available on CD on request from the stakeholder engagement officers.

Additional comment period was provided due to the extent of the project. Extension of time was provided until *20 January 2020*. The review period was extended to 20 January 2020, to accommodate Interested and Affected Parties' (I&APs) requests and to ensure the inclusion of all the comments into the Final EIA to be submitted to the DMRE.

9.2.1. Focus Group Meetings EIA Phase

Additional Focus Group Meetings (FGM) were held during the review period of the draft EIA Report. FGM were held with the following key stakeholders:

- MTPA;
- Representatives of the South African Forestry Companies Limited (SAFCOL) on 29 November 2019
- Representatives from Thaba Chweu Local Municipality on 03 December 2019;
- Representatives from the community of Schoonplaas / Newtown and the Ward Councillor on 03 December 2019
- Representatives from the community of Darks Gully on 03 December 2019

- Representatives from the Maorabjang Communal Property Association on 04 December 2019;
- Representatives from SANParks, MTPA, and MDARDLEA on 16 January 2020
- Representatives from DAFF to discuss the off-set conditions on 07 February 2020.

Minutes of these meetings, as well as the attendance registers are included in Appendix 3.

9.2.2. Public Open Day EIA Phase

The project database and all individuals or groups interested in, or potentially affected by the proposed project were invited to attend the public open day that was held on Wednesday 04 December 2019, from 15h00 – 18h00, at the Pilgrims Rest Museum (Information Centre) in Pilgrims Rest.

For a copy of the attendance register of the EIA open-day please refer to Appendix 3..

9.2.3. Comment and Response Report EIA Phase

All comments and issues received during the initial (January – May 2019) public participation process, as well as the public participation process followed from July 2019 until August 2019 until the submission of the draft EIA/EMPr Report were included in the Comments and Response Report (CRR).

As part of the FINAL EIA/EMPr Report a separate issues and response report was developed, incorporating all the comments received on the draft EIA report dated February 2020. The comments received during the review period of the draft EIA dated 13 November 2019 to 20 January 2020 AND 03 March – 06 July 2020 were incorporated into this report.

9.3. Environmental Impact Assessment Phase (second review)

The MTPA through their comments submitted on the draft EIA/EMPr requested that additional surveys of the affected sensitive biodiversity areas be conducted following the rainy season. These surveys were conducted in January 2020 and have resulted in the specialist report being updated to reflect the results of this additional survey work. This resulted in an additional 30-day review period.

The Updated Draft EIA/EMPr was made available to all I&APs for public review from 03 March to 03 April 2020. The notifications were issued with an electronic link to download the report and it was also made available on the Batho Earth website (www.bathoearth.co.za).

However during this review period the country was impacted on by the Covid-19 Pandemic Notification Letter was issued to all stakeholders on 30 March 2020, explaining the Regulations issued in terms of section 27(2) of the Disaster Management Act, 2002 (Act No. 57 of 2002) published under Government Notice No. 318 in Government Gazette No. 43107, 26 March 2020. The review period was placed "on hold" due to the nationwide lockdown implemented on 27 March 2020.

On 5 June 2020 the Minister of Environment, Forestry and Fisheries ("the Minister") issued directions ("the Directions") in terms of regulation 4(10) of the Regulations issued by the Minister of Cooperative Governance and Traditional Affairs in terms of section 27(2) of the Disaster Management Act, 2002 published on 29 April 2020 ("the Regulations").

The DMRE approved the public participation plan on 26 June 2020, in order to continue with the said review period.

The updated EIA/EMPr was made available to allow for an additional 8-day review period to enable I&APs to submit their final comments on the updated EIA documentation. The report was available from Monday 29 June 2020 to 8 July 2020.

9.4. Environmental Impact Assessment Phase (third updated report)

The *third updated* Draft EIA/EMPr was made available to I&APs for a 30-day comment period from 13 July – 14 August 2020 on the Batho Earth website (www.bathoearth.co.za). Copies of the second updated EIA/EMPr Report have been made available on the following platforms:

- Batho Earth Website
- Data Portals in the form of Dropbox access links
- Available on CD on request
- Community Authorities (Consultation with local Ward Councilor)

Batho Earth will also liaise with those stakeholders that do not have access to e-mail or internet.

- Hard copies of the document will also be available at:
- Office of the local ward councilor, Pilgrims Rest (if possible); and
- Offices of the Applicant, Pilgrim's Rest;

9.5. Summary of issues raised by I&APs

A summary of the comments received from the stakeholders and responses provided by the EAP have been incorporated and is attached as Appendix 3.

As part of the proposed application, two Public Participation Reports were compiled which should be read together. These documents are:

- Public Participation and Comments and Response Report dated November 2019. This report includes a description of the public participation process as part of the Scoping Phase undertaken from January 2019 until November 2019; and
- Public Participation and Comments and Response Report dated February 2020. This report includes a description of the public participation process as part of the EIA Phase undertaken from November 2019 until January 2020.
- As part of the EIA Phase Comments and Response Report dated 14 July 2020. The comments received during the review period dated March – July 2020 have been included into this report.

Both reports are attached to Appendix 3.

10. Environmental attributes associated with the development

This section provides a general overview of the status quo of the environmental and social context within which the proposed project is located. All of the proposed activities will take place within Pnt 42 of the Farm Ponieskrans. Most of the descriptions provided were based on specialist studies conducted for the project. Copies of the specialist studies are included in Appendix 4-14. Where necessary the regional context of the environmental features is also explained. For each environmental aspect discussed below, proposed environmental issues/impacts have been highlighted qualitatively where applicable. The EIA will explore these issues on a quantitative level.

10.1. Climate

The climatic conditions for this region are typical of that of the eastern Mpumalanga region, very hot summer days and cool to cold winters. Rainfall occurs during summer thunderstorms, which are accompanied by lightning and occasional hail.

10.1.1. Rainfall

According to the Hydrology Report the rainfall stations with long-term rainfall data closest to the project are the Pilgrims Rest and Morgenzon stations. Monthly patched rainfall was downloaded from the WR2012 study website. A summary of the details from the stations is provided in Table 14.

Table 14. Rainfall Stations Closest to the Project

Station Name	Station Number	Distance & Direction from TGME Plant	Rainfall Record (years)	MAP (mm)	Latitude*	Longitude*
Pilgrims Rest	0594444 W	3.2 km East	1903 – 1985	951	-24.88°	30.72°
Morgenzon	0594383 W	4.5 km North-West	1948 – 2019	940	-24.92°	30.77°

*Decimal degrees

Both stations have a similar MAP. Although located further away, the Morgenzon station has more recent rainfall data, and therefore data from this station was adopted to represent the rainfall for the study area.

The mean monthly rainfall is indicated in Figure 23 . The project is located in a high rainfall area, with a MAP of 940 mm. Rainfall is highest during the summer months of October to March, with January and February being the wettest months. Rainfall is lowest from April to September, with June and July being the driest months.

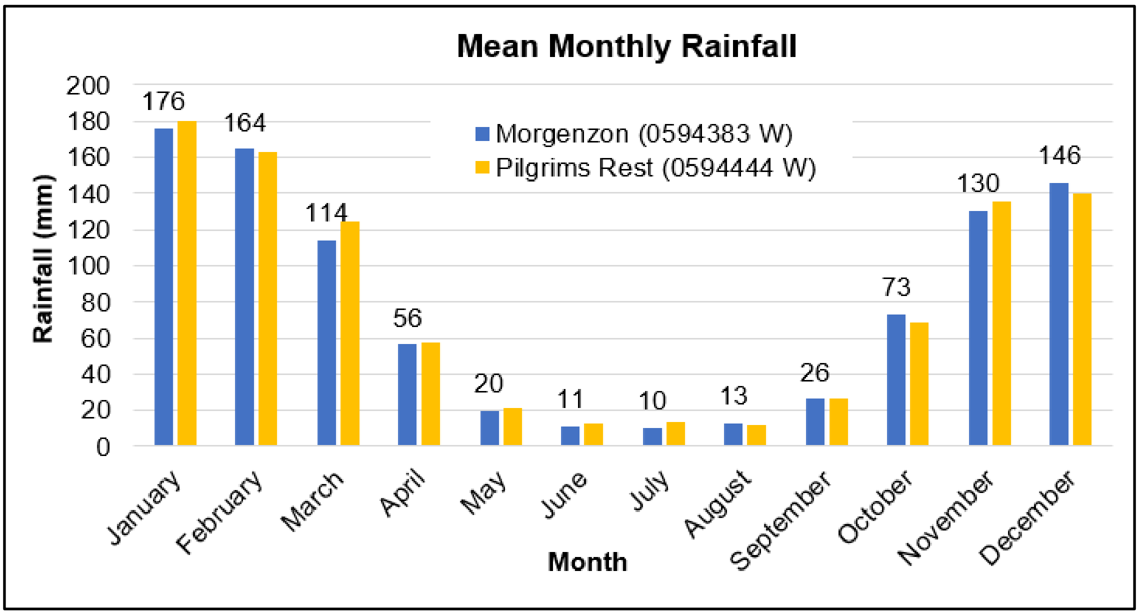


Figure 23. Mean monthly rainfall: Morgenzon rainfall station (1948 – 2010)

Figure 24 indicates the monthly rainfall over the period of October 1948 to September 2010 (62 years). The wettest month occurred in January 1978, with a total of 474.6 mm of rainfall, whilst 0 mm of rainfall has occurred on a number of occasions over the dry months of May to September. Monthly rainfall in excess of 300 mm has occurred on 18 occasions.

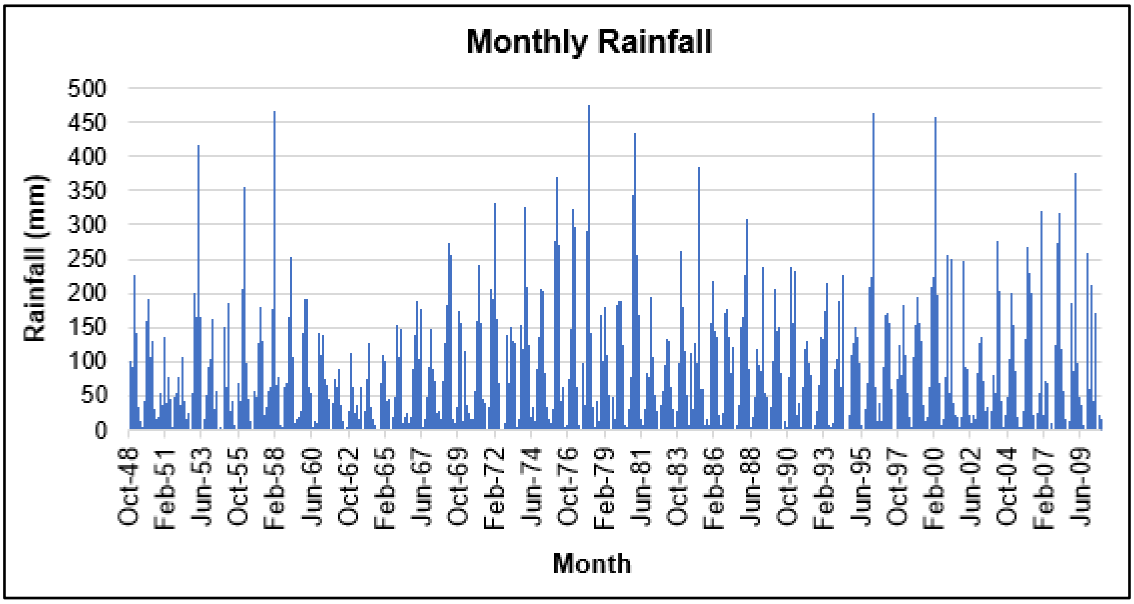


Figure 24. Monthly rainfall totals for Morgenzon rainfall station

Figure 25 shows the annual rainfall totals in comparison to the MAP. The wettest year occurred in 2000, with 1,618 mm recorded, whilst the driest year occurred in 1962, when 384 mm was recorded. The 1960s was a particularly dry period where the yearly rainfall reached levels well below average, whilst the 1970s was a particularly wet period.

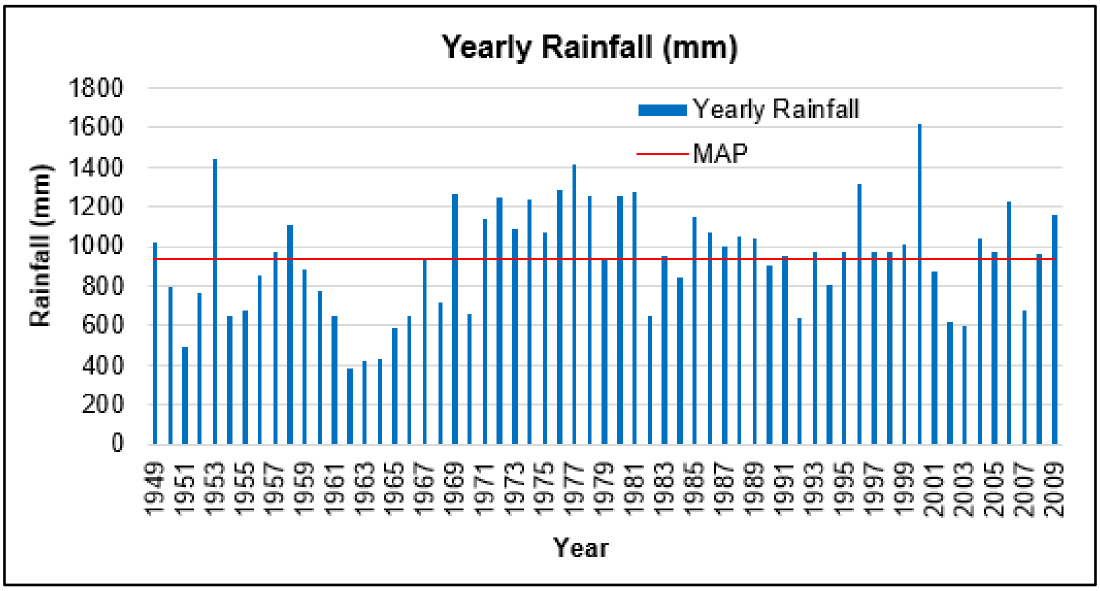


Figure 25. Yearly rainfall totals for Morgenzon rainfall station

10.1.2. Evaporation

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. The adopted monthly evaporation for the project is listed in Table 15. Evaporation is highest from October to March, and lowest during the cooler months of May to August.

Table 15. Evaporation for the project area

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. Topography

Figure 26 illustrates the topography and drainage of the project area. The general topography of the project area can be described as undulating and mountainous, with moderate to steep slopes. Flattish areas occur along the Blyde River floodplain.

10.2.1. Iota Pit and WRDs

The Iota Pit and WRDs is mostly drained in an easterly direction towards the Blyde River. Elevation varies from 1 500 mamsl at the west of the Iota Pit, to 1 235 mamsl along the Blyde River. The area is dominated by hilly to steep slopes.

10.2.2. Browns Pit and Wishbone WRD

The Browns Pit and Wishbone WRD are drained in a north-westerly direction along non-perennial drainage lines. Elevation varies from 1,385 mamsl at the south of the Browns Pit, to 1,342 mamsl along the Blyde River to the north. At the Wishbone WRD, elevation varies from 1,433 mamsl in the south-east, to 1,238 mamsl in the north, where the non-perennial drainage line discharges into the Blyde River. The Browns Pit is dominated by hilly slopes, whilst the Wishbone WRD is dominated by steep to very steep slopes.

10.2.3. Theta Pits

Theta Main Pit and Theta B Pit are drained in a westerly direction, whilst Theta Small North Pit is drained in a north-easterly direction. Elevation varies from 1,575 mamsl to the east of the Theta Main Pit, to 1,440 mamsl on the south-western side of the pit. Elevation at the Theta Small North Pit varies from 1,580 mamsl on the western side, to 1,520 mamsl along the north-eastern side. The Theta Main and B Pits is dominated by steep slopes, whilst the Theta Small North Pit is dominated by steep to very steep slopes.

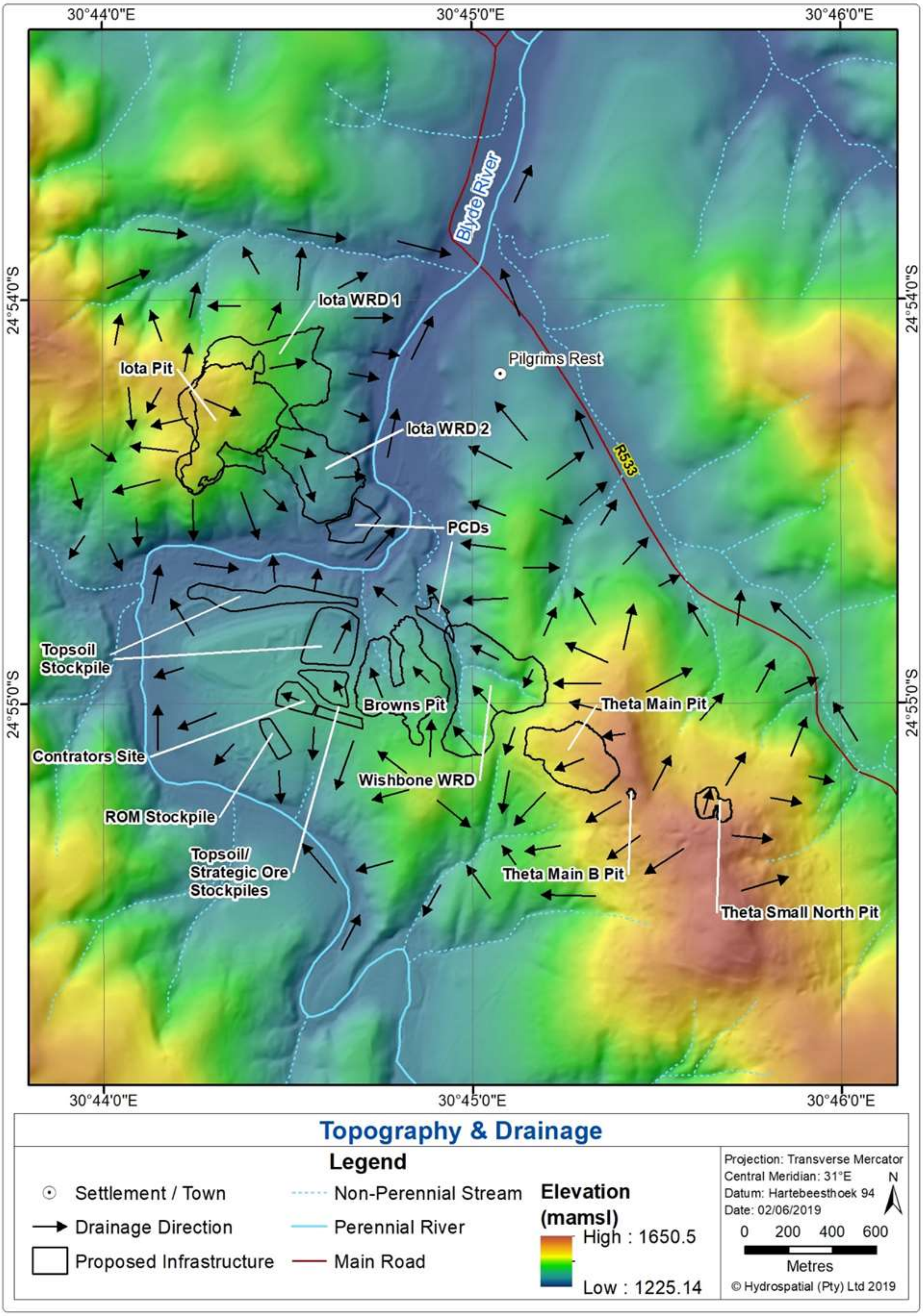


Figure 26. Topography and drainage

10.3. Geology

10.3.1. Regional Geology

The Sabie-Pilgrims Rest goldfield is situated in eastern Mpumalanga, overlying the preserved eastern rim of the early Proterozoic Transvaal basin. This north-south trending, shallow, westerly-dipping metallogenic province (goldfield) extends for approximately 140 km in a north-northeasterly direction, over a maximum width of 30 km along the Great Escarpment of Southern Africa[2].

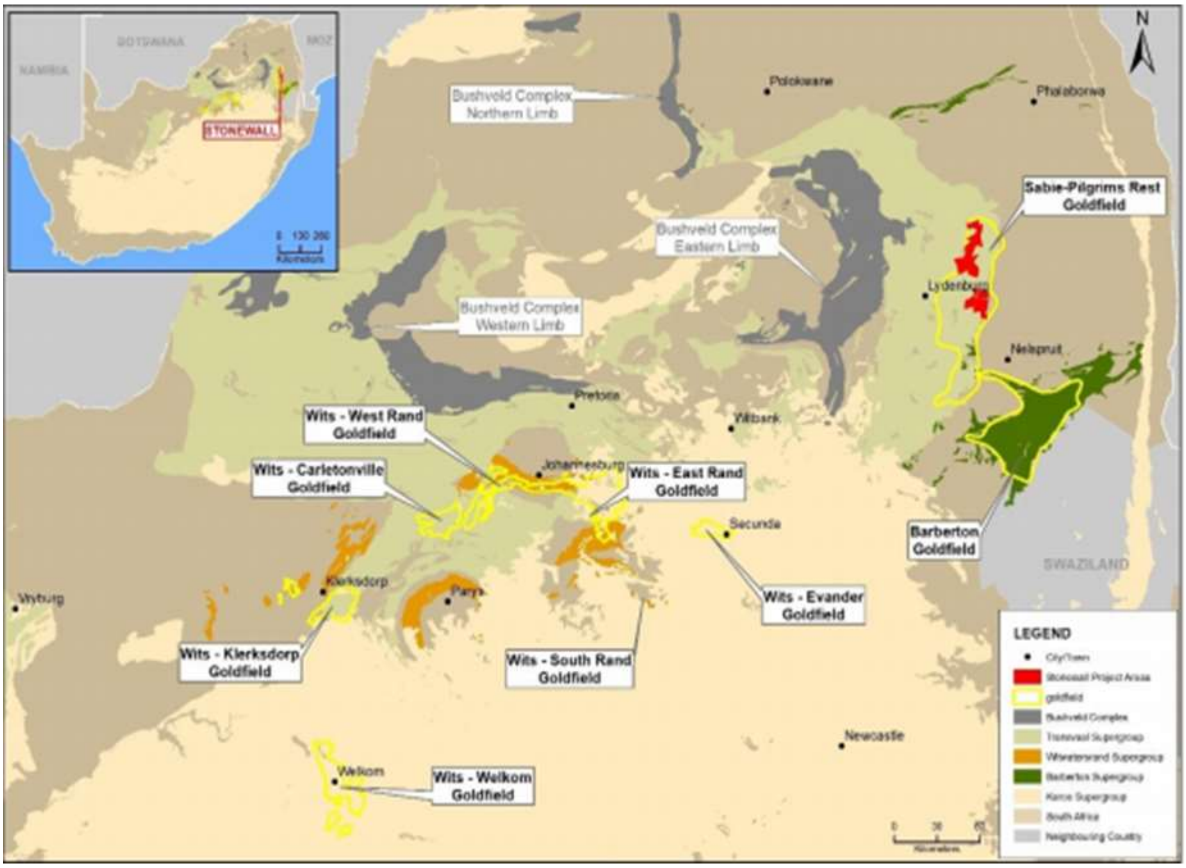


Figure 27. Regional Geological Setting

Gold mineralisation occurs on the eastern rim of the early Proterozoic Transvaal Basin, marked by the Drakensburg escarpment. The mineralisation occurs within sedimentary host rocks of the late Archaean to early Proterozoic Transvaal Supergroup. The Sabie-Pilgrims Rest Goldfield stratigraphic succession, younging upwards, includes Archaean basement granite, as well as minor volcano-sedimentary succession of Godwan Group and Wolkberg Group clastic sediments that uncomformably overlie the basement rocks. The Transvaal Supergroup is separated from the Wolkberg Group by an angular unconformity.

The Pretoria Group overlies the Deutschland Subgroup, but the latter is not present in the Pilgrim's Rest area and here the Pretoria Group overlies the Malmani dolomites on a slight unconformity called the Bevett's unconformity. The Bevett's conglomerate rests on this unconformity and grades upwards into the dark-coloured, fine-grained quartzite known as the Rooihoogte Formation. This formation grades upwards into the Timeball Hill Formation comprising mainly shale and carbonaceous shale.

[2] TGME, Geohydrological Study for the Theta Hill Project, Pilgrims Rest Region, MvB21/18/A017. 2019. MvB Consulting.

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

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

10.3.2. Local Geology

The stratigraphic succession in the study area, is similar to that of the Transvaal Supergroup, with the exclusion of the Deutschland Subgroup and Penge Iron Formation. Instead, the Pretoria Group is separated from the Malmani Subgroup by the Bevett's Unconformity.

Epigenetic gold mineralisation occurs as concordant and discordant veins in a variety of host rocks. The mineralisation in the area of interest is principally "flat" bedding parallel shears located mainly on shale partings within Malmani dolomite. However, there are other reefs located in the sediments apart from the dolomite. The ore bodies occur as narrow quartz carbonate veins (reefs), which occupy bedding parallel faults and shears, and generally conform to the shallow regional dip of the strata. Gold mineralisation is accompanied by various sulphides of iron (Fe), copper (Cu), arsenic (As) and bismuth (Bi).

Various discordant reefs within the study area are characterized by a variety of gold mineralisation styles. They are found throughout the Sabie-Pilgrims Rest Goldfield, and are commonly referred to as cross reefs, blows, veins, ore channels and leaders. These discordant bodies can be found sporadically throughout the stratigraphy as a varying assemblage of gold-quartz-sulphide mineralisation generally striking northeast. They vary greatly in terms of composition and depth.

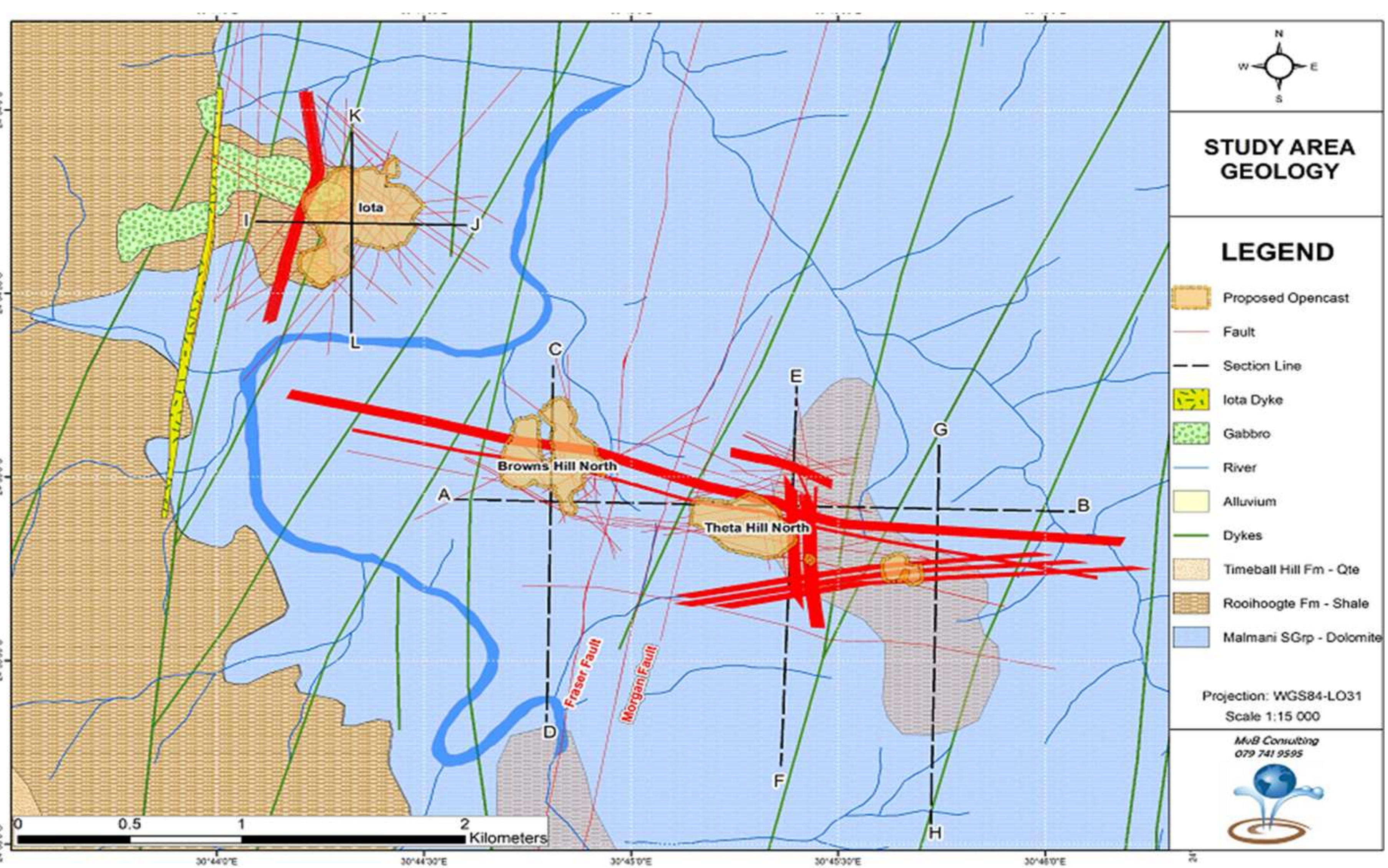


Figure 28. Study area Geology

10.4. Social baseline

The proposed new mining area is located within the jurisdiction of the Ehlanzeni District Municipality and the Local Municipality of Thaba Chweu. The mining footprint are falls within Ward 13.

The Ehlanzeni District Municipality (EDM) is one of the three districts in Mpumalanga Province and is located in the Northern Eastern part of Mpumalanga. EDM covers an area of 27 895.47 km². It is bordered by both Mozambique in the east and Swaziland in the south. EDM comprises four local municipalities namely Bushbuckridge, City of Mbombela, Nkomazi, and Thaba Chweu Local Municipalities (Figure 29).

Thaba Chweu Local Municipality (TCLM) is located in the north-western region of the Mpumalanga province. The escarpment divides the district into eastern and western sections. The western section (Lydenburg area) is dominated by agricultural and farming activities, while forestry is the main economic activity of the eastern section (Sabie/Graskop area).

The municipality shares its boundaries with the Bushbuckridge Local Municipality to the east, the City of Mbombela Local Municipality to the south, the Emakhazeni Local Municipality to the west and the Greater Tubatse Local Municipality which falls within the Limpopo Province (to the north).

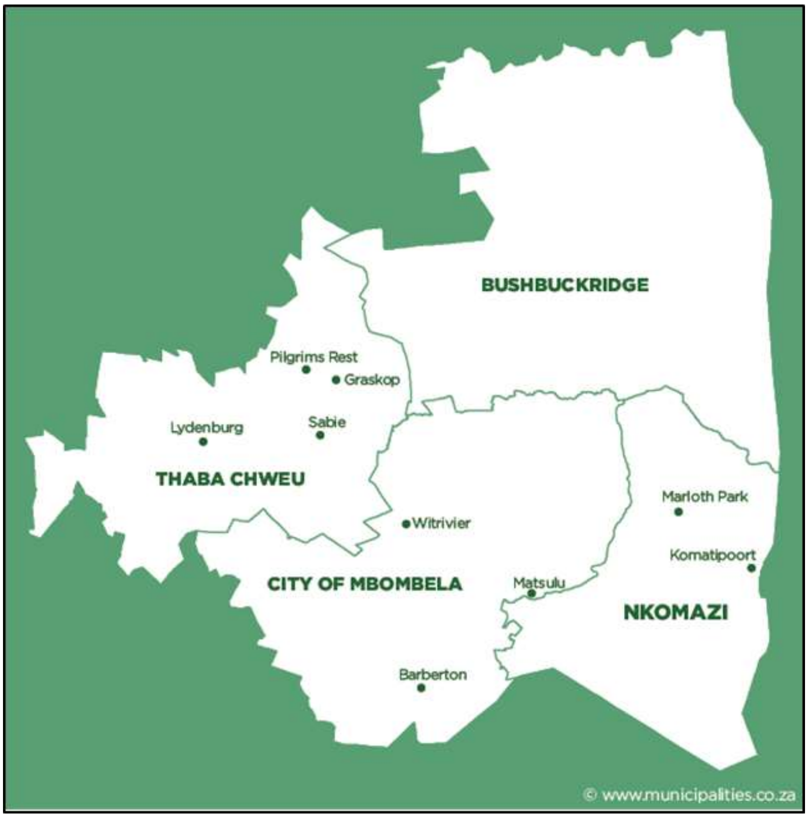


Figure 29. Thaba Chweu Local Municipality

10.4.1. Population Figures

Lydenburg, Sabie and Graskop are the core service centres and the main administrative units of TCLM. Lydenburg is the Municipality's head office.

The total population of the TCLM grew from 98,387 in 2011 to 101,895 in 2016, i.e. at an average annual rate of 3.4% per annum. The population growth of the municipality as a whole exceeded national population growth rates which is due in part to in-migration into TCLM, mainly due to increased mining activities in the Lydenburg, Burgersfort and Steelpoort areas since 2011.

The study area falls into Ward 13, which is a typical rural area without large settlements, which represents less than 3% of the total TCLM population (2,584 in 2011). Within Ward 13, 1,721 individuals were living in the town of Pilgrim's Rest in 2011, which represents 66% of Ward 13's population: 68 persons per km^2, 630 households and an average household size of 2.6.

According to local sources, the current (2019) population could be between 1,700 and 2,500 people – the majority of the population (±1,500 – 2,300) stay in the new township Newtown/Schoonplaas and in Darks Gully, close to the old town. Around 200 - 300 people stay in the historic part of the town.

According to local sources, the population has probably stayed relatively stable with limited in- or out-migration after 2011. In the past, influx to Newtown/Schoonplaas happened sporadically when labourers on short term construction works remained behind in the area. There is also a perception that young people leave Pilgrim's Rest for better job opportunities elsewhere, while illegal miners move into Pilgrim's Rest from areas as far afield as the Free State, Lesotho and Mozambique. From discussions with local representatives of TGME and residents of Pilgrim's Rest, the in-migration of illegal miners has substantially increased in the last year. Illegal miners operating in the area around Pilgrim's Rest are sub-letting from residents in Newtown/Schoonplaas and Darks Gully.

10.5. The Local Economy

10.5.1. The Structure of the Thaba Chweu Municipal Economy

In 2016, the total gross value added (GVA) of the Thaba Chweu municipal economy was estimated at R15bn (current prices) contributing close to 5% of the GVA produced in Mpumalanga province and 18% of the GVA of Ehlanzeni District. The formal economy created between 25,000 and 30,000 jobs in 2016, representing around 12% of formal jobs in the district and 4% in the Province.

The mining sector is the single largest sector in the local economy contributing almost a quarter (24%) to total job opportunities created in the local area. The contribution towards economic output could be significantly higher and is estimated to be between 45% and 50% of total economic production in 2013.

Thaba Chweu forms part of the Eastern Platinum Belt with more than 20 smelters and 30 platinum and other mineral resources mines operating in the Lydenburg and Steelpoort areas, producing mainly platinum. The mining companies operating in the area include Xstrata, Anglo Platinum, Impala Platinum, African Rainbow Minerals, Northam Platinum. There are also a number of junior miners and quarries.

While the primary sector (agriculture, forestry and mining) dominates the local economy there is limited downstream beneficiation of these products and most products are exported in a raw form and processed elsewhere. This situation is reflected in the relatively low contribution of the manufacturing sector to the local economy (Figure 30).

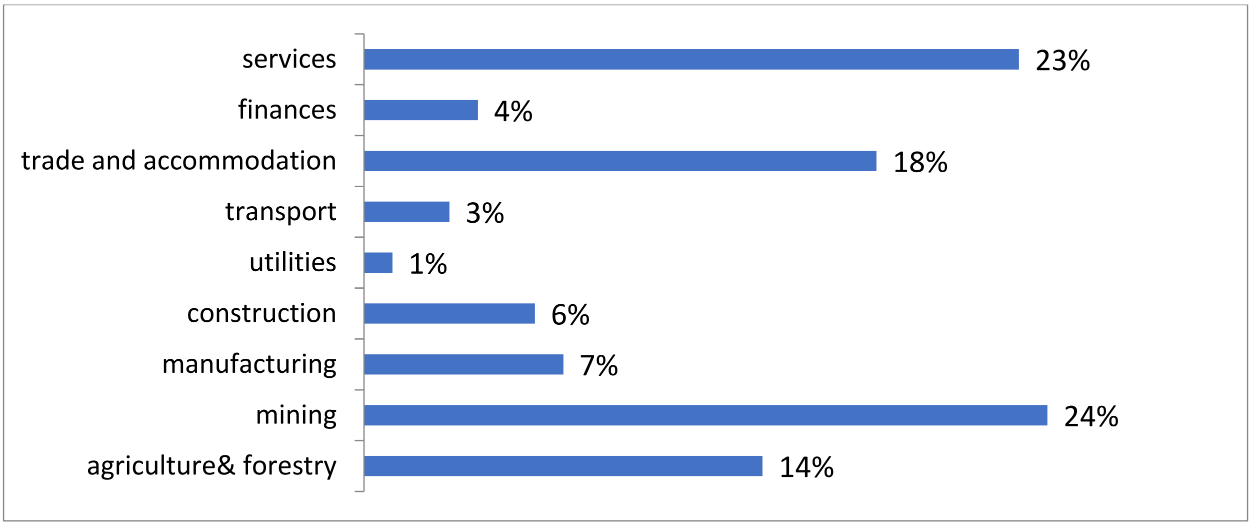


Figure 30. The Sector Distribution of Employment, Thaba Chweu, 2011

Between 1996 and 2013 the growth of the Mpumalanga economy was below that of the national economy at 2.3% per annum compared to the then national growth of 3.1% (Stats SA, 2016). The Ehlanzeni district grew at rates slightly higher than the provincial rate (2.4%) during this period with Thaba Chweu recording an average annual growth rate of 3.9% for this period.

Between 2013 and 2016 the national economy grew at a lower rate of 1.2% per annum. The growth in the Mpumalanga economy once again lagged behind the national economy at 0.9%. The Ehlanzeni District could have grown at a slightly higher rate of 1.3% per annum during this period.

10.5.2. The Tourism Sector

In 2015, Mpumalanga Province made the fifth highest contribution (9%) to the total 25 million domestic tourist trips in the country after Limpopo, KwaZulu Natal, Gauteng and the Eastern Cape. Mpumalanga Province's share of foreign tourist arrivals on the other hand is the third highest of all provinces, i.e. representing 11% or 8.6 million of the total 81 million bed-nights spent by international tourists in 2015.

The Ehlanzeni District Municipality (EDM) plays a dominant role in tourism in Mpumalanga hosting popular tourist destinations including the Kruger National Park (KNP) in Bushbuckridge Local Municipality as well as numerous prime tourism attractions located in Thaba Chweu Municipal area (e.g. Pilgrim's Rest, God's Window in Blyde Canyon, Three Rondavels, Bourke's Luck, Mac Falls). Thaba Chweu furthermore hosts numerous events throughout the year that attracts both local residents and visitors to the area including the Long Tom Marathon, Subaru/Ashburton Sabie Classic Mountain Bike race and Sabie Forest Fair.

In terms of specific destinations or landmarks, two of the top 20 landmarks visited by tourists in 2015 are located in Mpumalanga. Kruger Park received the 8th highest number of visitors in South Africa in 2015 (242,000) and God's Window in the Blyde River Canyon (133,000) was number 17 on the top 20 list in 2015.

Tourism spending contributed 12% towards GVA in Ehlanzeni compared to the 7% provincial average in 2013, i.e. the highest contribution of all three districts of Mpumalanga. For the past decade the number of visitors to the district grew at a rate of more than 8% per annum and more than doubled from 700,000 visitors in 2001 to more than 1.8m visitors in 2013.

In 2013, tourism spending in Thaba Chweu LM made the second highest contribution (16%) towards GVA after Nkomazi LM within the Ehlanzeni district (Mpumalanga Province, 2015). While there are indications of the growth of visitor numbers to Thaba Chweu municipality, not all tourist destinations share in tourism growth to the area.

While visitor numbers to God's Window for example grew from 106 000 in 2013 to 133 000 in 2015, the historic town of Pilgrim's Rest face a deteriorating tourism industry due to deteriorating safety and hygiene conditions. These 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. The town currently falls under the national Department of Public Works.

The impact of COVID-19 is expected to especially hit the South African tourism sector very hard and it might take several years for the international tourism sector (the main group visiting Pilgrim's Rest) to recover.

10.5.3. The Pilgrim's Rest Economy

The economy of Pilgrim's Rest town (historic and Newtown/Schoonplaas) is dominated by tourism related activities such as accommodation, restaurants/taverns and arts and craft shops. The Gross Value Added of the local economy could be in the region of R20 million (current 2019 prices), employing in the region of 250 people (including employment of unskilled staff at formal businesses, managers/entrepreneurs as well as 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 affected ward within the study area for the project is Ward 13 of TLCM. Ward 13 includes an area from north of Simile (near Sabie) to Pilgrim's Rest. The main town in the area is Pilgrim's Rest. Other areas falling in this ward include the Ohrighstad Dam area, Spekboom and Boomplaats.

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 (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.

Main tourism attractions in and close to Pilgrim's Rest include the historic town itself, gold panning tours, Pilgrim's Rest Ghost Tours, Crystal Springs Mountain Lodge, Mount Sheba Resort, hiking tours and mountain bike trails throughout the area as well as bird watching tours and trails. Several recreation facilities are available, such as gold panning, golf, fishing, soccer, horse-riding and hiking.

According to local sources international tourists (mainly from Europe) dominates the tourism industry of Pilgrim's Rest, accounting for 85% to 90% of tourists visiting the town. There are conflicting opinions concerning trends in domestic tourism to the local area. Some sources believe the domestic tourism market is stagnant while other business owners experience an increase in local tourists to the town, especially tourists from historically disadvantaged communities. Local tourism to the town increases substantially during the holiday seasons in April and December.

The reliance of the economy on the tourist industry is evident from the type of businesses present within the local economy namely accommodation establishments, formal arts and craft shops, informal craft staffs, restaurants/deli's, retail/wholesalers, an education centre and a recreation facility. Both formal businesses and informal crafts stalls operate in the two distinct geographic areas of the historic town of Pilgrim's rest, informally named 'uptown' and 'downtown'. Both areas serve the same market and there is little real distinction between them. In addition to the businesses in the historic town, there are restaurants/taverns and a general dealer in Newtown.

Apart from tourism, the main employers in Ward 13 are TGME, Mpumalanga Government and forestry (Komatiland & York). 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. Many of the town's business lease premises from DPWRT.

Analysis of the situation in Ward 13 suggests that local employment is dominated by informal craft and arts trade; this sector accounts for 43% of total employment, but only for 11% of total income. The Royal Hotel is the single largest employer in formal economy of Pilgrim's Rest and dominates the accommodation sector, providing more than 60 jobs in 2019. Figure 31 demonstrates the distribution of employment vs contribution to GVA.

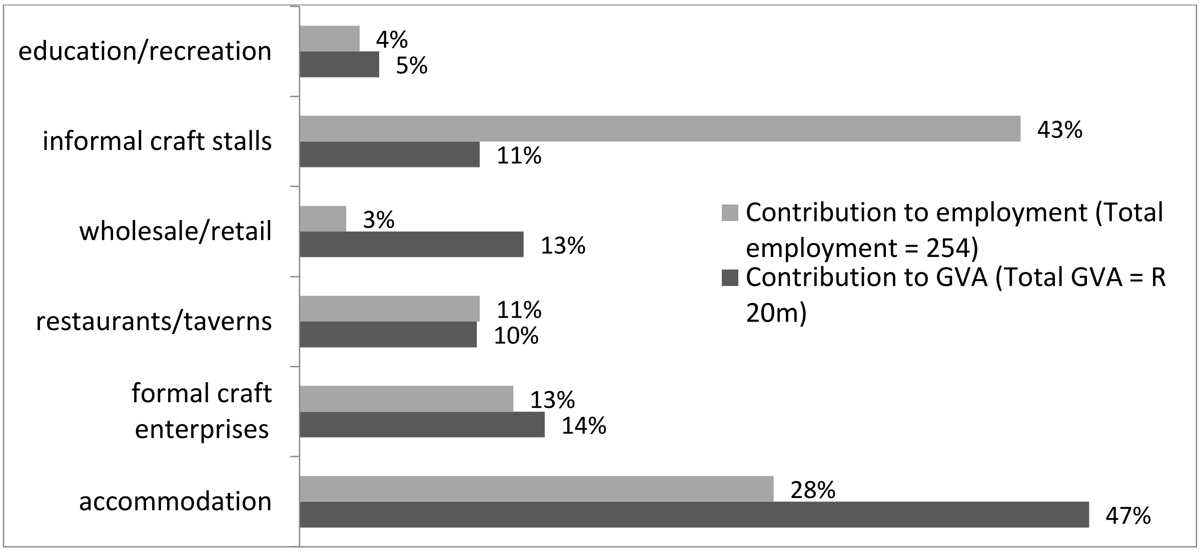


Figure 31. The Sector Distribution of Output & Employment, Pilgrim's Rest 2019

Local business sources agree that the economy of Pilgrim's Rest experienced a sharp decline since its peak in the early 1990's. The factors mentioned as the main reasons behind this decline include the deteriorating road infrastructure and concerns around general safety, especially related to the sharp increase in civil protest actions. Other factors include an increase in illegal mining activities, increased vagrancies due to poverty and unemployment and lack of public facilities and municipal functions such as street cleaning.

According to local business sources, in addition to the challenges above, the public tender process to fill the public-owned business premises in town created challenges in terms of unsustainable business enterprises and the non-payment of rentals. In 2014 the Public Protector released a report related to the negative impacts of alleged irregular tender processes in Pilgrim's Rest.

In the past decade an estimated 17 business premises in Pilgrim's Rest became vacant, resulting in the loss of close to 40 direct formal jobs. This included the local Caravan Park (300 stands), Bank and ATM. The decline in activities has had further negative effects on the remaining business establishments in town.

There has been some positive movement in the local economy in the past year, as a number of the vacant premises became occupied again, e.g. the Clewer general dealer and the re-opening of the garage. After some mass community action in 2018, the provincial Department of Public Works also appear to have placed the town higher on its agenda. There is however no consensus in the business community whether these trends imply the possible revival of the town. According to one respondent "for each step the town takes forward it moves a pace back". The low growth in the provincial and national tourism sector is also an ongoing concern for the town once again will be the impacts of COVID-19.

10.5.4. Composition of the labour force

Recent unemployment statistics for South Africa show that the national unemployment rate (official rate) has risen to close to 26% at the end of 2018. Mpumalanga Province had the third highest unemployment rate in South Africa in 2018 namely 34% (official/narrow unemployment) and 43% expanded definition – up from 30% (official rate) in 2011. The official TCLM unemployment rate was much lower than the provincial or national rate in 2011, at 21%.

Based on the population and employment figures in the sections above, the current (expanded) unemployment rate in Pilgrim's rest could be as high as 75% in 2019. Table 16 below shows high level estimates of Pilgrim's Rest labour force in 2016 and 2019 based on current employment estimates, 2011 population figures, provincial population growth rates since 2011 as well as Ward 13-based labour force participation rates. The table also shows that formal jobs could have accounted for slightly more than 50% of total employment in 2019 compared to 55% in 2016.

Table 16. The Composition of the Pilgrim's Rest Labour Force, 2019

Pilgrim's Rest labour force (2019)	2016	2019
Population	1,900	2,016
Population in economic active years (15-64)	1,330	1,411
Labour force participation rate (narrow)	71%	71%
Total labour force (narrow)	944	1,002
Formal employment (including management)	141	130
Informal employment	114	124
Unemployment	689	748
Unemployment rate	73%	75%

10.5.5. Economic diversity

While agriculture, forestry and tourism also play some role in the TCLM economy the local municipal economy is currently dominated by the mining sector in terms of output and employment. As was discussed in section 10.5.1 above, the mining sector currently makes a major contribution of between 45% and 50% towards local economic output. This situation potentially makes the local economy vulnerable to external factors such as fluctuations in commodity prices and changes in mining legislation with associated impact on investors. On the other hand, the more diversified the local economy in terms of economic activity, the more resilient the local economy will be.

The Pilgrim's Rest Economy is mainly reliant on the foreign tourism industry, leaving the economy vulnerable to external factors. For future resilience the local economy needs to diversify to reduce the impact when an economic sector is under pressure.

10.6. Social Receptors and Zone of Influence

Sensitive receptors in the study area (less than 5 km zone) include those shown in Table 17. Table 18 lists some of the receptors within a 5 – 10 km zone, whilst some of those more than 10 km away are listed in Table 19.

Table 17. Receptors within 5km zone

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
Brown's Hill community	300 metres north east of the existing TGME offices and plant area	This settlement consists of approximately four to five family units that consist of approximately 10 mud and tin dwellings. The residents include ± four young working adults and five elderly individuals (mainly elderly women). One child that is of school-going age also permanently resides there (total population of approximately 10 permanent residents with an additional family that are mainly residing there over weekends). The families have vegetable gardens and goats that roam free. There is no water or sanitation facilities and the residents are reliant on water supplied by tankers. The borehole is not in working order at the moment.
Darks Gully	± 500 m north west of Pilgrim's Rest Downtown	Residential area north of Pilgrim's Rest and west of the R533 road leading into Pilgrim's Rest. Consists of scattered homesteads (formal and informal). Dwellings are sub-let. Area is experiencing an influx of outsiders and illegal miners.
Schoonplaas/Newtown	± 700 m – 1 km northeast of Pilgrim's Rest town and east of R533 road leading to Pilgrim's Rest	Residential area northeast of Pilgrim's Rest and east of the R533 road. Consists of relatively densely populated homesteads (formal and informal). Dwellings are sub-let. Area is experiencing an influx of outsiders and illegal miners. The Pilgrim's Rest Primary School is located in Schoonplaas/Newtown.
Pilgrim's Rest Town	The town is ± 2 to 2.5 km to the east / northeast of TGME's existing plant with Brown's Hill and Theta Hill in between. Iota Hill is approximately 1.5 km to the west of Pilgrim's Rest's Downtown area.	Pilgrim's Rest is located on the farm Ponieskrans 543 KT. Businesses and the residential area of Pilgrim's Rest Town include inter alia the Royal Hotel, restaurants, guest houses, the Pilgrim's Rest Environmental Centre, a clinic and the Pilgrim's Rest Museum. The town was declared as a National Monument in 1986 and is under the management of the

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
		Mpumalanga Department of Public Works, Roads and Transport. The town consists of a Downtown area and an Uptown area with approximately 75 historical buildings.
TGME Metallurgical Plant and Tailings Storage Facility (TSF)	± 2 km to the west of Pilgrim's Rest	The existing TGME Metallurgical Plant and Tailings Facility are situated adjacent the TGME offices. These facilities are located to the west of Pilgrim's Rest (± 2 km) and are accessed via a tar and gravel road from the R533.
Former Pilgrim's Rest Caravan Park and Camping Site	± 2.3 km from the existing TGME Metallurgical plant. ± 500 m south of Darks Gully and ± 300 m north of Pilgrim's Rest Downtown.	The former Pilgrim's Rest Caravan Park and Camping Site is situated just north of the town of Pilgrim's Rest and just south of Darks Gully along the banks of the Blyde River. The Caravan Park ceased operations in 2015 when the lessee terminated the contract. Buildings are in a deteriorated state and the area is not properly maintained. The Caravan Park falls under the management of the Mpumalanga Department of Public Works, Roads and Transport.
Pilgrim's Rest Hut Guest House	± 2.5 km to the east of the proposed development	Self-catering accommodation facility situated in downtown Pilgrim's Rest Hikers undertaking the Komatiland (SAFCOL) hiking tour can start or finish certain hiking trails at this facility.
Grootfontein Village	± 2.7 km – south of the existing TGME Metallurgical plant	Village of approximately 150 residents employed by York Timber. Formal dwellings Water and sanitation facilities are available Cattle roam free within the area surrounding Grootfontein Village.
Mount Sheba Forever Lodge	± 4 km - southwest of the existing TGME Metallurgical plant	Facilities include: Accommodation at the lodge, caravan and camping sites, self-catering timeshare cottages, general recreational facilities, conference facilities, wellness centre and wedding venue. Activities include: General recreational activities (walking, swimming etc.), hiking trails and birdwatching.
Mount Sheba Private Nature Reserve	± 4 km and further - southwest of the existing TGME Metallurgical plant	Mount Sheba Lodge is situated within a private nature reserve.
Grazing areas	Surrounding and within the proposed development site	Community members' cattle are roaming free and grazing throughout the area surrounding Pilgrim's Rest.

Table 18. Receptors within 5-10km zone

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
Crystal Springs Mountain Lodge	± 6 km - northwest of the northern section (Iota Hill) of the proposed project	Crystal Springs Mountain Lodge is situated on a 2 400 ha game farm. Facilities include: Accommodation and Recreational Facilities (restaurant and wellness centre), and Conference Facilities. Activities include: General recreational activities (walking, swimming etc.), game drives, hiking and birdwatching.
South African Forestry Company Limited (SAFCOL)	Varying distance due to distance of farms from proposed development (between 2.5 km to 20 km) Farms are mainly located to the north of the proposed development.	State owned company under the jurisdiction of the Department of Public Enterprises (DPE) involved in the commercial timber industry. Operating and/or leasing properties in the study area, namely: Blackhill 528 KT (Property of TCLM leased by SAFCOL: Morgenzon Plantation); Berlyn 506 KT (RSA Government Property leased by SAFCOL: Blyde Plantation); Doornhoek 488 KT Ptn 2 (Morgenzon Plantation); Frankfort 509 Ptn 1, Ptn 2 and Ptn 3 (RSA Government Property leased by SAFCOL); Krugershoop 527 KT (RSA Government Property leased by SAFCOL); Lisbon 531 KT RSA Government Property leased by SAFCOL: Blyde Plantation); Morgenzon 525 KT RE (leased by SAFCOL); New York 530 KT (RSA Government Property leased by SAFCOL: Blyde Plantation); Peach Tree 544 KT Farm (RSA Government Property leased by SAFCOL); Rotunda Creek 510 KT RSA Government Property leased by SAFCOL: Morgenzon Plantation); Van der Merwes Reef 526 KT RE (leased by SAFCOL) Main activities include timber harvesting, timber processing and related activities

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
York Timbers (Pty) Ltd.	Farms owned by York Timbers are located to the south and east of the proposed development. Varying distance due to distance of farms from proposed development (between 2.5 km to 10 km)	Property owner (involved in the timber industry) of and/or leasing the following farms in the study area: Grootfontein 562 KT RE; Ptn 1 and Ptn 2; Driekop 546 KT (Government Property leased by York) Main activities include timber harvesting, timber processing and related activities.
SAPPI	Farm owned by SAPPI is ± 6 – 10 km southwest of the proposed development	SAPPI is involved in the commercial timber industry (global producer of wood fibre, paper, paper pulp and wood pulp) in the study area. Property owner of the farm: Breytenbachskraal 556 KT

Table 19. Receptors: Further than 10 km Zone

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
SAFCOL	Varying distance due to distance of farms from proposed development (between 2.5 km to 20 km) Farms are mainly located to the north of the proposed development.	Property owner and/or leasing properties in the study area, namely: Blackhill 528 KT (Property of TCLM leased by SAFCOL: Morgenzon Plantation); Berlyn 506 KT (RSA Government Property leased by SAFCOL: Blyde Plantation); Doornhoek 488 KT Ptn 2 (Morgenzon Plantation); Frankfort 509 Ptn 1, Ptn 2 and Ptn 3 (RSA Government Property leased by SAFCOL); Krugershoop 527 KT (RSA Government Property leased by SAFCOL); Lisbon 531 KT RSA Government Property leased by SAFCOL: Blyde Plantation); Morgenzon 525 KT RE (leased by SAFCOL); New York 530 KT (RSA Government Property leased by SAFCOL: Blyde Plantation); Peach Tree 544 KT Farm (RSA Government Property leased by SAFCOL);

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
		Rotunda Creek 510 KT RSA Government Property leased by SAFCOL: Morgenzon Plantation); Van der Merwes Reef 526 KT RE (leased by SAFCOL);
Maorabjang Communal Property Association	Varying distance due to distance of farms from proposed development (between 10 km to 25 km)	Maorabjang CPA is the title deed holder of the following farms that fall within 83MR: Frankfort 509 KT: Ptn 4 Frankfort 509 KT: Ptn 5 Frankfort 509 KT: Remainder Ponieskrans 543 KT: Remainder
Blyde River Canyon Nature Reserves	15+ km east from the proposed development	The Blyde River Canyon Reserve extends along the Blyde River Canyon against the Greater Drakensberg escarpment and includes Bourke's Luck Potholes, the Three Rondavels, Pinnacle Rock and God's Window. Accommodation includes private lodges and guesthouses Main activities include: Hiking, horse riding, white water rafting, kloofing, hot-air ballooning, fly-fishing, biking, tours and boat trips on the Blyde Dam.

10.7. Economic development priorities and initiatives

The Local Economic Development (LED) Strategy of TCLM has identified four priority areas including:

- Tourism Regeneration and Integration
- Development of Agriculture sector and Value Chain
- Business Development with a focus on SMMEs and BEE
- Creating an enabling Environment

The following economic opportunities have been identified in TCLM:

- Beneficiation of agriculture and forestry products (e.g. roof trusses, furniture)
- Tourism development around Kruger National Park and Blyde Canyon Reserve
- Using opportunities related to the N4 Maputo Corridor
- The development of a mining supplier park and downstream processing of mining products. So far, the only progress that has been made in this regard is with the launch of the Lydenburg Enterprise Development Hub as private sector (Glencore) initiative at the end of 2018 in partnership with Regoapele Capital, aimed at incubating new entrepreneurs from all sectors, including the mining sector.
- Retail opportunities in Lydenburg, Sabie, Graskop, Ohrigstad and Mashishing

TCLM has a Local Economic Development Agency known as Thaba Chweu Local Economic Development Agency (THALEDA) that was established in 2009. THALEDA assists in catalytic capital LED programmes and projects. The flagship Local Economic Development

(LED) Projects in Thaba Chweu Municipality mainly focuses on the tourism and agriculture sectors.

The projects include:

- The skywalk at God’s Window and enhancement of the Blyde River Cable car and heritage visitor centre (also part of the Blyde River Canyon National Park - a focus area of the Mpumalanga Provincial Growth Strategy)
- Bourke’s Luck Tourism Centre including a five-star lodge and restaurant
- Pilgrim’s Rest Historical Mining Town Rejuvenation including Pilgrim's Rest Theme Park and integrated family resort/ relaxation spa
- Family resort/spa in Sabie
- Sabie/ Castlerock Caravan Park
- Graskop Holiday Resort
- Newly established chalets in the Gustav Klingbiel Nature Reserve
- Graskop Retail Centre Development; Retail/Transit Node Development
- Graskop Industrial Park Development
- The upgrading of the Coromandel Farm in Mashishing including Fresh Produce Production (maize, wheat and blueberries)
- Rozenkrans Farm Fresh Produce Production
- Mashishing Industrial Park
- Furniture Cluster / Wood Beneficiation.
- Motlolo Amusement Park
- Integrated Waste Management Strategy that will generate income for the community and for the municipality through recycling of solid and organic waste including a ‘waste-to-energy’ programme.

Specific development priorities listed for Pilgrim’s rest in Ward 13 of TCLM include:

- Need for housing
- Need for land for human settlement and commercial township development
- Need for improved sanitation (flush toilets)
- Fencing and cleaning of the cemetery
- Need for municipal satellite offices for easy payment of social services
- Need for a library
- Need for crime prevention
- Need for internal streets/roads
- Water supply needs
- Need for permanent structures for the primary and secondary schools
- Need for re-opening of shops
- Need for jobs
- Need for SMMEs and other businesses

10.7.1. Institutional Capacity for Development Planning

As was mentioned above, The Mpumalanga Department of Public Works, Roads and Transport (DPWRT) is currently the custodian of Pilgrim’s Rest and is responsible for the maintenance and restoration of Pilgrim’s Rest. The involvement of a provincial department in the administration of the town pose a challenge in terms of coordinating and demarcating the responsibilities of other levels of provincial government (e.g. health and education) and the TCLM in terms of public service delivery together with integrated human settlement and development.

It is specifically cross-cutting local government functions such as integrated development planning (including spatial planning and Local Development Planning) that appear to fall down the cracks. It is for example not clear whether the TCLM or the provincial department of economic development is responsible for economic development planning for the town.

Private local networks in Pilgrim's rest are also lacking and it would appear that it is down to individual businesses to take up some of the business's challenges in town (e.g. hawkers harassing tourists or charging exorbitant prices for certain services such as car washing). While there is a number of economic networks that represents general business and tourism interests in the municipal area, Pilgrim's Rest have limited representation in regional organisations. Pilgrim's Rest also currently has active Business and Tourism *Association (as opposed to associations that exist for Lydenburg/Mashishing, Sabie and Graskop).* The Royal Hotel represents the interests of Pilgrim's Rest on the regional business chamber for Ehlanzeni District, the Kruger Lowveld Chamber of Business and Tourism (KLCBT).

In 2016 a multi-stakeholder committee for Pilgrim's Rest was established comprising the Mpumalanga Department of Public Works, Roads and Transport (MPDWRT), the Mpumalanga Department of Economic Development and Tourism, the Mpumalanga Tourism and Parks Agency (MTPA), Mpumalanga Department of Human Settlement, Ehlanzeni District Municipality, Thaba Chweu Local Municipality and the private sector. However, some local stakeholders have indicated that this platform has not yet become an effective planning platform for the town.

10.7.2. The Economy of the Downstream Blyde River Catchment Area

The economy downstream from the planned mining activities falls in the Blyde River upper catchment area that in turn forms part of the larger Olifants River Water Management Area (WMA). Due to the pristine condition of the river, Blyde River is popular with anglers. The upper region of the catchment area close to Pilgrim's Rest (downstream of the proposed mining activities) generates sustainable income for Pilgrim's Rest in terms of national angling competitions, provincial angling trials and ad hoc angling tourists. Based on conversations with local sources and provincial angling associations Pilgrim's Rest hosted two national angling competitions during the past three years. This could have generated an income injection to the town of R200,000 for 3 days at least every second year. The national competitions generate demand for approximately 4 days overnight accommodation and work for 50 to 60 angling marshals employed from Newtown on the 3 days that the competitions last.

Apart from national competitions, provinces across South Africa hold angling trials at Pilgrims, around 5 times a year. These trials involve around 18 people per trial spending 3 days in Pilgrim's Rest over the two-day trial. The provincial trials could generate an additional R200, 000 to the town every year and supply informal, ad hoc employment to close to 18 angling marshals from Newtown for 2 days every second month. Non-competitive leisure anglers could generate an additional R135,000 for Pilgrim's Rest around the year. In summary angling activities in the Blyde River 20km downstream from Pilgrim's Rest could generate a total turnover of close to R500,000 per annum. It is possible that close to 20% (R100,000) of this turnover could flow to low income families of which some R75,000 could flow to informal angling marshal services per annum, generating some 450 full time equivalent (FTE), person-days of work annually.

From a broader perspective, the entire Blyde River catchment area forms part of the lower Olifants River catchment area. The Blyde catchment area originates in Hartebeesvlakte (20km upstream from Pilgrim's Rest) and further downstream joins the Olifants River north of Hoedspruit before entering Kruger National Park. While the Blyde River is less than 200km in length, its total catchment area size is 2,842 km², which is 23% of the total lower Olifants River catchment area of 12,154 km^2, which stretches from Steelpoort to Phalaborwa and into the Kruger National Park.

Figure 32 below shows the Blyde River catchment area within the larger lower Olifants River. The figure shows that the population density in the Blyde catchment area is fairly low with larger population concentrations around Bourke's Luck (Moremela). The population in the total Blyde catchment area could have been around 62,000 people in 2011, which is about 18% of the population of the entire lower Olifants River catchment area (350,000 people in 2011).

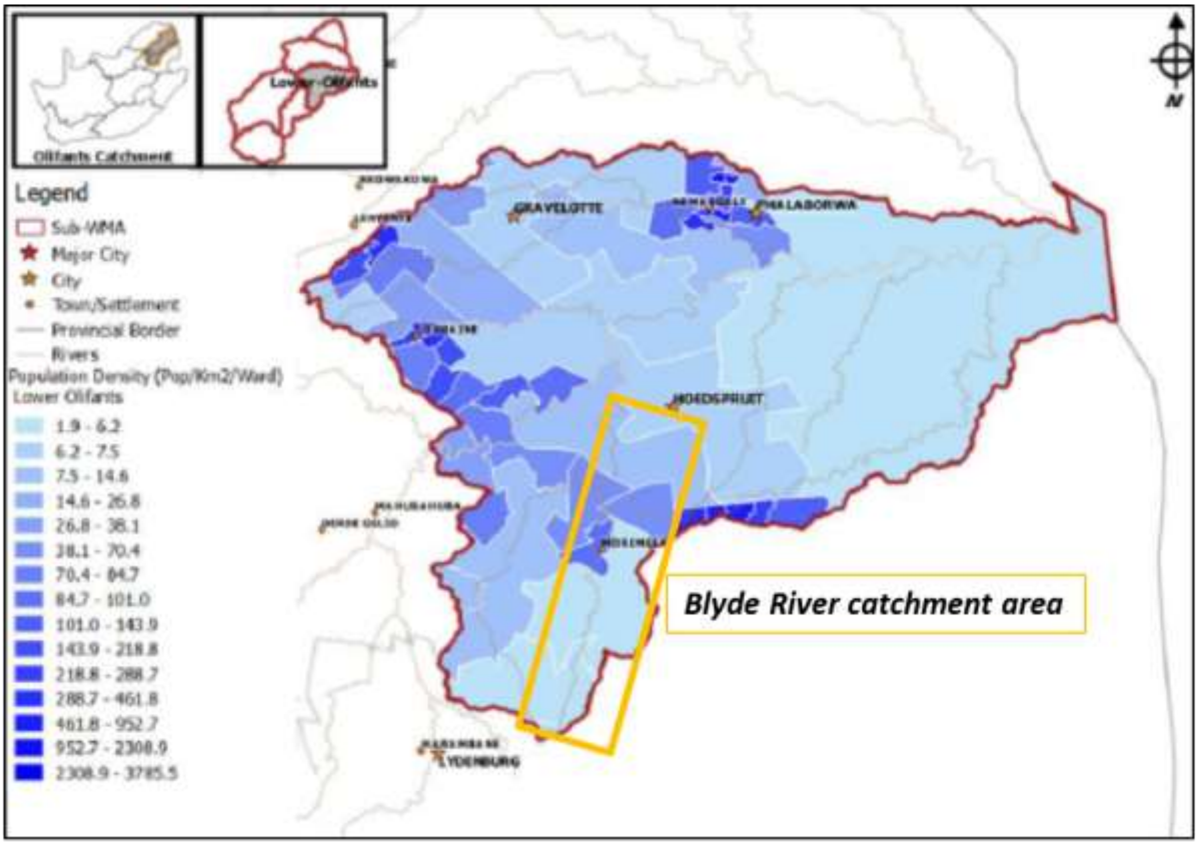


Figure 32. The Lower Olifants River Catchment Area[3]

Indigenous forests account for almost 50% of land use in the 1,400 km^2 Blyde catchment area. Close to 10% (240 km^2) is used for intensive agriculture - mainly citrus in the Hoedspruit area - and about 8% (200 km^2) is utilised for commercial forestry.

In terms of economic activity, the Blyde River catchment area falls in the Kruger to Canyons Biosphere that hosts numerous eco-tourism related activities and establishments. The Blyde River Canyon Nature Reserve gets some 133,000 visitors each year and hosts well-known natural attractions such as Bourke's Luck Potholes, the Three Rondavels, Pinnacle Rock and God's Window. The Blydepoort dam is a crucial water source for the intensive agriculture activities upstream.

In Table 20 below, socio-economic information is provided for selected municipal wards within the Blyde River catchment. Note that only wards that could potentially be affected by the project (downstream of the project) are included in the table. The table shows that 35,000 people lives downstream of Pilgrim's Rest up to the Hoedspruit area; close to 6,500

[3] Source: Department of Water and Sanitation, 2018

formal and 3,000 informal jobs are created in the relevant downstream economy and the GVA of the economy could have been in the region of R460m in 2011 (i.e. R 740m in 2019 prices).

Table 20. Selected Municipal Wards within Downstream Blyde River Catchment Area (2011)

Relevant Wards	Population	Households	Formal Employment	Informal Employment	Total GVA Estimate (R million)	Main Economic Activities
TCLM ward 10 (including Ngwetsintshage and Kanana settlements north)	6,371	2,682	1,798	671	140	Rural subsistence, agriculture
TCLM ward 9 (including settlement of Moremela)	7,528	2,136	647	191	47	Rural subsistence, agriculture
TCLM ward 8 (including Blyde Poort Dam)	7,367	2,201	586	235	46	Agriculture, eco-tourism
Maruleng LM ward 2 (downstream from Blydepoort Dam)	8,255	3,143	1,322	1,481	79	Intensive agriculture (citrus) and eco-tourism
Maruleng LM ward 1 (including Hoedspruit)	5,622	2,113	2,126	455	146	Intensive agriculture (citrus) and eco-tourism
Blyde catchment area (downstream from Pilgrim's Rest)	35,143	12,275	6,479	3,033	459	

The Department of Water and Sanitation estimated in a study in 2011 that the total value of eco system services derived from the lower Olifants River could have been in the region of R411 million in 2010, which is R707m in 2019 prices. Table 21 below shows the high contribution made by tourism (61%) followed by agriculture-related services (22%). The eco-system services in the entire Lower Olifants River catchment area could sustain in the region of 8,000 jobs (formal and informal).

Table 21. Eco-System Services in the Lower Olifants River (2010)

Eco-System Service	R million
Domestic water use	55
Livestock watering and grazing	48

Harvesting products (plants, food, medicinal, hunting and fishing)	44
Water regulation and purification (e.g. Groundwater recharge, flood control)	6
Carbon sequestration	2
Tourism	252
Aesthetic value (property values)	6
Education	0
Total	**411**

If the assumption is made that economic activities are fairly evenly distributed across the lower Olifants River catchment area (and that the economic and geographic contribution of the Blyde River catchment area towards the larger catchment area is the same) the eco system services of the Blyde River catchment area could account for approximately, 23% of the R411m eco system services estimated for the lower Olifants River catchment area. Furthermore, around 2,000 jobs could be directly dependent on the healthy functioning of the Blyde River. That would imply that closer to 20% of the total economy in the wards within the downstream Blyde River catchment area (i.e. R95 million as portion of the total downstream economy of R459 million) could be directly dependent on the health of the Blyde River.

10.8. Soils, Land Use and Agriculture Potential

Based on the observation during the field assessment, the current land use activities associated with the focus area and surrounding areas are largely dominated by wilderness, forestry, grazing, residential as well as some mining operations. Apart from forestry, no commercial agricultural activities were observed within either the Focus Area or a 3km radius of the area.

The Focus Area resembles a Lithic and Anthropic catena, with Mispah/Glenrosa and Witbank (Anthrosols) being the dominant soil forms within the total surveyed area. Lithic soils such as Mispah/Glenrosa are regarded as shallow soils, attributed to their shallow pedogenic and effective depth. These soils constitute approximately 72.7% of the total Focus Area, whilst Witbank (Anthrosols) soils occupy approximately 2.69% of the total investigated Focus Area.

The shallow nature of the dominant soil forms can be largely attributed to limited rock weathering or rejuvenation through natural erosion on steeper, convex slopes. Witbank soils have been extensively disturbed such that no recognisable diagnostic soil morphological characteristics could be identified, corresponding to Anthrosols in the international soil classification terminology. The remainder of the Focus Area comprises Dundee (Alluvial soils) soil form which occupy approximately 3.47%, and residential areas, mining and associated structures (i.e. mine plant complex, WRD, office areas, roads) which collectively occupy approximately 21.14% of the total investigated area.

Below is a tabular presentation (Table 22) of the dominant soils, with relative description of soil horizons as well as associated land capability. The land capability of the identified soils forms ranged between Class V and VIII due to land use limitations related to anthropogenic activities and shallow effective rooting depth (Figure 33 and Figure 34).

Table 22. Land Capability classes for soil forms identified within the Focus Area

Soil Form	Code	Diagnostic Horizon Sequence	Land Capability	Areal Extent (ha)	Percentage (%)
Mispah	Ms	Orthic/ Hard Rock	Grazing (Class VI)	237.06	82.67
Glenrosa	Gs	Orthic/ Lithic			
Dundee	Du	Orthic/ Alluvial	Grazing (Class V)	16.23	5.76
Witbank	Wb	Unspecified	Wildlife (Class VIII)	32.94	11.51
TOTAL				286.23	100.00*

*****Infrastructural areas (21.14%) were not included in the table above since they were not considered in the land capability ratings

The findings of this assessment in the focus area suggest that the soil limiting factors for land capability, and specifically for rainfed cultivated agriculture, include the following:

- Shallow effective rooting depth due to shallow indurated bedrock of the Mispah and Glenrosa soil forms: these soils are not considered to contribute significantly to agricultural productivity on a local, provincial as well as national scale;
- Susceptibility to erosion of Mispah/Glenrosa soils forms associated with the Focus Area due to their occurrence on sloping areas;
- Poor water and nutrient holding capacity of the Alluvial soils (Dundee) which disqualifies these soils for cultivated agriculture. However, preservation of these soils for conservation purposes is regarded important since they are associated with water courses, parallel with the National Water Act, 1998 (Act No. 36 of 1998);
- Lack of soil medium for plants and crop growth for the mine infrastructure, surface water areas and Witbank (Anthrosols) soils.

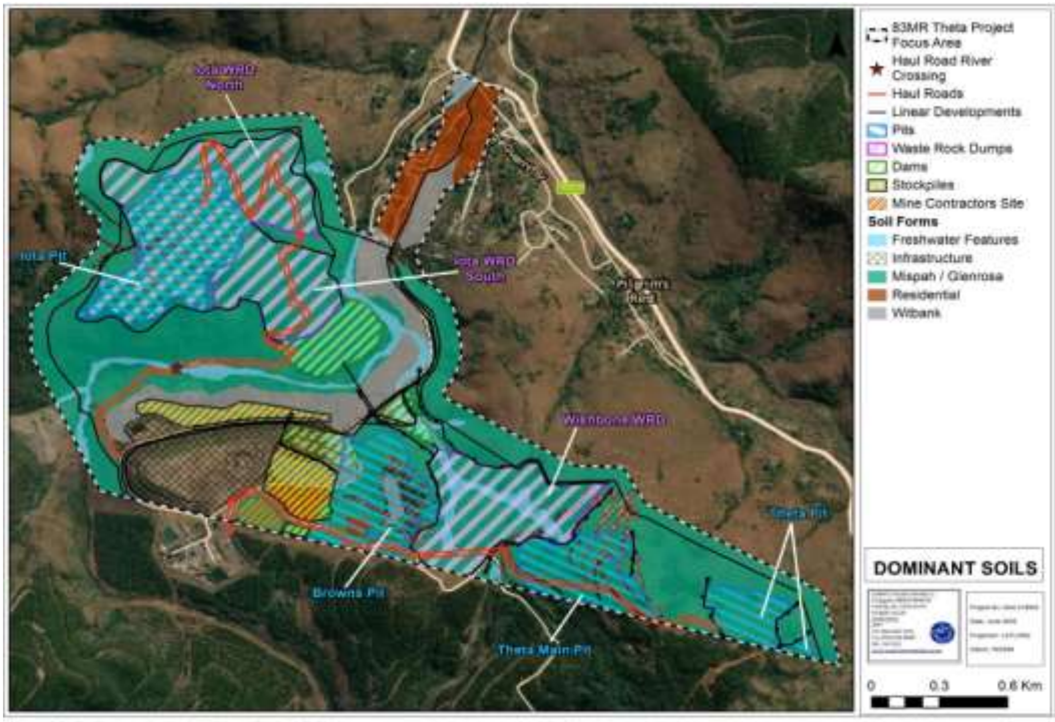


Figure 33. Soil map depicting identified soil forms associated with the mine infrastructure.

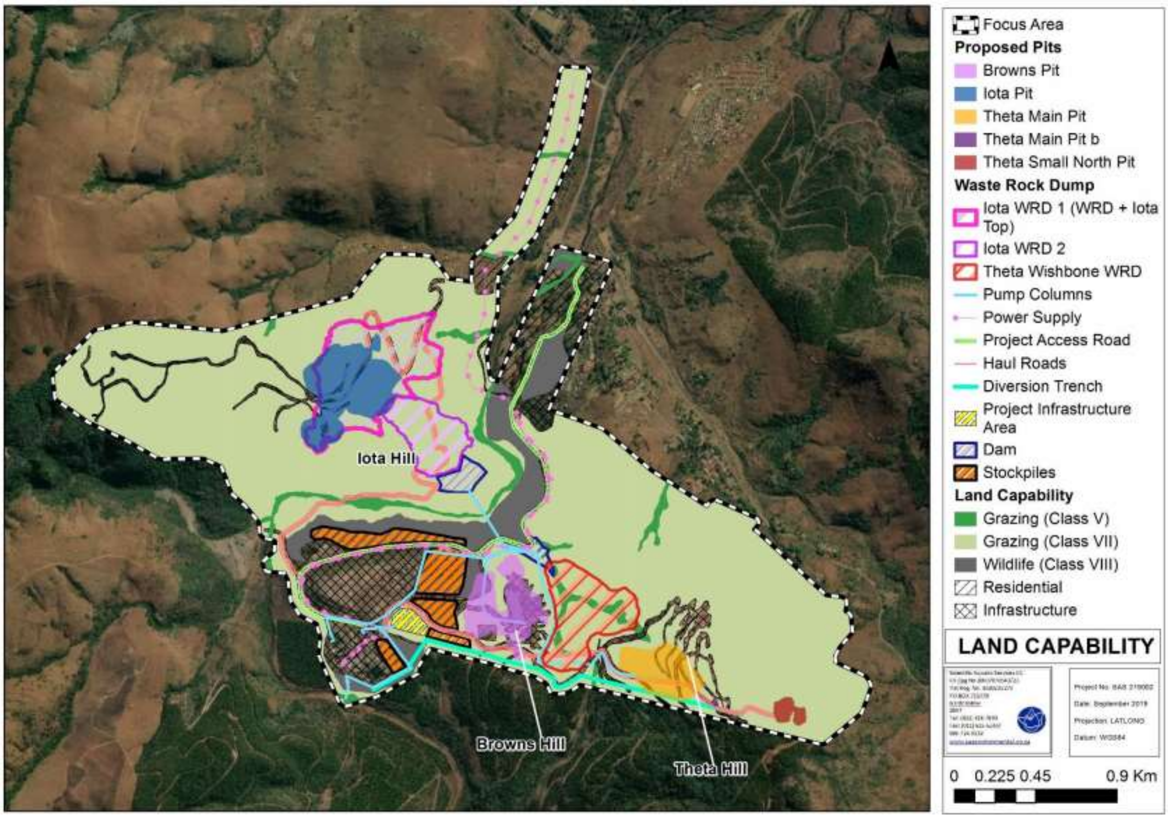


Figure 34. Land Capability Classes of Soils within the Focus Area

10.9. Flora

The desktop assessment indicated that the focus area falls within four vegetation types according to Mucina and Rutherford (2012 and 2018 databases, Section A: Figure 10), including both grassland and forest biomes. The focus area, therefore, falls within the ecotone of these four vegetation types, owing to the potential for a complex and diverse floral species composition to be associated with the focus area - this was evident within the remaining natural areas of the focus area. As stated above, the focus area is associated with both current and historic mining and forestry activities and, at the time of the assessments, large sections of the assessed vegetation had been transformed and/or degraded as a result.

The results presented below are based on four field investigations related directly to the Theta Project:

- March 2019 assessment: The autumn assessment took place at the end of the wet season and a good representation of habitat conditions and species composition of the various habitat units could be observed. However, due to the sensitivity of the vegetation, additional floral surveys were required to better saturate the species list and to get a better representation of floral SCC within the focus area (or suitable habitat for such species).
- September 2019 assessment: The spring assessment took place before the onset of the rain season and after seasonal burning of the veld. These are not generally considered good conditions for a vegetation survey, but the assessment yielded the detection of several pioneer floral species that establish post-fires and that could otherwise be easily overlooked once the veld has fully recovered. Though the spring assessment resulted in a better understanding of the fuller compliment of species

utilising the focus area, it was deemed necessary to conduct additional surveys in a more favourable season.

- January 2020 assessment: The summer assessment took place after adequate rains and yielded favourable results. Several assumptions regarding the veld conditions and potentially occurring species was confirmed with over 80 additional species recorded for the focus area (refer to full species list in Appendix 6 and 7).
- April 2020 assessment: This assessment specifically focussed on the forest areas and drainage lines of Iota Hill, as well as forest patches within the proposed Wishbone WRD. Previous assessments were limited within these areas due to safety risks posed by artisanal mining activities within these sections.

The vegetation communities distinguished during the field assessment are described in this section under four broad habitat units, namely:

Mountain outcrops:

- Cliff faces with associated Forest-like Thickets;
- Dolomite/quartzite outcrops.

Montane Grassland:

Encompassing rocky grasslands along mountain slopes with species represented by all three grassland vegetation types indicated for the focus area by the Mucina and Rutherford 2018 database, i.e. Long Tom Pass Montane Grassland, Northern Escarpment Quartzite Sourveld and Northern Escarpment Dolomite Grassland.

Riparian Habitat & Forest Remnants:

- Riparian vegetation associated with drainage lines and the Blyde River (freshwater resources); and
- Forest Remnants – including indigenous forest and degraded forest which typically occur adjacent to the Riparian Habitat.

Degraded Habitat:

Including transformed/built-up areas and AIP-dominated vegetation.

The Degraded Habitat also includes remnants of the *Northern Mistbelt Forest*, which was inaccessible due to restricted access and safety concerns (Iota WRD south-western footprint) and therefore no tangible specialist input can be provided for this vegetation type. However, the Department of Agriculture, Forestry and Fisheries (DAFF) have commented on the scoping phase of the proposed Theta Mining Project and have recommended that natural forests, regardless of the extent of alien tree proliferation, should be excluded from the direct project footprint. A 30m buffer around natural forests within the focus area was proposed by DAFF (Appendix 6 - Flora assessment). This buffer was applied to the natural forests and is displayed on the habitat sensitivity maps.

The initial field assessment of March 2019 was based on the Scoping Phase layout and resulted in a large area being covered as part of the floral investigation. After the September 2019 field assessment, the habitat units were refined and updated. For the purposes of this report, the layout map was cropped to a 50 m buffer around the revised site layout plan (Figure 35). The impact assessment took into consideration the surrounding sensitive vegetation communities.

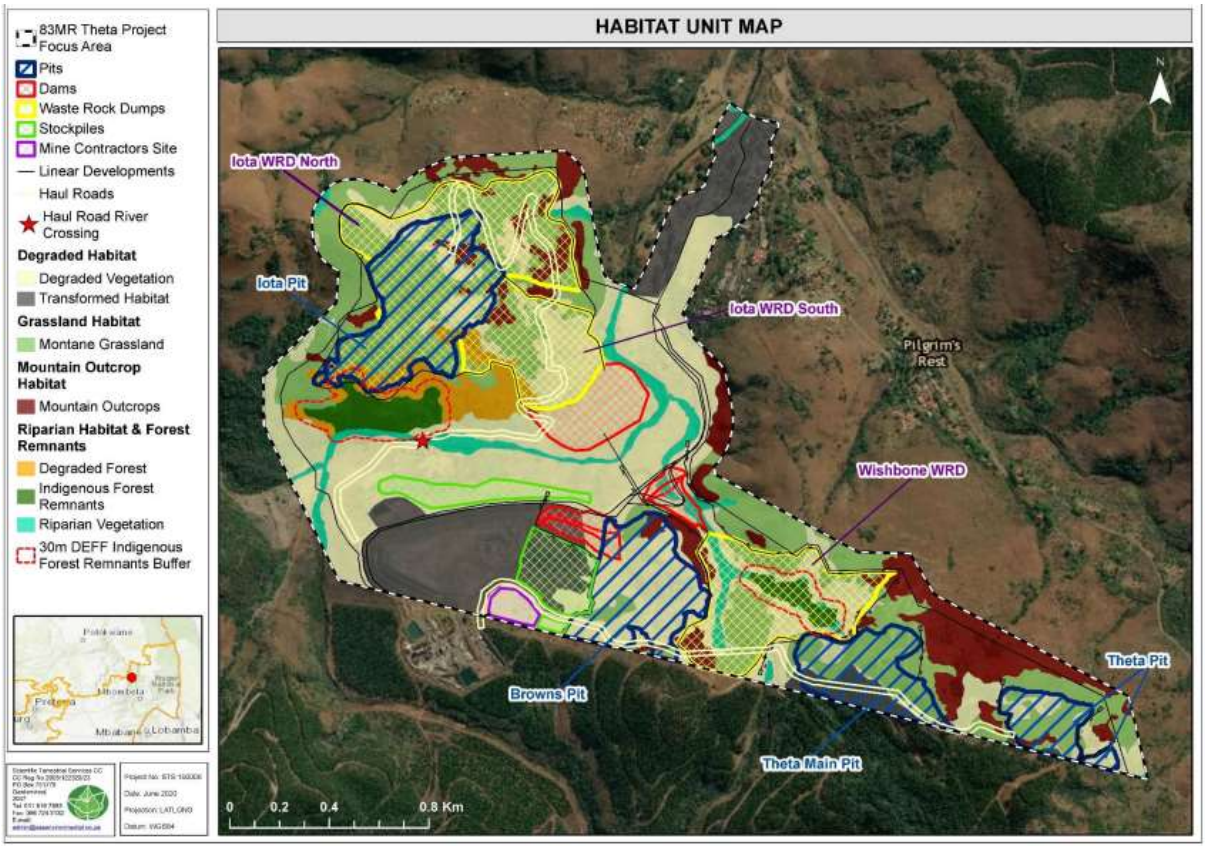


Figure 35. Conceptual Illustration: Habitat Units Relative to Proposed Mining Activities

10.9.1. Habitat Unit 1: Mountain Outcrops Habitat Unit

The Mountain Outcrops habitat unit is present throughout the focus area; however, only areas that fall within the direct footprint of the proposed Theta Project was thoroughly assessed during the field assessment (based on the layouts provided at the time field assessments occurred). The Mountain Outcrop Habitat associated with the Theta Main Pit and Theta Pit consists of vegetation and habitat representative of the Northern Escarpment Quartzite Sourveld, i.e. habitat that is "very rocky and occurs on weather-resistant quartzite", with vegetation consisting of a "short, closed grassland rich in forb species with scattered trees and shrubs" (Mucina and Rutherford, 2006).

The main distinguishing characteristic that separates this habitat unit from the others is its prominent rock features which supports a high diversity of floral species through the creation of unique micro-habitat niches. Two floral communities can be distinguished within this habitat unit based on the type of rock formation, i.e. cliff face vegetation and rock outcrop vegetation. Within the focus area, cliff faces refer to the vertical, or nearly vertical, exposed rock formations.

The more prominent cliff faces occur at the higher elevations of Theta and Iota Hill. The vegetation occurring on the cliff faces ranges from numerous herbaceous and succulent species adapted to shallow, well-drained soil conditions, to forest-like thickets that have formed due to long-term protection from fires. The rock outcrops are scattered throughout the focus area but are most abundant within the eastern sections, i.e. most prominent in Theta Hill but also present within Browns Hill and Iota Hill. Rock outcrops are the parts of a rock formation that appear above the surface of the surrounding land and can range from scattered smaller rocks to clumps of larger boulders. Within the focus area, these include both dolomite and quartzite outcrops. The rock outcrops are associated with a high graminoid, forb and succulent species diversity, with several shrub species, also benefitting from the niche habitat provided by these outcrops.

10.9.2. Habitat Unit 2: Montane Grassland Habitat Unit

According to the updated Mucina and Rutherford 2018 database, the focus area is associated with three grassland vegetation types, or reference states, i.e. the Long Tom Pass Montane Grassland (far northern portion of the focus area), Northern Escarpment Quartzite Sourveld (small section of the south-eastern portion) and Northern Escarpment Dolomite Grassland (majority of the focus area). The field assessment revealed that the grasslands within the focus area had a large overlap in floral species and all grasslands are thus jointly discussed under one broad habitat unit, i.e. Montane Grassland. However, species characteristic of each of the reference states were recorded throughout the focus area with the Long Tom Pass Montane Grassland vegetation type least represented and the Northern Escarpment Dolomite Grassland best represented.

The Montane Grassland habitat unit is best described as rocky, high altitude grasslands interspersed with sporadically occurring shrubby patches. These shrubby patches either consisted of Erica species or Protea species. Elements of the Northern Escarpment Quartzite Sourveld, such as the rugged landscapes with steep east-facing cliffs, are mainly found within the vicinity of the proposed Theta Main Pit and Theta Pit. In areas of higher disturbance, the common Bracken fern formed dense patches. AIP tree species have encroached into this habitat unit.

A large number of rare or endemic species occur in mountain grasslands, mostly restricted to either quartzite or dolomite, and these grasslands must be considered a conservation priority (Schmidt et al., 2002). Where grasslands formerly spanned 61% of Mpumalanga, agriculture and other development (such as mining and forestry) have resulted in the approximate irreversible transformation of 44% of grasslands (MBSP Handbook, 2014). This habitat unit is of high conservation importance.

10.9.3. Habitat Unit 3: Riparian Habitat & Forest Remnants

This habitat unit is predominantly associated with a woody component and will be presented below:

- Forest Remnants associated with Iota Hill, including Degraded Forest and Indigenous Forest Remnants;
- Indigenous Forest Remnants associated with the Wishbone WRD; and
- Riparian Vegetation – represented throughout the focus area.

The focus area is associated with Forest Remnants, which include a section of the wishbone drainage line (described further down), with Northern Mistbelt Forest (Mucina and Rutherford, 2006) occurring along the cliff face of southern Iota Hill (largely outside of the direct footprint). Several sections of the Forest Vegetation have been degraded; i.e. more than 70% of the vegetation consists of AIPs (mapped as Degraded Forest, Figure 11). Where forests are deemed natural and AIPs do not form the dominant vegetation cover, reference is made to Indigenous Forest Remnants, in alignment with the definition of natural forest7 within the National Forest Act, 1998 (Act No. 84 of 1998, as amended in September 2011) (NFA).

Riparian Habitat8 occurs throughout the footprint area and is mainly associated with the Blyde River (running through the centre of the focus area), the Peach Tree stream and with drainage lines along Theta Hill, Browns Hill and Iota Hill. The wishbone drainage line located between Browns Hill and Theta Hill will be directly impacted by the proposed Theta Project.

Iota Forest Remnants:

Most of the vegetation associated with the Forest Remnants within the proposed footprint of Iota Hill is considered degraded due to the dominance of alien woody species such as Acacia dealbata, Eucalyptus diversicolor, Lantana camara and Solanum mauritianum. Historically, the Degraded Forest on Iota Hill was not part of Mucina and Rutherford's Northern Mistbelt Forest; instead, these areas were grasslands.

The eastern arm of the Degraded Forest is associated with a preferential flow path where the indigenous vegetation, particularly referring to the woody component, only make up about 30 – 40% of the species composition. Rockier areas still provide habitat for indigenous succulent and bulbous species such as Aloe arborescens and Morea species. The remaining sections are almost completely overgrown by Eucalyptus diversicolor. Acacia dealbata dominates the area north of the Indigenous Forest Remnants.

The Indigenous Forest Remnants associated with Iota Hill occur along a cliff. Mucina and Rutherford describe these forests as Northern Mistbelt Forest which largely falls outside of the proposed footprint (approximately 0.11 ha falling within the proposed footprint). Due to safety concerns and access constraints, the assessment of the Northern Mistbelt Forest was limited to ad hoc observations, the use of high-resolution Lidar imagery and drone footage. Although a comprehensive species list cannot be provided for this vegetation type, it was evident that the species composition comprised mainly of indigenous floral species, of which the woody component included species such as Celtis africaca, Morella pilulifera, Seemannaralia gerrardii and Ficus species.

The Northern Mistbelt Forest is listed in the Declaration of a list of National Forest types as Natural Forests in terms of section 7(3)(a) of the NFA. The effect of this declaration is that in terms of section 7(1) of the NFA, no person may cut, disturb, damage or destroy any indigenous tree in, or remove or receive any such tree from a natural forest except in terms of:

- A) a license issued under subsection (4) or section 23; or
- B) an exemption from the provisions of subsection (4) published by the Minister in the Gazette

Wishbone Forest Remnants:

The drainage line within the proposed Wishbone WRD footprint has largely been degraded (discussed in the Riparian Vegetation section) with only the eastern arm still predominantly comprising indigenous vegetation. The Indigenous Forest Remnants within the Wishbone WRD occur within a rocky kloof associated with a drainage line. As such, the vegetation comprise woody floral species adapted to both moisture-rich and rocky habitat; with a clear distinction between canopy and understory (shade-tolerant) vegetation. This section is not mapped as forest in Mucina and Rutherford (2018 updated database) and likely formed due its location in a fire refugia.

The patchy distribution of indigenous forests within hilly and mountainous areas are due to their formation being so closely associated with fire patterns. Within the mountain kloofs, the forests are protected from fire, as is the case with the forest patches associated with Iota Hill and the proposed Wishbone WRD footprint. The sharp change in topography from mountain slopes to kloof or drainage lines prevents fire from reaching these areas and this is why there is such a rapid or sharp transition from grassland to forest. The Indigenous Forest Remnants within the Wishbone WRD footprint is represented by moderate diversity of woody species, all commonly occurring flora not necessarily associated with a specific forest type. Many of the recorded woody species, however, are described as being associated with either rocky ravines, forest margins or developing forests. The vegetation structure also conforms to the NFA's definition of natural forests that have not yet been declared as forest by the Minister, i.e. "…a group of indigenous trees - (a) whose crowns are largely contiguous;…".

Riparian Vegetation

The vegetation associated with the Riparian Habitat within the focus area has largely been degraded from a floral perspective due to the proliferation of AIP species. The section of the Blyde River within the focus area is characterised by the presence of woody and herbaceous AIPs with indigenous vegetation only recovering (or becoming the dominant vegetation) again outside of the focus area. Several anthropogenic pressures have resulted in this degradation of riparian vegetation, including previously disturbed areas left unrehabilitated (mostly mine related) and the presence of artisanal miners. The various drainage lines within the focus area have been transformed by encroaching Wattles (mostly Acacia dealbata), Gum trees (mostly Eucalyptus diversicolor), Lantana camara, Rubus niveus (subgenous Idaeobatus) and Solanum mauritianum. Native vegetation still occurs within the drainage lines; however, AIP proliferation is extensive. Representative photos are provided below.

10.9.4. Habitat Unit 4: Degraded Habitat Unit

Across the entire Theta project focus area there are sections where the natural vegetation has been heavily modified to the extent that native vegetation is poorly represented, or no vegetation remains at all. Within areas where historic or current anthropogenic disturbances have resulted in the proliferation of AIPs, native species have been displaced and the vegetation has largely lost its integrity.

This habitat unit includes areas where indigenous vegetation has been cleared for either mining or forestry purposes, which includes built-up areas, mined areas and plantations.

10.10. Existing impacts on floral communities within the focus area

Several areas within and around the focus area have historically been impacted by mining activities and are currently impacted by illegal (artisanal) mining and small-scale agricultural practices. These areas are typically left disturbed and as a result are extensively encroached by alien and invasive plant (AIP) species – although not all AIP proliferation is associated with mining activities. A brief description of the existing impacts / disturbances associated with the focus area is discussed below:

Indirect impacts: The most significant indirect impacts relate to the extensive proliferation of AIPs within previously disturbed areas. Considerable woody AIP proliferation have occurred within forested kloofs and especially along the drainage lines which are not necessarily associated with historic disturbance. The presence of artisanal mining further impacts on the riparian habitat due to impacts on water quality, sediment loads to the stream and the subsequent impacts on aquatic life. Physical disturbance to the Blyde river has also resulted from illegal mining activities where a section of the river has been diverted.

Direct historic impacts: Direct historic impacts are associated with historic mining activities, dating back to the late 1950s, as well as forestry practices. Within the focus area and immediate surroundings, this mostly relates to Browns Hill and sections of Theta Hill. As a result of ongoing disturbances at Browns Hill, the current landscape is unnaturally uneven, and several areas still comprise of waste rock and soil heaps. The topsoil layer has thus been disturbed for over a decade (referring to available digital satellite imagery) to the extent that indigenous plant species are struggling to recover within impacted areas.

The forestry areas, mostly comprising pine plantations and gum and wattle stands, have resulted in the complete transformation of historic grassland vegetation.

Direct current/recent impacts: More recently, exploration activities have occurred within the focus area and resulted in prospecting roads with a significant footprint area (approximately 18m wide at some sections). Clearing activities related to the construction of these exploration roads have resulted in the isolated loss of habitat along the road footprints and the adjacent downslope areas due to the discarding of cleared material.

10.11. Floral Species of Conservation Concern

Threatened/protected species are species that are facing a high risk of extinction. Any species classified in the IUCN categories Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) is a threatened species (referred to as SANBI Red Data Listed species). Furthermore, SCC are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare and Declining. A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7 of the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA).

The SCC assessment not only considers floral SCC recorded on site during the field assessment but also includes a Potential of Occurrence (POC) assessment where the assessment takes suitable habitat to support any such species into consideration. Thus, for the POC assessment, a list of floral SCC recorded within the QDS 2430DC and QDS 2430DD was obtained from the MTPA, comprising SANBI Red Data Listed species. The data from MTPA was provided for various farm portions and these were mapped, and categorised according to the diversity of SCC recorded. The occurrence of floral SCC was categorised in this manner to give an indication of SCC diversity within the region and, thus, further depicting the sensitivity of the area. The MTPA data is not necessarily complete and more SCC are likely present.

Also taken into consideration as part of the POC assessment was:

- The list of Schedule 11 Protected Plants [Section 69 (1)(a)] and Schedule 12 Specially Protected Plants [Section 69 (1)(b)] under the Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998);
- The List of Protected Tree Species (GN 809 of 2014) under the National Forest Act (Act 84 of 1998).

10.11.1. SANBI Red Data Listed species

One SANBI RDL species was encountered during the field assessment, i.e Merwilla Plumbea (NT), which was abundant within the Mountain Outcrops associated with Browns and Theta Hill. However, following the POC calculations, it was determined that there are favourable growing conditions within the focus area for several RDL plants. Mountain grasslands typically support many rare or endemic species that are mostly restricted to either quartzite or dolomite (Schmidt et al., 2002).

Thus, suitable habitat and growing conditions within the focus area are mostly available within the Mountain Outcrops and Montane Grasslands habitat units. The forest-like thickets associated with Mountain outcrops and the smaller drainage lines with woody riparian zones associated with Riparian Vegetation and Forest Remnants further provide suitable conditions for several floral SCC. Despite these species not found on site during the field investigation, it by no means suggests that they do not occur there and a thorough walk-down of any area to be impacted by construction activities will be necessary before any vegetation clearing takes place. A Rescue and Relocation Plan is recommended if any Red Data Listed species are encountered on site.The forest-like thickets associated with Mountain outcrops and the smaller drainage lines with woody riparian zones associated with Freshwater Habitat further provides suitable conditions for several floral SCC. Despite these species not found on site during the field investigation, it by no means suggests that they do not occur there and a thorough walk-down of any area to be impacted by construction activities will be necessary. A Rescue and Relocation Plan is recommended if any RDL species are encountered on site.

The POC of each of the species listed for the area was calculated, following the precautionary approach, and is presented in the flora assessment. The below table includes species that obtained a POC of 60% or higher and that is considered likely to be present within the focus area

Table 23. Floral SCC potentially occurring within the focus area.

SCIENTIFIC NAME	ECOLOGY & HABITAT	NATIONAL RED LIST STATUS	MTPA STATUS	POC (%)	SUITABLE HABITAT WITHIN THE FOCUS AREA
SPECIES RECORDED ON THE FARM PONIESKRANS 543 KT (FOCUS AREA) OR WITHIN THE PILGRIMS REST AREA					
Aloe fouriei	Rocky areas in grasslands, either at the edges of large sheets of exposed dolomite, on cliff faces, or among large tumbled rocks on the summits of hills, generally on south to east facing slopes.	**DD**	**NT**	**80**	Mountain outcrops
Callilepis leptophylla	Grassland or open woodland, often on rocky outcrops or rocky hill slopes.	**LC**	**Declining**	**60**	Mountain outcrops
Crocosmia mathewsiana	Damp, shady places along streams and forest margins.	**VU**	**VU**	**67**	Forest-like thickets associated with Mountain outcrops. Wooded drainage lines associated with Freshwater Habitat
Curtisia dentata	Evergreen forest from coast to 1,800 m.	**NT**	**NT**	**60**	Forest-like thickets associated with Mountain outcrops.
Erica atherstonei	Rocky areas (quartzite) in montane grassland at edge of escarpment or on steep slopes, occasionally in moist areas, 1500-2500 m.	**NT**	**NT**	**60**	Mountain Outcrops & Montane Grasslands
Hypodematium crenatum	Crevices on dolomite cliffs or in soil at the base of dolomite outcrops, from 1260-1600 m.	**VU**	**VU**	**80**	Mountain Outcrops
Kniphofia rigidifolia	Terrestrial	**LC**	**Rare**	**60**	Mountain Outcrops & Montane Grasslands
Kniphofia triangularis subsp. *obtusiloba*	Quartzitic rocky outcrops in montane grasslands, 1200-2200 m.	**Rare**	**Rare**	**73**	Mountain Outcrops
Monopsis kowynensis	Along forest margins in mistbelt grassland.	**VU**	**VU**	**67**	Forest-like thickets associated with Mountain outcrops. Wooded drainage lines associated with Freshwater Habitat

SCIENTIFIC NAME	ECOLOGY & HABITAT	NATIONAL RED LIST STATUS	MTPA STATUS	POC (%)	SUITABLE HABITAT WITHIN THE FOCUS AREA
Pelargonium album	Grows on humus-rich soils, in shady rock crevices on dolomite hills.	**Rare**	**Rare**	**80**	Mountain Outcrops
Pentatrichia alata	Grassland or savanna, on rocky slopes and sandy ground.	**DDD**	**DDD**	**60**	Mountain Outcrops Montane Grasslands
Prunus africana	Evergreen forests near the coast, inland mistbelt forests and afromontane forests up to 2100 m.	**VU**	**VU**	**73**	Forest-like thickets associated with Mountain outcrops. Wooded drainage lines associated with Freshwater Habitat
Schizochilus crenulatus	Edges of flat Black Reef Quartzite rock flushes, in damp, to wet conditions, and often in moss, substrate rarely deeper than 10 mm.	**VU**	**VU**	**60**	Wooded drainage lines associated with Freshwater Habitat
Schizochilus lilacinus	Occurs among rocks or on narrow ledges on steep rocky slopes in damp areas. 1600-2300 m.	**Rare**	**Rare**	**60**	Forest-like thickets associated with Mountain outcrops. Wooded drainage lines associated with Freshwater Habitat
Senecio latissimifolius	**Range**: Pilgrim's Rest. **Description**: Unknown.	**DDD**	**DDD**	**60**	-
Zantedeschia pentlandii	Rocky hillsides.	**VU**	**VU**	**80**	Mountain Outcrops
SPECIES RECORDED ON NEIGHBOURING FARM PORTIONS					
Curtisia dentata	Evergreen forest from coast to 1800 m.	**NT**	**NT**	**60**	Forest-like thickets associated with Mountain outcrops. Wooded drainage lines associated with Freshwater Habitat
Eucomis autumnalis	Damp, open grassland and sheltered places from the coast to 2450 m.	**Declining**	**Declining**	**87**	Montane Grasslands
Gladiolus saxatilis	Shady places on sandstone rocks and cliffs of black reef quartzite.	**Rare**	**Rare**	**60**	Mountain Outcrops
Ledebouria parvifolia	Dolomite of the Malmani Formation in the Chuniespoort Group.	**DDD**	**DDD**	**60**	Mountain Outcrops
Pentatrichia alata	Grassland or savanna, on rocky slopes and sandy ground.	**DDD**	**DDD**	**73**	Mountain Outcrops & Montane Grasslands
Tulbaghia coddii	Montane grassland, on damp, shallow soils over sheet rocks or in open grassland.	**Rare**	**Rare**	**60**	Mountain Outcrops & Montane Grasslands
SPECIES RECORDED ON FARM PORTION WITHIN 10 KM OF THE FOCUS AREA					
Adenia gummifera var. *gummifera*	Forested ravines, forest patches and forest margins, forest scrub, miombo woodland, savanna, dune forest, on stony slopes, termitaria and littoral bush, 0-1 800 m.	**LC**	**Declining**	**67**	Wooded drainage lines associated with Freshwater Habitat
Aloe albida	Mistbelt grassland.	**NT**	**NT**	**67**	Montane Grassland
Aloe modesta	Montane grassland, 1600-2000 m.	**VU**	**VU**	**67**	Montane Grassland
Argyrolobium muddii	Mistbelt Grassland.	**EN**	**EN**	**67**	Montane Grassland
Cymbopappus piliferus	Rocky quartzitic ridges in montane grassland.	**VU**	**VU**	**67**	Mountain Outcrops

SCIENTIFIC NAME	ECOLOGY & HABITAT	NATIONAL RED LIST STATUS	MTPA STATUS	POC (%)	SUITABLE HABITAT WITHIN THE FOCUS AREA
Erica holtii	**Major system**: Terrestrial	**LC**	**Rare**	**60**	Mountain Outcrops & Montane Grasslands
Merwilla plumbea (=Scilla natalensis)	Montane mistbelt and Ngongoni grassland, rocky areas on steep, well drained slopes. 300-2500 m.	**NT**	**NT**	**100**	Mountain Outcrops
Protea parvula	Most prominent in Lydenburg montane grassland.	**NT**	**NT**	**60**	Montane Grassland
Senecio hederiformis (was Cineraria)	Cracks of quartzite rock faces in mistbelt.	**Rare**	**Rare**	**60**	Mountain Outcrops
Warburgia salutaris	Variable, including coastal, riverine, dune and montane forest as well as open woodland and thickets.	**EN**	**EN**	**67**	Forest-like thickets associated with Mountain outcrops. Wooded drainage lines associated with Freshwater Habitat
SPECIES RECORDED ON FARM PORTION WITHIN 20 KM OF THE FOCUS AREA					
Brachystelma minor	Shallow pockets of dolomite, tolerating both open and shady conditions.	**VU**	**VU**	**67**	Mountain Outcrops
Clivia caulescens	Forest patches and forest margins.	**NT**	**NT**	**60**	Forest-like thickets associated with Mountain outcrops. Wooded drainage lines associated with Freshwater Habitat
Cyrtanthus huttonii	**Major system**: Terrestrial	**LC**	**Rare**	**73**	Mountain Outcrops & Montane Grasslands
Dioscorea sylvatica	Wooded and relatively mesic places, such as the moister bushveld areas, coastal bush and wooded mountain kloofs.	**VU**	**VU**	**60**	Forest-like thickets associated with Mountain outcrops. Wooded drainage lines associated with Freshwater Habitat
Disa maculomarronina	Swamps, montane grassland on the edges of Black Reef Quartzite, 1500-1700 m.	**NT**	**NT**	**60**	Mountain Outcrops
Eucomis montana	Rocky montane grassland.	**LC**	**Declining**	**73**	Montane Grassland
Eulophia zeyheriana	**Provincial distribution**: Eastern Cape, KwaZulu-Natal, Mpumalanga **Major system**: Terrestrial	**LC**	**Rare**	**60**	Mountain Outcrops & Montane Grasslands

10.11.2. NFA Protected species

One tree species protected under the NFA was recorded within the Forest Remnants during the field assessment, i.e. Pittosporum viridiflorum. Suitable habitat is available for several additional species within the forest-like thickets associated with Mountain outcrops, as well as within the woody drainage lines associated with Riparian Habitat and within the Indigenous Forest Remnants. The Mountain Outcrops also provides suitable habitat for

NFA protected trees. Species of Podocarpus was noted within the built-up areas – likely planted as an ornamental – not within the direct footprint. NFA protected tree species may not be cut, disturbed, damaged or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the DEFF or a delegated authority. Applications for such activities should be made to the responsible official in each province. Each application is evaluated on merit (including field assessments) before a decision is taken whether or not to issue a licence (with or without conditions). Such decisions must be in line with national policy and guidelines.

Several floral SCC listed in the MNCA were recorded within the focus area. The detailed floral report presents some representative photographs of the protected flora encountered on site. The majority of SCC were found within the Mountain Outcrops, mostly on Theta Hill and within the less disturbed areas in Browns Hill. The Montane Grasslands further harboured several floral SCC. The Degraded Habitat only supported a few SCC due to the disturbed and/or transformed habitat that are associated with this habitat unit.

An indication of the abundance of floral SCC recorded within the proposed Theta Protect footprint is depicted in Figure 19. It should be noted that marking the occurrences of all SCC individuals within the focus area was not part of the scope of work and that the depicted floral SCC abundances are merely a guideline to indicate that the species were present. Before any construction activities can take place, a detailed walk-down of the area is necessary, during which all SCC are marked and either considered for rescue and relocation or, if planning to destroy or move these individuals, permits would be required from relevant authorities.

As the MBSP Handbook (2014) points out, the large number of rare and endangered species in grasslands is a problem for environmental impact assessments because these plants are mostly small, have a very localised distribution and are only visible for a few weeks in the year when they flower – which means that they can easily be missed with once-off field assessments. Thus, SCC marking will need to take place during specific times of the year with the guidance of an MTPA approved specialist.

10.12. Medicinal Plant Species

The National Biodiversity Assessment (2011) (NBA) estimates that South Africa has over 2000 medicinal plant species. Medicinal plant species are not necessarily indigenous species, with many of them regarded as alien invasive weeds. Medicinal plants in Mpumalanga are known to be in high demand (MTPA, 2014) which is evidenced by the high volume (700 tons) of plants being consumed annually within the Province, and even more being transported for sale at markets in other urban centres. The high demand for medicinal plant use and trade within the province can place additional pressure on floral communities within the focus areas if the proposed Theta Project is authorised, as it will result in increased human activity in the area.

A moderately high diversity of medicinal species is present with most of the species being common and widespread and not confined to the focus area. Some of the medicinal species that could be negatively impacted by the proposed mining activities due to being protected species (MNCA) include Aloe arborescens, Haemanthus humilis subsp. hirsutus, Merwilla plumbea and Scadoxus puniceus. M. plumbea in particular is a highly sought-after species that has been exploited over most of its range for medicinal use (see http://redlist.sanbi.org/species.php?species=7485-2).

Table 24 lists the dominant traditional medicinal floral species identified during the field assessment. Medicinal applications and application methods are also presented (van Wyk, Oudtshoorn, Gericke, 2009). Alien species are indicated with an asterisk (*). Protected species are indicated in Bold.

Table 24. Medicinal Plant Species

Species	Name	Plant parts used
*Agave sisalana	Sisal	Leaves
*Agrimonia eupatoria	Scented Agrimony	Herb
*Ailanthus altissima	Tree of Heaven	Bark
Aloe arborescens (MNCA)	Krantz aloe	Leaves, or leave gel
Artemisia afra	African wormwood	Roots, stems and leaves
Asparagus sp.	Wild Asparagus	Rhizomes and fleshy roots
Baccharoides adoensis var. kotschyana	-	Leaves and twigs
*Bidens pilosa	Blackjack	Herb
Boophone disticha	Bushman Poison Bulb	Bulb scales
Cheilanthus hirta	Lip Fern	Leaves
*Datura stramonium	Common Thorn-apple	Leaves, Seeds
Dicoma anomala	Fever Bush	Leaves and twigs, sometimes roots
Dombeya rotundifolia	Wild pear	Bark, sometimes wood and roots
Gomphocarpus physocarpus	Balloon Milkwees	Leaves, sometimes the roots
Haemanthus humilis subsp. hirsutus (MNC Act)	Rabbit's ear	Bulbs and roots
Helichrysum nudifolium var. pilosellum	Everlasting	Leaves and twigs, sometimes roots
Heteromorpha arborescens var. *abyssinica*	Parsley tree	Roots, sometimes stem bark and leaves
Lannea edulis var. *edulis*	Wild grape	Bark of the rootstock
Lippia javanica	Fever tea	Leaves and twigs
***Merwilla plumbea* (MNC Act)**	Blouberglelie	Bulb
Rapanea melanophloeos	Cape Beech	Bark, sometimes roots
Pellaea calomelanos	Hard fern	Leaves and rhizomes
Plantago lanceolata	Ribwort Plantain	Leaves, Herb
**Plantago major*	Hoary Plantain	Leaves, Herb
**Plectranthus barbatus*	Indian coleus	Root & Herbs
Rhoicissus tridentata subsp. cuneifolia	Wild grape	Roots or tuberous rootstock
**Ricinus communis*	Castor oil Plant	Seed oil
Scabiosa columbaria	Wild Scabious	Leaves or fleshy roots
***Scadoxus puniceus* (MNC Act)**	Red paintbrush	Bulbs and roots
Sida cordifolia	Flannel Weed	Root
Syzygium cordatum var. cordatum	Water berry	Bark, leaves and roots
Xerophyta retinervis	Monkey's tail	Whole plant
Ziziphus mucronata	Buffalo Thorn	Leaves, Root & Bark

10.13. Alien and Invasive Plant (AIP) Species

Alien and invasive floral species are floral species of exotic origin which are invading previously pristine areas or ecological niches (Bromilow, 2001). Not all weeds are exotic in origin but, as these exotic plant species have very limited natural "check" mechanisms within the natural environment, they are often the most opportunistic and aggressively growing species within the ecosystem. Therefore, they are often the most dominant and noticeable within an area.

Disturbances of the ground through trampling, excavations or landscaping often leads to the dominance of exotic pioneer species that rapidly dominate the area. Under natural conditions, these pioneer species are overtaken by sub-climax and climax species through natural veld succession. This process, however, takes many years to occur, with the natural vegetation never reaching the balanced, pristine species composition prior to the disturbance. There are many species of indigenous pioneer plants, but very few indigenous species can out-compete their more aggressively growing exotic counterparts.

Alien vegetation invasion causes degradation of the ecological integrity of an area, causing (Bromilow, 2001):

- A decline in species diversity;
- Local extinction of indigenous species;
- Ecological imbalance;
- Decreased productivity of grazing pastures;
- Increased agricultural input costs.

AIPs are defined in terms of the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA) and categories are assigned as per the NEMBA List of Alien and Invasive Species (2016) in accordance with Section 70(1)(a) of the NEMBA:

- Category 1a Listed Invasive Species are those species listed as species which must be combatted or eradicated:
- Category 1b Listed Invasive Species are those species listed as species which must be controlled;
- Category 2 Listed Invasive Species are those species listed as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be;
- Category 3 Listed Invasive Species are species that are listed as species which are subject to exemptions and prohibitions.

During the floral assessment, dominant AIPs species were identified and are listed in the fauna assessment attached as Appendix 6.

10.14. Floral Sensitivity

Based on the March 2019 field assessment, the sensitivity of the habitat units for the larger focus area were determined according to their sensitivity in terms of the presence or potential for floral SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity. The September 2019, January 2020 and April 2020 assessments were able to refine the sensitivities of the affected areas (Figures 33).

The table 22 below presents the sensitivity of each identified habitat unit along with an associated conservation objective and implications for development.

Table 25. Summary of the sensitivity of each habitat unit and implications for development.

HU	Sensitivity	Impacting Infrastructure	Conservation Objective	Development Implications
Mountain Outcrops	**High**	Iota Pit North-eastern portion of the Wishbone WRD Several stretches of the Haul Road and Linear Developments associated with Iota Hill and Theta Pit	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered Offsetting or compensation for residual loss to be considered only as a last resort	The Mountain Outcrops were determined to be of the most sensitive of the habitat units encountered within the focus area, especially those associated with Theta Hill. The Theta Hill and Browns Hill Mountain Outcrops are highly sensitive from both an ecological and conservation perspective, owing to their high floral diversity, an abundance of floral SCC and the presence of intact vegetation and habitat integrity. The Mountain Outcrops associated with Iota Hill had lower species diversity and fewer SCC but is still considered highly important due to its presence within an Irreplaceable CBA. From a floral resource management and conservation perspective, these areas must be excluded from surface developments, as far as is feasibly possible. The EIA Phase layout has reduced its footprint considerably, especially within the northern and eastern portions of Theta Hill. The current highest risk to the Mountain Outcrops will thus be on Iota Hill, where the proposed layout will lead to the direct loss of favourable habitat for floral communities and floral SCC numbers locally. Several of the highly sensitive floral communities are located within Irreplaceable CBAs, ESAs and threatened ecosystems; there is thus a conflict between the intended land use and the conservation requirements for the region.
	Moderately High	Iota Pit, Iota WRD North and Iota WRD South Theta Pit Northern Section of Browns Hill Several stretches of the Haul Road and Linear Developments associated with Iota Hill and Theta Pit	Preserve and enhance the biodiversity of the habitat unit and surrounds while optimising development potential Offsetting or compensation for residual loss to be considered only as a last resort	
	Intermediate	Iota Pit and Browns Pit	Preserve and enhance the biodiversity of the habitat unit and surrounds while optimising development potential Offsetting or compensation for residual loss to be considered only as a last resort	
Montane Grasslands	**High**	Most of the Iota Pit and Iota WRD North, as well as central portion of Iota WRD South Northern portion of the Wishbone WRD	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered Offsetting or compensation for residual loss to be considered only as a last resort	The Montane Grasslands are characterised by a high floral diversity and several floral SCC were recorded in this habitat unit. However, in some sections, habitat integrity was lower for this habitat unit than for the Mountain Outcrops due to the presence of several anthropogenic-related disturbances, including roads excavated along the slopes of Iota Hill (habitat fragmentation) and AIPs encroaching into natural areas throughout. Thus, the Montane Grasslands range from moderately high to high importance from a floral ecological and conservation perspective.

HU	Sensitivity	Impacting Infrastructure	Conservation Objective	Development Implications
	Moderately High	Scattered sections within the Iota WRD North. Northern-most portion of the Iota WRD South Theta Main Pit, Theta Pit and much of the Wishbone WRD Haul Roads associated with Iota Hill and Theta Hill Several stretches of the Linear Developments	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance Offsetting or compensation for residual loss to be considered only as a last resort	The Montane Grasslands are characterised by a high floral diversity and several floral SCC were recorded in this habitat unit. However, in some sections, habitat integrity was lower for this habitat unit than for the Mountain Outcrops due to the presence of several anthropogenic-related disturbances, including roads excavated along the slopes of Iota Hill (habitat fragmentation) and AIPs encroaching into natural areas throughout. Thus, the Montane Grasslands range from intermediate to high importance from a floral ecological and conservation perspective. Along the south-eastern slopes of Iota Hill, where several roads have been excavated, the grasslands have been fragmented and it is evident that floral diversity is lower in these sections. Thus, considering the impact of habitat fragmentation, together with the conservation significance of South African montane grasslands, no further destruction of these grasslands should take place. Furthermore, the high probability of rare and endemic species occurring in this habitat unit further necessitates the conservation, rather than destruction, of this habitat unit. Several of the highly sensitive floral communities are located within Irreplaceable CBAs, ESAs and threatened ecosystems; there is thus a conflict between the intended land use and the conservation requirements for the region.
	Intermediate	Browns Pit Iota Pits and Iota WRDs Theta Pit	Preserve and enhance the biodiversity of the habitat unit and surrounds while optimising development potential Offsetting or compensation for residual loss to be considered only as a last resort	
Riparian habitat and forest remnants	**Moderately High**	Eastern arm of the Wishbone WRD	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance Offsetting or compensation for residual loss to be considered only as a last resort	The Riparian Habitat and Forest Remnants are of moderately low to moderately high ecological and conservation significance from a floral resource management and conservation perspective. The habitat integrity of the Riparian Habitat within the focus area has been greatly compromised by the proliferation of AIPs, e.g. Acacia dealbata, Eucalyptus grandis, Jacaranda mimosifolia, Rubus cuneifolius and Solanum mauritianum have encroached into most drainage lines and comprise the majority of vegetation along the Blyde River. Floristically this habitat unit is significant due to the provision of water and the creation of niches for facultative or obligate wetland plants. However, in its current AIP-encroached condition, many native

HU	Sensitivity	Impacting Infrastructure	Conservation Objective	Development Implications
	Intermediate	Sections of the Wishbone WRD Linear developments, mainly Haul Roads and Linear Developments Browns PCD	Preserve and enhance the biodiversity of the habitat unit and surrounds while optimising development potential Offsetting or compensation for residual loss to be considered only as a last resort	species have been displaced. With the potential for additional disturbances that would stem from the proposed miningrelated activities, it is likely that the Riparian Habitat will suffer further loss of native species diversity and downstream effects of possible siltation, water contamination and AIP proliferation could lead to additional impacts on floral communities within the larger region. The section of the Forest Remnants where indigenous forest species still form the dominant vegetation component is floristically more sensitive and provides unique habitat for forest species. The remnants of Northern Mistbelt Forest should be excluded from planned mining activities and as per the DEF recommendations, no mining activities should occur within 30 m of this vegetation type. Activities that are planned within freshwater resources as delineated by the Freshwater Ecologist or within the zones of regulation, as identified in the Freshwater Report, will require authorisation from the Department of Water and Sanitation (DWS). Mining-related activities within this habitat unit will require cogent mitigation measures to ensure no additional, or cumulative, impacts on floral communities occur.
	Moderately Low	Iota Pit	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	
Degraded Habitat	**Low**	Popwerline (existing) Balancing Dam Option 1 Sections of the Topsoil Stockpiles and Haul Road Southern portion of the Theta Main Pit and a small section of the Theta Pit	Optimise development potential.	This habitat unit is of moderately low to low sensitivity, from a floral ecological and conservation perspective. Development within this habitat unit should not pose significant threats to native floral communities within the central part of the focus area. However, edge effects will need to be carefully managed, especially the potential spread of AIPs. Development within this habitat unit on Theta and Iota Hills have a greater potential for edge effects to impact on the adjacent, more sensitive habitat units. Ecological functioning and habitat integrity are significantly compromised, and these areas can be optimised for development.
	Moderately Low	Sections of Iota Pit, Iota WRD North and Iota WRD South. Most of Browns Pit and southern sections of the Theta Pits, as well as sections of the Wishbone WRD Haul Roads and several stretches of the Linear Developments	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	

HU	Sensitivity	Impacting Infrastructure	Conservation Objective	Development Implications
		Stockpiles and Mine Contractors Site		

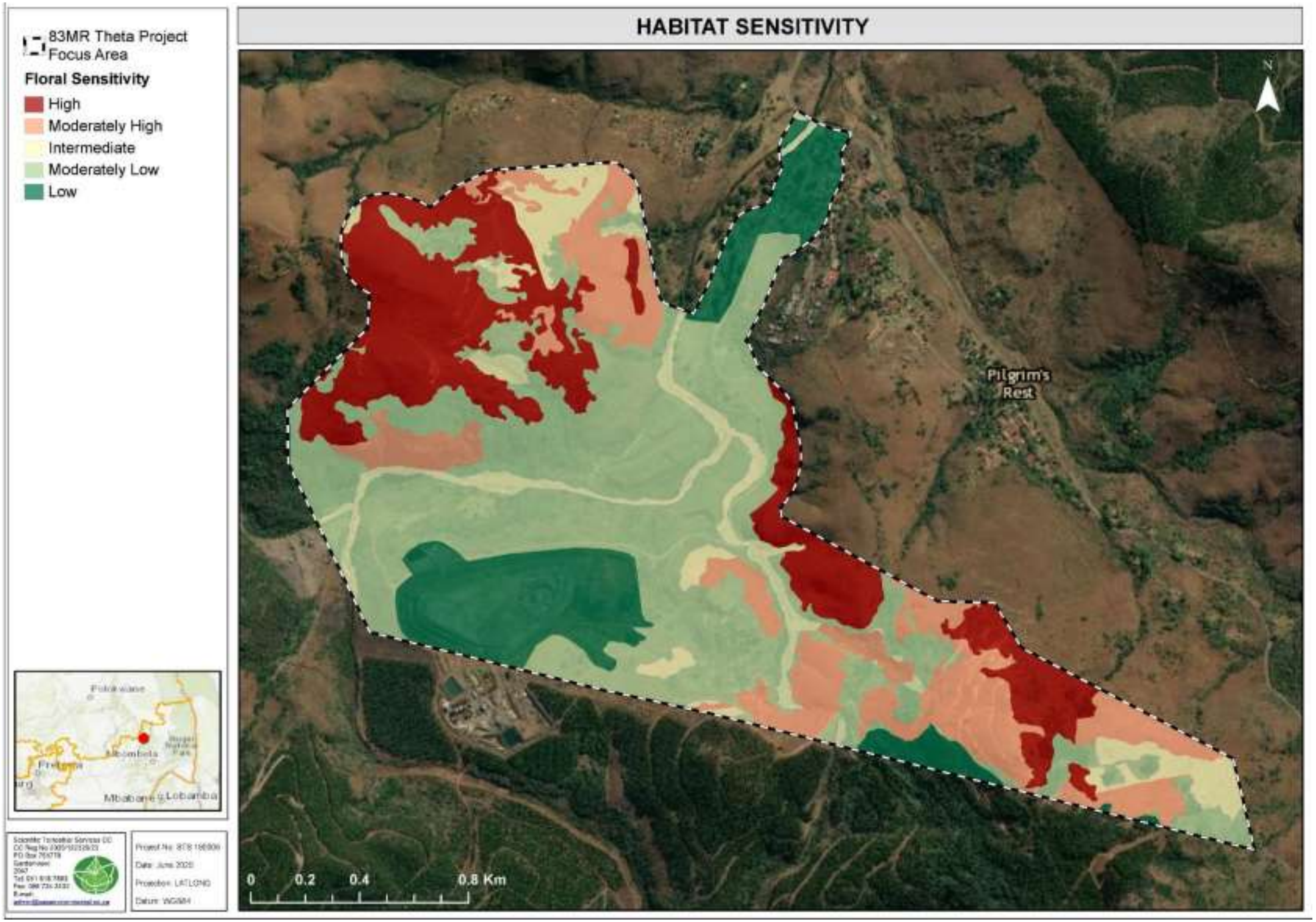


Figure 36. Sensitivity map based on updated results from the September 2019, January 2020 and April 2020 field assessments..

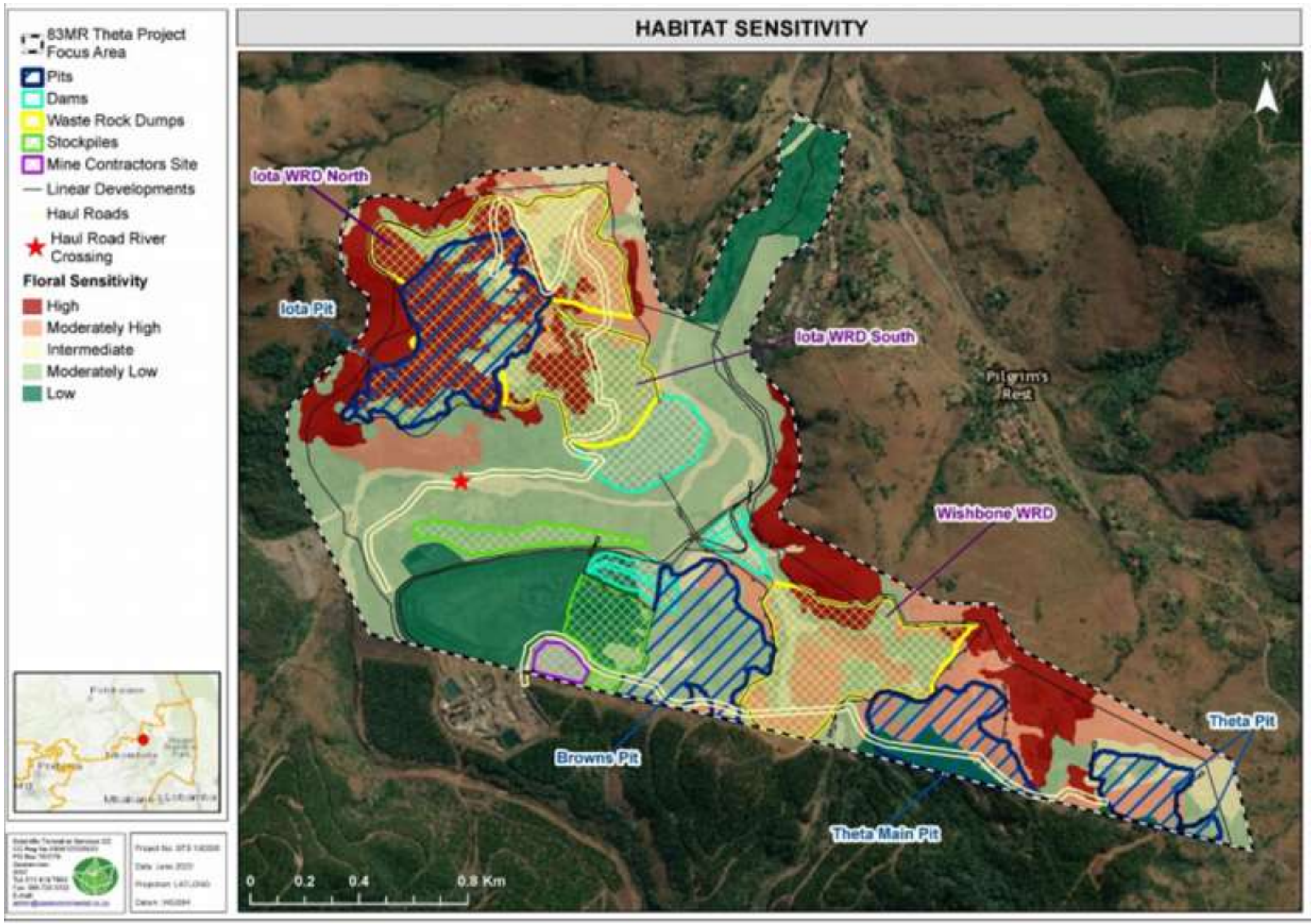


Figure 37. Sensitivity map for the focus area based on updated results from the September 2019 and January 2020 field assessments

10.15. Off-Set Discussions

Scientific Terrestrial Services (STS) and Conservation Strategy Tactics & Insight was appointed to investigate the suitability of a biodiversity offset, including the calculation of potential biodiversity losses and required offset quantum, for the proposed Theta Project (Appendix 17).

Based on the outcomes of the initial biodiversity assessments, the proposed Theta Project will impact on Irreplaceable and Optimal Critical Biodiversity Areas (CBAs) (MBSP, 2014), as well as on threatened ecosystems (Mucina and Rutherford, 2018; National Threatened Ecosystems, 2011). The Theta Project Phase 1 Biodiversity Offset Investigation has consequently been initiated to investigate the requirement to compensate for residual impacts on biodiversity, where these are considered to be high, and to define the quantum of the offset; hereafter referred to as the "Phase 1" offset investigation.

Following the "Phase 1" offset investigation and the new mining layout proposed, STS and Conservation Strategy Tactics & Insight (Mark Botha) updated there reports, and produced the Theta Project Biodiversity Offset and Compensation - Revised Report dated July 2020 (Appendix 17). It builds on the initial study conducted on offset requirement, quantum and potential availability (STS 2019), revised flora (STS 2020) and freshwater studies (SAS 2020) and the initial Offset and Compensation Study (Botha, Steyn, van Staden February 2020). The details herein can be used to frame appropriate conditions of authorisation, should this project be approved (in whatever form, the mitigation can be scaled appropriately). It also sets out the required offset and compensation parameters for the proposed "Implementation Agreement" between TGME, MTPA, and, if necessary, any implementing agent.

The terrestrial CBA and threatened ecosystem biodiversity offset requirements were calculated using the offset ratios presented in the draft National Biodiversity Offset Policy (2017). The quantification of the losses relied heavily on field surveys conducted as part of the EIA process (STS 190006, Part B – C).

Using desktop methods, several priority areas within the Transvaal Gold Mining Estate's (TGME) Mining Right Areas (MRAs) were identified that meet the requirements for a "like for like" offset. For the proposed Theta Project, the target vegetation type to meet the "like for like" offset is the Northern Escarpment Dolomite Grassland (Mucina and Rutherford, 2018 database).

The extent of the various biodiversity features (Irreplaceable CBAs, Optimal CBAs and Malmani Karstland Ecosystem) that fall within the Dolomite Grassland was calculated within TGME's MRAs. To further ensure that the biodiversity offset achieves the desired biodiversity outcome, target offset areas were identified where connectivity between protected areas can be promoted (following the guidelines in the draft National Biodiversity Offset Policy), which required identifying potential offset areas outside of TGME's MRAs. Due to their potential relevancy as offset areas, i.e. falling in line with the guiding principles set out in the draft National Biodiversity Offset Policy (DEA et. al, 2017), the target offset areas identified in this report should be prioritised for investigation in the Phase 2 offset investigations.

Approximately 129 ha (117ha + 10% buffer) of Northern Escarpment Dolomite Grassland, Long Tom Pass Montane Grassland, and Northern Escarpment Quartzite Sourveld will be impacted (STS 2020). Traditionally, offset metrics would be calculated per vegetation type, but as there is some interdigitation and gradation between these types on site, and the fact the presence of CBAs will dominate the offset metrics, we have opted to base offset metrics on CBA impacts going forward.

Around 69 ha of irreplaceable CBA (demanding an offset ratio of 30:1) and 48 ha of optimal CBA (requiring a ratio of 20:1) will be lost to the revised mine footprint development. A 10% buffer was applied to these areas to cater for unforeseen eventualities and potential infrastructure creep.

The extent of impact on indigenous forest is complicated by the fact that almost the entire impacted area (<2ha) at Iota is heavily disturbed and invaded with Acacia and other invasive plants. To what extent Forest impact can be considered significant or offset able must be discussed with DFFE.

To counterbalance the loss of the biodiversity in the footprint of the activities applied for, an offset of at least **3336 ha** is required. To ensure a like-for-like outcome, this offset must be located in the Northern Escarpment Dolomite Grassland vegetation type, ideally within the Malmani Karstland Listed Ecosystem and cover a substantial portion of the related Critical Biodiversity Areas, preferably in the B60B quaternary catchment.

A suite of potential offset target properties was assessed for suitability. These properties are all located North of the proposed mine as most surrounding properties are either state-owned or already declared protected. Most of the potential offset target areas are held under mining right 10167 by TGME and are owned by the Maorabjang Communal Property Association.

It would seem inevitable that at least 3336 ha of these properties would need to be selected as an offset for the impacts under the Theta project. These would need to be declared as a nature reserve in perpetuity to safeguard the biodiversity features.

To assist further with offsetting the loss of CBAs and natural habitat in the Northern Escarpment Dolomite Grassland, and specifically, the Malmani Karstland Listed ecosystem, TGME will undertake to control Invasive Alien Plants1 (IAPs) on land it does not own, thereby slowing or even reversing future loss of the impacted vegetation type. While control of IAP invasions and restoring basic grassland cover will not sufficiently offset the impacts on its own, it will improve ecosystem function and contribute to mitigation of other impacts (through contributing to meeting Resource Quality Objectives for the Blyde River and to reduce risk of further loss of grassland and forest vegetation).

To secure the outcomes of restoring functionality and avoided loss of grasslands, the control of IAPs will be focused on the Stanley Bush Kop section of the Blyde River Nature Reserve (an 'unvalidated' protected area2) and key parts of the Peachtree Stream Catchment. The rehabilitation gains will need to be secured and protected through approved management plans, and land use control and notarised conservation servitudes.

As part of the EIA application the following suggested mitigation measures are suggested:

Biodiversity offset:

- As an offset for the biodiversity footprint impacts of the project, the applicant must secure an area of not less than 3336ha of NE Dolomite Grassland, within the Malmani Karstland listed ecosystem and containing as great a proportion of CBAs (set out in the MBSP 2014) as possible.
- The applicant must procure the necessary consents, permissions and other administrative and management authority agreements for the offset area for declaration to the relevant authority as a Nature Reserve (or a part of an existing Nature Reserve) under Section 23 of the NEMPA. The required consents (land owners, beneficial occupiers, management authority and other rights holders inter alia) and other administrative measures to secure this declaration must be submitted to the relevant MEC (or failing that the Minister of Environment, Forestry and Fisheries) for consideration for the declaration, before the activities may commence.

- The requisite Protected Area Management Plan for the Offset property(ies) must be drawn up, in consultation with MTPA (and/or DEFF if applicable), within 1 year of the submission of the documents noted above, and submitted to the MEC for consideration.
- The applicant must be responsible for all costs of declaration, establishment and the procurement of and implementation of the management plan for the offset site protected area for a minimum of 30 years or until 10 years post the issue of a closure certificate for the mining operations covered by 83 MR, whichever is the later.
- The applicant must procure an independent auditing of management performance of the offset site PA every 5 years, with the audit report being submitted to MTPA, DARDLEA, DEFF and the DMRE. The applicant is required to comply with the independent audit recommendations, failing which the specified portion of the guarantee or performance bond required below will become due and payable to the institution established to safeguard the offset and compensation.

Biodiversity-related compensation for potential water and sedimentation impacts:

- To compensate for existing licenced abstraction of water in this Strategic Water Source Area, as well as for potential impacts on water ecosystems and associated biodiversity through sedimentation and altered flows, the applicant must develop two rehabilitation plans, and implement those components of the plans outlined below, to achieve the requisite outcomes.
- The applicant must develop, in conjunction with MTPA, DARDLEA, the Thaba Chweu Municipality, large landowners (>1000ha), the FPA, DWS and DEFF an integrated conservation, forestry and agriculture land use and rehabilitation plan for the Quaternary Catchment B60B with 2 years of the issue of the EA (The Rehabilitation Plan for B60B).
    - This plan must set out priority areas for rehabilitation, deployment of biocontrol and other effective means of long-term control of invasive species, existing lawful agricultural (ploughing) use, and be able to inform future land use planning instruments (IDP, SDF and LUS) of the municipality;
    - The plan must provide for alignment of all investments in natural resource management, including but not limited to, Invasive Alien Tree control and biocontrol, wetland and riparian restoration, erosion and sedimentation control, and forest and grassland rehabilitation. It may provide for alignment with fire management plans produced by the relevant FPA, if appropriate;
    - The plan must be signed off by MTPA before finalization, and lodged with the operational divisions of all applicable resource management entities (DEFF NRM, FPA, Thaba Chweu LM, DARDLEA); and
    - The plan must be revised every five years after initial lodging, and again after every major fire or other significant disturbance.
- The applicant must develop, in conjunction with MTPA, the Thaba Chweu Municipality, large landowners, DARDLEA, DWS and DEFF an integrated Conservation and Forestry land use and rehabilitation plan for the Quaternary Catchment B60A with 2 years of the issue of the EA (The Rehabilitation Plan for B60A).
    - The plan for B60A must include, where relevant, similar components and requirements to that for B60B.
- The applicant must fund the Coordination, Management and Reporting Structures for the implementation of both the rehabilitation plans for a period of not less than 12 years from the submission of the plan (5-year Life of Mine + 7 years follow up).
    - The applicant must at least be responsible for reaching the rehabilitation targets of the Rehabilitation Plans for its mining rights area (83MR) and for the portion of land in the Rehabilitation Plans within the Stanley Bush Kop

section managed as part of the Blyderivierspoort Nature Reserve (BNR) ; and
  - The rehabilitation target of the B60B Rehabilitation Plan for the 'Stanley Bush Kop' section of the Blyderivierspoort Nature Reserve shall not be less than the maintenance, for a minimum of 5 years, of the Reserve at:
    * an invasive alien tree density of <1%;
    * with no mature, seed-bearing trees;
    * a basal cover measured on a 10 square metre plot of at least of 30% indigenous vegetation; and
    * sedimentation runoff reduced by at least 25% compared to a baseline prior to the activities' commencement.
- All land owned by the applicant within quaternary catchments B60B and B60A outside the mine works areas shall comply with the stipulations set out in the rehabilitation plans and related regulations for natural resource management (viz. Maintain natural vegetation for 5 years at <1% Invasive Alien tree cover, with indigenous basal cover >30%, and measured sedimentation runoff at least <25% of pre-commencement levels).

Safeguards for offset and biodiversity compensation:
- As a suspensive condition of this Environmental Authorisation, an implementation agreement must be concluded with the MTPA describing the specifics of the offset site(s), the steps for compiling the quaternary catchment Rehabilitation Plans, the institutional and financial arrangements for achieving the requisite outcomes of the full scope of required offset and compensation, and other relevant matters.
- This agreement is to be concluded with MTPA and submitted to the relevant DMRE office and the DEFF before commencement can begin.
- The applicant is expressly prevented from applying for any new Environmental Authorisations (except those under Section 24G for rectification of impacts prior to the issuance of this Authorisation) until such time as the offset declaration is complete and management plan approved by the responsible authority, the Rehabilitation Plans are developed and submitted to MTPA and DARDLEA, and the financial guarantees to the implementing party are in place to the satisfaction of the MTPA.

10.16. Fauna

10.16.1. Mammals

During the field assessment sherman traps were used to establish the presence of small mammals, camera traps were also used within the focus are to record cryptic mammal species which may otherwise not be seen during a walkabout of the area. Faunal diversity was rated Moderately-High, the common mammalian species observed during the survey included Elephantulus myurus (Eastern Rock Sengi), Rattus norvegicus (Brown Rat), Sylvicapra grimmia (Common Duiker), Canis mesomelas (Black-backed Jackal) and Pelea capreolus (Grey Rhebok).

Three mammal SCC were recorded during the survey namely Pelea capreolus (Grey Rhebok, NT), Rhinolophus blasii (Blasius's Horseshoe Bat, NT) and Rhinolophus smithersi (Smithers Horseshoe Bat, NT). The footprint area is capable of supporting various mammal SCC which have previously been recorded in the Quarter Degree Squares (QDS).

The food and habitat availability within the focus area is rated High with good browsing and grazing potential, the high abundances of invertebrates, avifauna and amphibian life, promote the occurrence of predaceous small mammals. The diversity of the habitat units in themselves provides a myriad of macro and micro habitats for mammal species, including areas of refuge and secluded areas for the raising of young. The variation amongst the habitat units further provides a variety of food resources for mammal species which is a contributing factor to the moderately high diversity of species. The small and medium sized herbivores which occur within the focus area are in turn utilised by predatory species as a food resource. In addition, is likely that the focus area will form part of the larger home ranges of predators, notably Canis mesomelas and Panthera pardus and as such the loss of the habitat within the focus area will impact upon these species as well as others.

The habitat integrity of the focus area is classed High for the focus area, although large areas of the degraded habitat unit are present within the focus area, the remaining habitat units are intact enough to support a diverse assemblage of mammal species.

10.16.2. Avifauna

During the assessment only common avifaunal species were recorded, which may be attributed to the inclement weather patterns experienced during the field assessment which led to reduced visibility, decreased avifaunal activity, additionally due to the time of year most migrant SCC would have been absent from the focus area, it is highly recommended that a follow up study be conducted in the month of February to improve the saturation of data for the area.

Common species observed included: Saxicola torquatus (African Stonechat), Cossypha dichroa (Chorister Robin Chat), Cossypha caffra (Cape Robin-chat), Buteo rufofuscus (Jackal Buzzard), Falco rupicolus (Rock Kestrel), Halcyon albiventris (Brown-hooded Kingfisher) and Plocepasser mahali (White-browed Sparrow Weaver). For the full list of observed birds see the fauna assessment in Appendix 7.

The food availability of the focus area was rated High. The majority of the habitat units are in relatively unimpacted state which offer a wide range of food resources for avifaunal species. The Mountain Outcrops and Montane Grassland habitat unit provides good resources for graminoid and nectar feeding avifauna. The Freshwater Habitat unit in turn provides habitat for avifauna associated with watercourses whereas the pine plantations associated provide good nesting and roosting habitat for raptors, the likelihood that large raptors frequent the area is deemed high due to the high abundances of small mammals, amphibians and insects observed at the time of the survey and the close proximity of the Canyon to Kruger Biosphere Reserve.

The habitat integrity of the Mountain outcrops, Montane Grassland and Freshwater Habitat unit appears to be in good condition with limited alien invasive plant proliferation present.

10.16.3. Amphibians

Three amphibian species were observed during the survey namely: Afrana angolensis (Angola River Frog); Amietophrynus gutturalis (Guttural Toad) and Amietophrynus rangeri (Raucous Toad).

The amphibian diversity of the focus area was classed Intermediate, with good food availability within the Blyde River system. The food availability and habitat integrity of the riparian habitat were classed high, primarily due to the high invertebrate communities observed in the surrounding areas which serve as a suitable food resource to amphibian species.

The Blyde River reach associated with the focus area also offers good habitat for leaf folding frogs with extensive reed banks established downstream. The habitat integrity of the riparian habitats associated with the focus area was classed High, although several low bridge crossings are established downstream which have slightly altered the flow dynamics of the reach, adequate habitat still remains available for amphibian species

10.16.4. Reptiles

Several species of reptiles were observed during the assessment including Chamaeleo dilepis (Common Flap-necked Chameleon, LC), Pseudocordylus melanotus (Drakensburg Crag Lizard, LC), Psammophylax tritaeniatus (Striped Grass Snake), Philothamnus natalensis occidentalis (Western Natal Green Snake) and Agama aculeata distanti (Eastern Ground Agama) amongst others.

The initial faunal assessment (March 2019) yielded low reptile observations primarily due to the cooler and less favourable weather conditions encountered, however the subsequent survey (January 2020) yielded greater results, with increased reptile activity and abundance being noted. The focus area is capable of supporting a diversity of reptiles due to the high level of food availability. The habitat and food availability of the footprint area was defined as high during the assessment with high abundances of invertebrate and small mammal species observed during the assessment. The Montane Grassland habitat unit provides good habitat for most of the expected SCC with high abundances of insects and small mammals present. The Mountain outcrops offer ideal shelter for theses SCC with scattered crevices observed during the assessment. The habitat integrity of the focus area remains largely intact for reptile species although moderate transformation has occurred.

10.16.5. Invertebrates

The insect diversity of the focus area was classed moderately high with the following common invertebrates observed: Xeloma tomentosa (Gold-haired Fruit Chafer), Acraea natalica (Natal Acraea), Danaus chrysippus (African Monarch), Papilio demodocus (Citrus Swallowtail) and Mylothris agathina (Common Dotted Border). For the full list of insects observed refer to the fauna assessment in Appendix 7.

An abundance of habitat and food resources are associated with the focus area which in turn supports a high abundance of insect species from nectar feeding insects to herbaceous and burrowing species. In addition, insects are important to the ecosystem as they fulfil numerous ecological roles, such as removal and breakdown of detritus material, helping with nutrient cycling, whilst also acting as important pollinators for numerous plants. The increased abundance of insects play a pivotal role in the food chain as insect species provide an important and staple food source for many small mammals, reptiles, amphibians and avifauna. The habitat integrity of the focus area is largely intact in most of the habitat units with areas of alien proliferation being noted within the freshwater resource habitat unit. The pine plantations within the Degraded Habitat unit still provide sufficient habitat for insects living in leaf litter on the forest/woodland floors.

10.16.6. Arachnids

Arachnids are normally crepuscular or nocturnal which makes observation of this faunal group limited, the rocky outcrops offer ideal refuge for arachnids during the hottest periods of the day The arachnid diversity of the focus area was rated Moderately- High with the following common arachnid species observed: Harpactira hamiltoni (Highveld Baboon Spider), Argiope trifasciata (Banded Argiope) and Cheloctonus jonessi (Jone's Creeper). For the full list of observed arachnids refer to the fauna assessment in Appendix 7.

The habitat and food availability within the focus area was rated high due to the high abundances on invertebrate species observed during the survey which form the primary food source of arachnids. The habitat integrity of the focus area remains largely intact for arachnid species. The Rocky Outcrops provide ideal areas of refuge for many arachnid species during the daylight hours, with many such species becoming more active following dusk.

Such activity cycles are also applicable to species inhabiting the grassland areas, notably burrowing arachnids and those which construct intricate funnel webs between grass tufts and between rocks. Such behavioural activities as well as the general secretive nature of many arachnid species makes detection of arachnids more difficult. Although at the time of assessment only a limited number of arachnids were observed, suitable habitat and food resources are available within the focus area and as such it is expected that the focus area will, overall, support an increased diversity and abundance of arachnids.

10.17. Faunal Species of Conservation Concern

During field assessment, it is not always feasible to identify or observe all species within an area, due to the secretive nature of many faunal species, possible low population numbers or varying habits of species. To assess an area for faunal SCC, a Probability of Occurrence (POC) matrix is used, utilising a number of factors to determine the probability of faunal SCC occurrence within the focus area species listed in the faunal assessment report (Appendix 7) with known distribution ranges and habitat preferences. Several faunal SCC are considered to have an increased probability of occurring within the focus area, having been recorded Faunal SCC recorded historically in the associated Quarter Degree Squares (QDS).

Table 26. Faunal SCC recorded historically in the associated (QDS)

Scientific name	Common Name	MTPA	IUCN Status	POC
Chrysospalax villosus	Rough-haired Golden Mole	VU	VU	70
Amblysomus septentrionalis	Highveld Golden Mole	VU	VU	70
Pelea capreolus	Grey Rhebok	NT	NT	100
Leptailurus serval	Serval	NT	LC	75
Mellivora capensis	Honey Badger	NT	LC	75
Otomys laminatus	Laminate Vlei Rat	NT	NT	70
Panthera pardus	Leopard	NT	VU	75
Hydrictis maculicollis	Spotted-Necked Otter	-	NT	70
Rhinolophus blasii	Blasius's Horseshoe Bat	NT	LC	100
Rhinolophus cohenae	Cohen's Horseshoe Bat	VU	VU	75
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	NT	LC	75
Rhinolophus swinnyi	Swinny's Horseshoe Bat	VU	LC	75
Rhinolophus smithersi	Smithers Horseshoe Bat	-	NT	100
Scotopelia peli	Pel's Fishing Owl	EN	LC	70
Podica senegalensis	African Finfoot	VU	LC	70
Eupodotis senegalensis	White-bellied Korhaan	VU	LC	70
Falco peregrinus	Peregrine Falcon	VU	LC	70
Geronticus calvus	Southern Bald Ibis	VU	VU	70
Necrosyrtes monachus	Hooded Vulture	CR	CR	60
Gyps africanus	White-Backed Vulture	CR	CR	60
Gyps coprotheres	Cape Vulture	EN	EN	70
Hirundo atrocaerulea	Blue Swallow	CR	VU	75
Neotis denhami	Denhams Bustard	VU	NT	70
Sagittarius serpentarius	Secretarybird	VU	VU	70
Sarothrura affinis	Striped Flufftail	VU	LC	75
Stephanoaetus coronatus	African Crowned Eagle	VU	NT	70

Scientific name	Common Name	MTPA	IUCN Status	POC
Zoothera gurneyi	Orange Ground-thrush	NT	LC	70
Hadromophryne natalensis	Natal Ghost Frog	NT	LC	75
Hyperolius semidiscus	Yellow Striped Reed Frog	VU	LC	70
Amblyodipsas concolor	Natal Purple-Glossed Snake	VU	LC	70
Amplorhinus multimaculatus	Many-spotted Reed Snake	NT	LC	70
Bradypodion transvaalensis	Northern Dwarf Chameleon	VU	NE	70
Chamaesaura aenea	Coppery Grass Lizzard	NT	LC	70
Chamaesaura macrolepis	Large-scale Grass Lizard	NT	LC	70
Tetradactylus breyeri	Breyer's Long-Tailed Seps	VU	LC	70
Orachrysops violescens	Violescent Blue	VU	NE	70
Proischnura rotundipennis	Round Winged Bluet	VU	LC	70
Aloeides nubilus	Cloud Copper	EN	EN	70
Lepidochrysops irvingi	Irving's Blue	EN	EN	70
Pseudagrion newtoni	Harlequin Sprite	VU	VU	70

Many of the above listed species have been highlighted as being of conservation concern as a result of habitat loss and degradation stemming from the expansion of human populations, loss of habitat to agricultural and forestry as well as other anthropogenic activities such as mining and hunting. Many of the above listed species occur in niche habitats and are sensitive to habitat changes. The region in which the focus area is poised has already been subjected to several of the afore-mentioned impacts, and as such the remaining natural habitat units found in the focus area can be considered to be of increased importance for faunal SCC.

It is deemed likely that the proposed mining activities will have a negative and long-term impact on faunal SCC within the focus area and possibly in the region. Niche habitat loss, decrease in food resources and impacts from mining activities (dust, noise, vibrations etc) pose a cumulative threat to the continued conservation and long-term survivability of these species.

Should the proposed mining activities be allowed, it is recommended that if any of the abovementioned species are encountered during the construction phase, the relevant activities which pose a risk to the population or community of concern must be stopped immediately, and a biodiversity specialist and representative of Mpumalanga Parks must be consulted in order to advise the best way forward.

10.18. Fauna Sensitivity

The figure 34 below conceptually illustrate the areas considered to be of increased faunal ecological sensitivity. The areas are depicted according to their sensitivity in terms of the presence or potential for faunal SCC, habitat integrity, levels of disturbance and overall levels of diversity. The table 24 below presents the sensitivity of each area along with an associated conservation objective and implications for development.

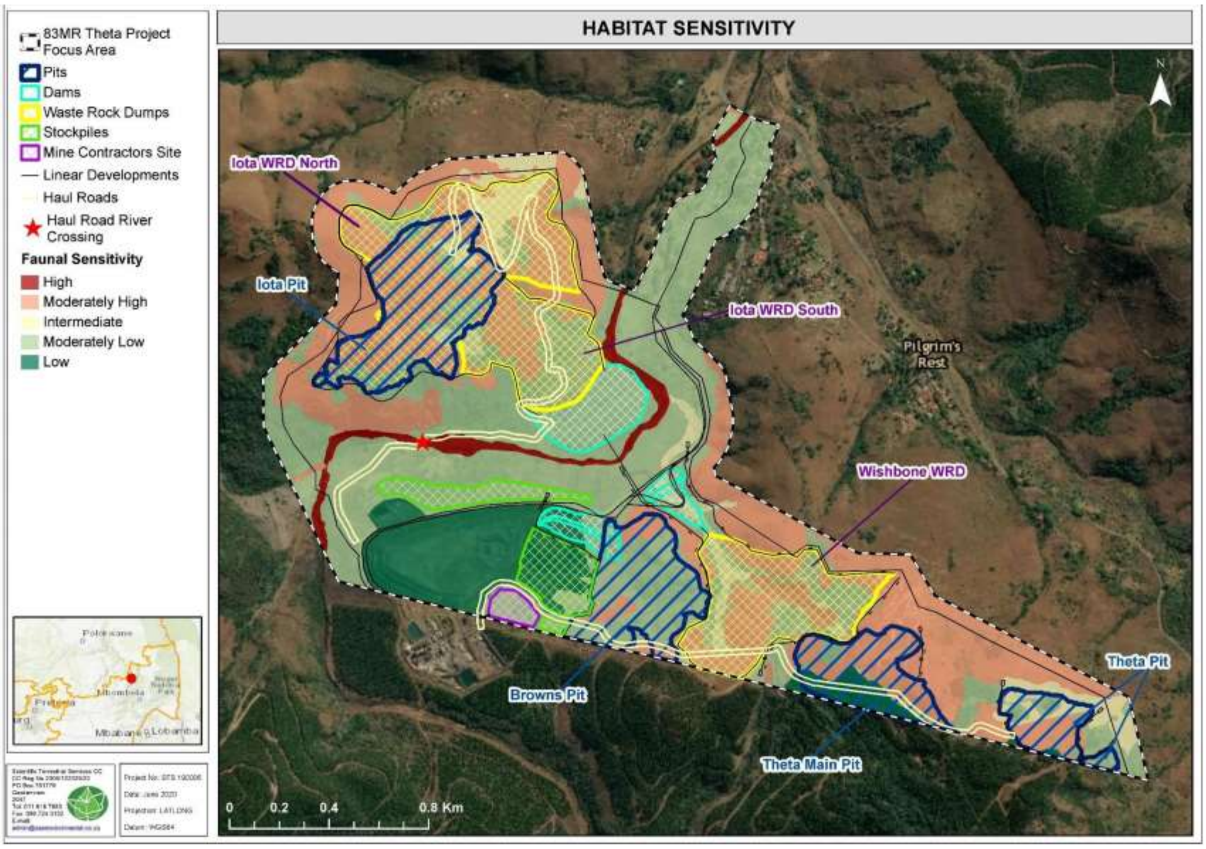


Figure 38. Final Site layout depicted on the established fauna sensitivities

Table 27. A summary of the sensitivity of each habitat unit and implications for the proposed development.

HU	Sensitivity	Impacting Infrastructure	Conservation Objective	Development Implications
Montane Grasslands	**Moderately High**	Iota Pit, Iota WRD north and south Section of Browns Hill Several stretches if the Haul Road Portions of the Wishbone WRD Portions of the Theta Pits	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential in an ecologically sensitive manner. Offsetting or compensation for	This habitat unit offers ideal habitat for wide variety of species including mammals, reptiles and avifaunal species. Mining activities should be kept to a minimum within this habitat unit. In this regard, maintaining migratory corridors and connectivity in along the montane grassland is deemed essential. If development will take place within a close proximity of this habitat unit, care must be taken to prevent any negative impacts on vegetation and as such edge effects on this, and surrounding habitats, should be limited. All mitigation measure as set out in this report are to be correctly implemented.

HU	Sensitivity	Impacting Infrastructure	Conservation Objective	Development Implications
Mountain Outcrops			residual loss to be considered only as a last resort	The Mountain Outcrops habitat unit offers ideal habitat for numerous reptile SCC and arachnid species which will take advantage of the crevices for shelter. Any disturbance of sensitive faunal habitat must be actively avoided. In this regard, maintaining migratory corridors and connectivity in along the Mountain Outcrops is deemed essential. If development will take place within a close proximity of this habitat unit, care must be taken to prevent any negative impacts on vegetation and as such edge effects on this, and surrounding habitats, should be limited. All mitigation measure as set out in this report are to be correctly implemented.
Forest Remnants	Moderately High	Theta Wishbone WRD Down slope but not in footprint of Iota Pit	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential in an ecologically sensitive manner. Offsetting or compensation for residual loss to be considered only as a last resort	This habitat unit provides good habitat for arboreal mammal and reptile species, avifauna and invertebrates. In addition, there is a high likelihood that large raptors will also take advantage of the area for nesting purposes. Any disturbance of sensitive faunal habitat must be actively avoided. Portions of this habitat unit within the Wishbone WRD will be completely lost if current plans are approved, impacting notably on avifaunal species who roost and next in this area. Where development will take place within close proximity of this habitat unit (Iota Pit), care must be taken to prevent any negative impacts on vegetation and as such edge effects on this, and surrounding habitats, should be limited. All mitigation measures as set out in this report are to be correctly implemented.
Riparian Habitat – Blyde River	High	Linear developments, mainly Haul Roads, Pump Column Iota PCD Downslope risk from Iota Pits and WRD's	Mining activities should be actively avoided in this habitat unit Offsetting or compensation for residual loss to be considered only as a last resort	This habitat unit provides ideal refuge for amphibians, small mammals, reptiles and waterfowl. Mining activities and infrastructure should be minimised in this habitat unit as far as possible due to the possible presence of several faunal SCC. Additionally, the Blyde River plays a pivotal and important function in terms of species support, notably as a corridor of movement and as a permanent source of drinking water. The proposed mining may pose a significant risk to the downstream habitat should activities not be suitably managed.
Riparian Habitat -Drainage Lines	Moderately High	Small portion of Iota WRD and linear infrastructure	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential in an ecologically sensitive manner. Offsetting or compensation for residual loss to be considered only as a last resort	The habitat integrity of the drainage lines (tributaries of the Blyde) have been notably compromised as a result of the proliferation of AIPs, e.g. Acacia dealbata, Eucalyptus grandis, Jacaranda mimosifolia, Rubus cuneifolius and Solanum mauritianum have encroached into most drainage lines. Although AIP species are present, there are still indigenous plant species present. This habitat unit still provides habitat for several faunal species, and whilst AIP species are present, these species still provide seasonal food resources (berries, seeds and flowers) for fauna. The increased vegetation density further provides areas of refuge for fauna.
	Intermediate	Wishbone WRD Linear developments Wishbone Dam	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects	The habitat integrity of the drainage line have been compromised as a result of the proliferation of AIPs, outcompeting much of the indigenous plant species leading to notable habitat loss. Common faunal species do still utilise these areas, although to a lesser degree than the more intact habitats. In addition, these drainage lines are often used as access points by illegal miners, resulting in increased anthropogenic impacts and disturbances.

HU	Sensitivity	Impacting Infrastructure	Conservation Objective	Development Implications
Degraded Habitat and degraded Forest	Moderately Low	Sections of Iota Pit, Iota WRD North and Iota WRD South. Most of Browns Pit and southern sections of the Theta Pits, as well as sections of the Wishbone WRD Haul Roads and several stretches of the Linear Developments Stockpiles and Mine Contractors Site	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	This habitat is of moderately low importance for faunal species in the region. The degraded state of the habitat and proliferation of AIPs limit faunal habitation opportunities. Although faunal species do traverse, and in some instance common species inhabit this unit, the continued mismanagement of the areas will further result in habitat loss and degradation through AIP proliferation. Development within this habitat unit is not expected to lead to high impacts to the faunal community of the region.
Transformed Habitat	Low	Stockpiles, Dams, Potions of Theta Pit and areas of the Haul Road	Optimise development potential.	Development in this area is unlikely to have any impact on faunal species given the already large extent of habitat loss that has occurred. In order to ensure that no further species and habitat loss occurs, it is imperative that edge effects are managed and that no footprint creep occurs into the surrounding areas

10.19. Heritage Resources

In 1974 the historic village of Pilgrim's Rest, situated on Portion 42 of the farm Ponieskrantz 543KT was bought by the Transvaal Provincial Administration (TPA) and developed as a National Monument under the National Monuments Act, No. 28 of 1969 (as amended). This was later extended to include the rest of the farm and in 1975 the part on which Alanglade (the house of the mine's general manager) and the golf course are situated, were also bought by TPA. However, with the promulgation of the National Heritage Act, No. 25 of 1999, the Pilgrim's Rest site lost its national status and reverted to be a site of provincial heritage status.

In 2007 efforts were made to have the Central Reduction Works declared as World Heritage site by having it added to UNESCO's Tentative List for World Heritage Status (Rowe & Venter 2007). However, at the last available revision of the Tentative Lists, dated 15/04/2015 (http://whc.unesco.org/en/tentativelists/), it seems as if this listing was terminated as the Pilgrim's Rest Central Reduction Works is not included on the list.

During the survey, a number of sites, features or objects of cultural significance were identified. Those falling within the focus area, their potential impact and proposed management are listed in Table 28, and their locations indicated on the map in Figure 39.

Table 28. Known heritage sites and features in close proximity of within the development area

Name	Latitude	Longitude	Impact	Management
002 Cemetery	-24,91814	30,74484	Outside development	Avoid/Retain
003 Burial site	-24,91806	30,74478	Outside development	Avoid/Retain
004 Burial site	-24,91792	30,74353	Outside development	Avoid/Retain
005 Graves	-24,91748	30,74682	Outside development	Avoid/Retain
019 Pump house	-24,90674	30,74701	Close to access road	Avoid/Retain
001 Fort	-24,91824	30,75706	Inside Theta Hill Pit	Avoid/Retain
024 Cocopan bridge	-24,90787	30,74648	Integral part of remaining track	Avoid/Retain
025 Cocopan track (east)	-24,91013	30,74188	In proposed haul road	Document

026 Cocopan track (west)	-24,91006	30,73983	In proposed haul road	Document
032 Concrete structure	-24,91243	30,74408	Inside waste rock dump area	No further action
033 Foundations	-24,91222	30,74263	Inside waste rock dump area	No further action
034 Farmer's race	-24,91245	30,74267	Inside waste rock dump area	No further action
038 Foundations	-24,91383	30,73645	In proposed haul road	No further action
046 Informal settlement	-24,91581	30,74291	People to be relocated	Document
047 Compound	-24,91712	30,74277	Abandoned 1972	No further action

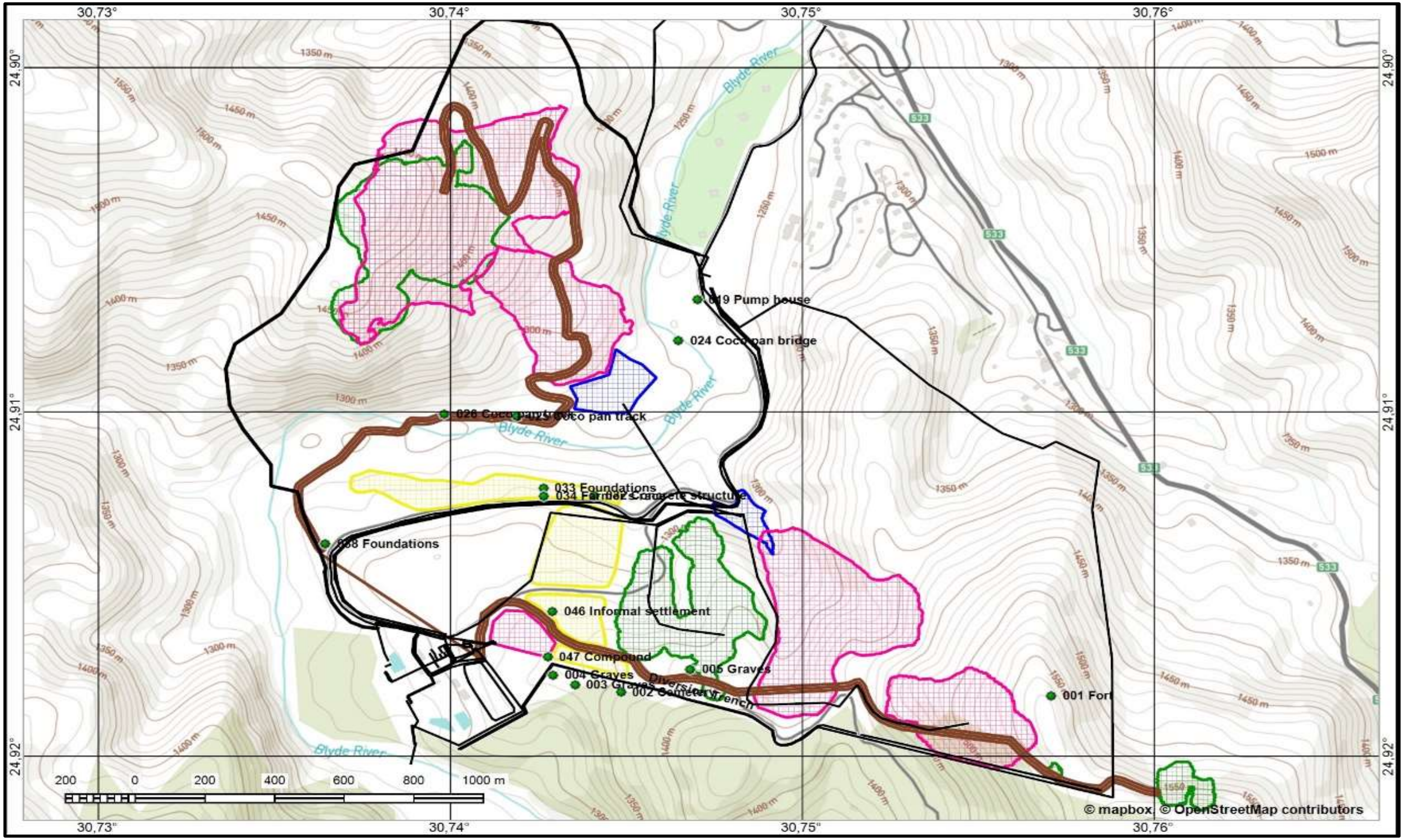


Figure 39. Heritage sites in close proximity of the development area

10.20. Freshwater and Aquatic Ecology

The freshwater and aquatic assessment that was undertaken as part of the EIA, presents the results obtained during early spring (October 2018), early autumn (March 2019), and mid-summer (January 2020). It includes a desktop assessment of the aquatic ecosystems and a field assessment. All three assessments were performed at four sites along the Blyde River, one upstream of the study area (BUS), two sites within the study areas (BMS1 and BMS2) and one site downstream of the study area (BDS). During the first assessment in October 2018 and in the third assessment in January 2020, an unnamed tributary of the Blyde River, known locally as Peach Tree Stream (PTS) was assessed.

During the January 2020 assessment an additional three sites were assessed on the Blyde River (BRN1, BRN2 and BRN3), and an additional two sites were assessed on another tributary of the Blyde River known as the Pilgrim's Creek. Assessment of points on the PTS, the Blyde River and the Pilgrim's Creek included the following:

- assessment of the in-situ water quality;
- a survey of habitat conditions for aquatic macro-invertebrates;
- aquatic macro-invertebrate community integrity, and;
- fish community integrity.

Table 29 contains geographic information for the assessed points. Figure 36 indicates the location of the study areas and monitoring points on a digital satellite image.

Table 29. Co-ordinates of the biomonitoring sites on the Blyde River.

Site*	Study Area	Description	GPS co-ordinates	
			South	East
BUS	Between Theta Pit and Browns Pit Opencast	Upstream site situated in the upper reaches of the Blyde River, upstream from the town of Pilgrims Rest and the active mining area. Site serves as a reference site for the sites further downstream as well as for future monitoring.	24°55'36.69"	30°44'37.69"
BMS1	Between Iota Pit and Browns Pit Opencast	Located downstream of the BUS site, below the mine's site office on the Blyde River adjacent to the Iota Hill study area.	24°54'43.43"	30°44'06.58"
BMS2		Located downstream of the BMS1 site, downstream of the confluence of the Peach Tree Stream flowing adjacent to Iota Hill Opencast study area.	24°54'37.93"	30°44'19.96"
BDS	Downstream of Iota Pit Opencast	Downstream site situated in the lower reaches of the Blyde River, downstream of Pilgrim's Caravan Park and Iota Hill Opencast study area.	24°53'53.69"	30°45'01.49"
PTS	Adjacent to Iota Pit Opencast	Located on an unnamed tributary, locally known as Peach Tree Stream (PTS) of the Blyde River	24°54'34.74"	30°43'25.38"

		adjacent to the Iota Hill Opencast study area.		
BRN1	Between Iota Pit and Browns Pit Opencast	Located in the upper reaches of the Blyde River, downstream of the BUS site, but upstream of the BMS1 site and mine's site office.	24°55'12.99"	30°44'19.50"
BRN2	Adjacent to the Iota Pit WRD	Located downstream of site BMS2 and downstream of various small-scale artisanal mining operations. Located upstream of the Pilgrim's Caravan Park.	24°54'18.09"	30°44'45.42"
BRN3	Downstream of the study area and the Pilgrims Rest town and WWTW	Located at the historical River Health Programme (RHP) monitoring site, downstream of the Pilgrim's Rest town and downstream of the Pilgrim's Rest WWTW facility.	24°52'40.05"	30°45'39.65"
PCN1	Upstream of the Theta North Small Pit	Located on the Pilgrim's Creek upstream of the historical town of Pilgrims Rest and the proposed mining operations.	24°55'10.21"	30°46'4.30"
PCN2	Downgradient of the Theta North Small Pit, the Theta Main Pit and the Browns Pit	Located on the Pilgrim's Creek downstream of the historical town of Pilgrims Rest and the proposed mining operations prior to its confluence with the Blyde River	24°53'53.97"	30°45'6.73"
BRO1	Visual observation points within and in the vicinity of the proposed project area	Located at selected points on the Blyde River	24°54'30.16"	30°44'50.53"
BRO2			24°54'21.91"	30°44'44.34"
GOP			24°53'53.70"	30°45'2.48"
PCO1		Located at selected points on the Pilgrims Creek	24°54'23.20"	30°45'26.45"
PCO2			24°54'1.15"	30°45'11.77"

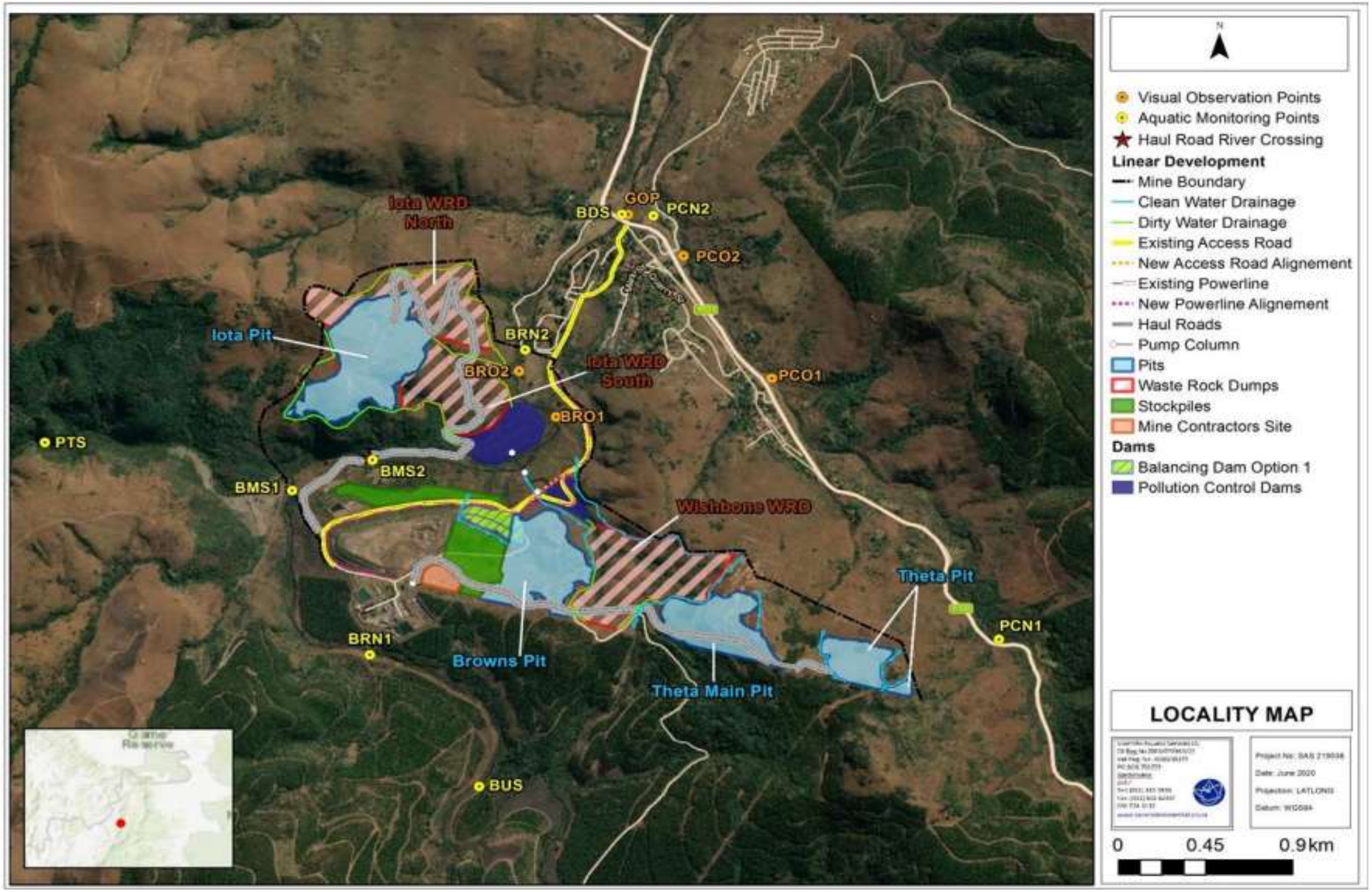


Figure 40. Aquatic ecological assessment points associated with the refined study areas (September 2019) presented on a digital satellite image.

10.20.1. Character of the Watercourses.

Table 30 below provides background information on the watercourse associated with the study area, whilst Figure 37 depicts the locality of these freshwater resources in relation to the various study areas.

Table 30. Desktop data relating to the character of watercourses within the study area and surrounding region.

Aquatic ecoregion and sub-regions in which the study areas are located	
Ecoregion	Northern Escarpment Mountains
Catchment	Olifants North
Quaternary Catchment	B60A
WMA	Olifants
subWMA	Lower Olifants
Dominant characteristics of the Northern Escarpment Mountains Aquatic 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 (m a.m.s.l)	500 to 2100

Detail of the study areas in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database	
FEPACODE	The study areas are located within a subWMA currently defined as a Freshwater Ecosystem Priority Area (FEPA) catchment. River FEPAs achieve biodiversity targets for river ecosystems and threatened fish species and were identified as 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 in this area (specifically the Blyde River and Treur River – the latter is not within the study areas but is a tributary of the Blyde River) are important for threatened fish species Enteromius treurensis (synonym Barbus treurensis) (EN), Amphilius natalensis (DD), Amphilius sp. 'natalensis cf. treur' (DD), as well as the Vulnerable Pseudagrion newtoni ("Harlequin sprite" damselfly), and amphibian species (Hadromophryne natalensis – Vulnerable in Mpumalanga).
NFEPA Wetlands	According to the NFEPA database there are no wetland features situated within the study areas, however there is one artificial unchanneled valley bottom wetland feature indicated within the investigation area. This artificial unchanneled valley bottom wetland feature is indicated by NFEPA to be critically modified (Figure 4).
Wetland Vegetation Type	The Theta pit, Browns pit and the majority of Iota pit fall within the Mesic Highveld Grassland Group 9 WetVeg group (Least Threatened), while a small portion within both Iota pit and Iota Waste Rock Dump

MAP (mm)	500 to 1000		option 2 fall within the Mesic Highveld Grassland Group 6 (Least Threatened) (conservation statuses taken from Mbona et al. 2014).
Coefficient of Variation (% of MAP)	<20 to 29		
Rainfall concentration index	55 to 64	NFEPA Rivers	The Blyde River flows between the Iota and Browns pits. The Blyde River is considered a FEPA River (Figure 4) and therefore, in terms of the NFEPA Implementation Manual (2011), mining (and/or prospecting) is not considered a compatible land use within 1km (1000m) of a riverine buffer around a river FEPA. 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).
Rainfall seasonality	Early to mid-summer		
Mean annual temp. (°C)	10 to 22		
Winter temperature (July)	0 – 24 °C		
Summer temperature (Feb)	8 – 30 °C	Detail of the study areas in terms of the Mpumalanga Biodiversity Sector Plan (MBSP, 2014)	
Median annual simulated runoff (mm)	40 to 150; 200 to >250	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 1000m (1km) 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). 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 Status of the most proximal sub-quaternary reach (DWS, 2014)			
Sub-quaternary reach	B60A – 00653 (Blyde River)		
Proximity to study areas	Flows between Beta Mine and Browns Pit Opencast areas	Ecological Support Area (ESA): Strategic Water Source Area	The study areas are situated within an ESA Strategic Water Source Area. 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.
Assessed by expert?	Yes		
PES Category Median	Moderately Modified (Class C)		

<table>
<tr><td>Mean Ecological Importance (EI) Class</td><td>High</td><td rowspan="2">ESA: Important Sub-catchments</td><td rowspan="2">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.</td></tr>
<tr><td>Mean Ecological Sensitivity (ES) Class</td><td>Very High</td></tr>
<tr><td>Stream Order</td><td>1</td><td rowspan="2">Heavily Modified</td><td rowspan="2">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.</td></tr>
<tr><td>Default Ecological Class (based on median PES and highest EI or ES mean)</td><td>Very High (Class A)</td></tr>
<tr><td colspan="4">Importance according to the Mining and Biodiversity Guidelines (2013)</td></tr>
<tr><td colspan="4">The Theta, Browns and the majority of Iota pits fall within areas considered to be of Highest Biodiversity Importance. The remaining portions of the study areas fall within High Biodiversity Important Areas. Highest Biodiversity Importance areas include areas where mining is not legally prohibited, but where there is a very high risk that due to their potential biodiversity significance and importance to ecosystem services (e.g. water flow regulation and water provisioning) that mining projects will be significantly constrained or may not receive necessary authorisations. High Biodiversity Importance areas include protected area buffers (including buffers around National Parks, World Heritage Sites 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 or buffering other biodiversity priority areas, for maintaining important ecosystem services for particular communities or the country as a whole. An EIA 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.</td></tr>
</table>

CBA = Critical Biodiversity Area; DWS = Department of Water and Sanitation; EI = Ecological Importance; ES = Ecological Sensitivity; ESA = Ecological Support Area; m.a.m.s.l = Metres above Mean Sea Level; MAP = Mean Annual Precipitation; MBSP = Municipal Biodiversity Summary Project; NFEPA = National Freshwater Ecosystem Priority Areas; PES = Present Ecological State WMA = Water Management Area

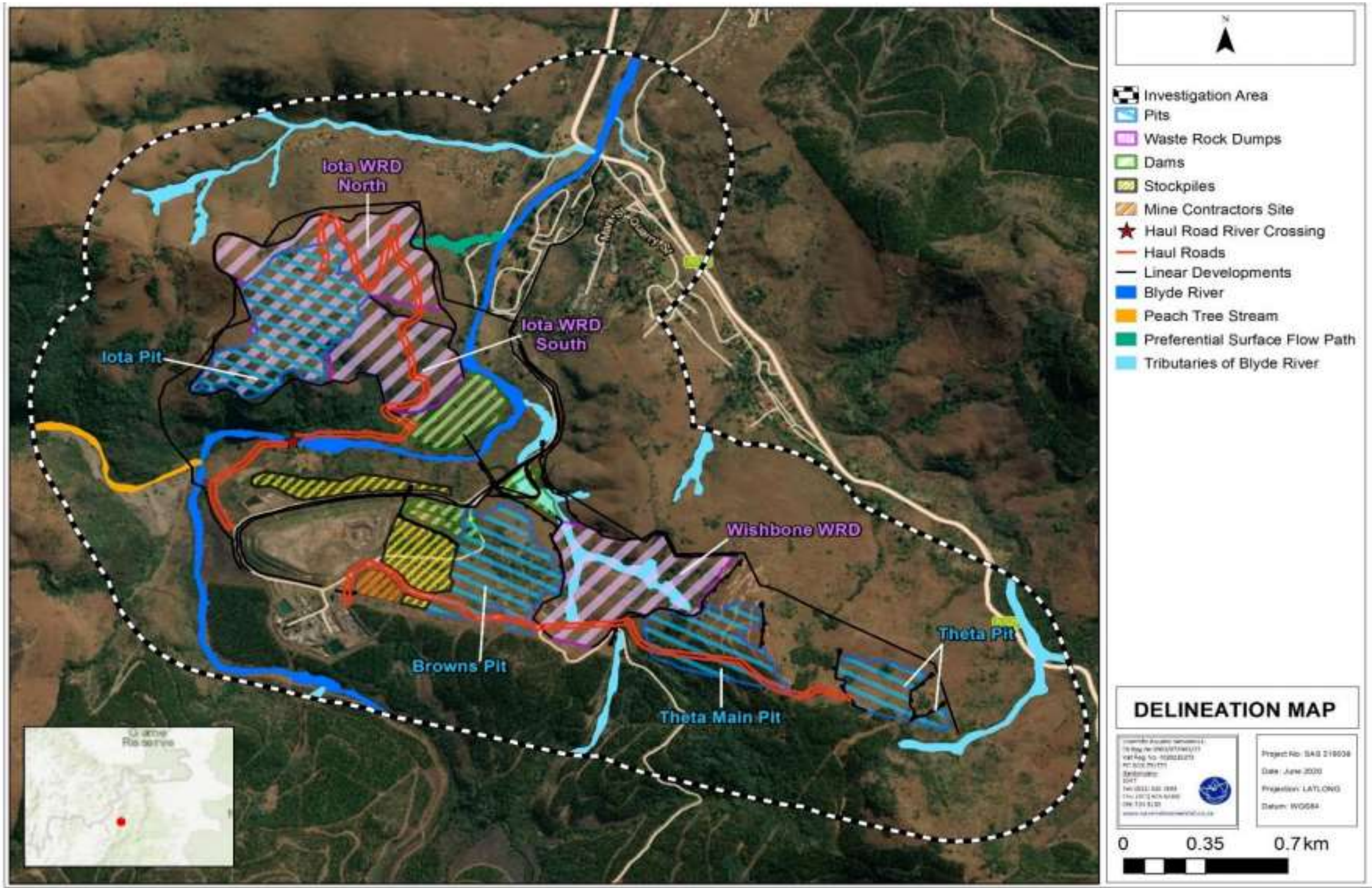


Figure 41. The location of the identified watercourses within the study and investigation areas, in relation to the surrounding landscape.

10.20.2. Field Verification Results

The tables below summarise the findings of the field verification in terms of relevant aspects (hydrology, geomorphology and vegetation components) of freshwater ecology of the identified freshwater resources. The headwaters of several smaller freshwater systems are located outside of, but downgradient of various study areas, with specific mention of one small system located to the south-east of the Theta WRD Option 2 (please refer to Figure 40 above; the system is identified in the figure as "Headwater of Blyde River Tributary"). The PES and EIS of this system was not assessed since it is not within the Theta pit study area. However, it was taken into consideration when applying the DWS Risk Assessment Matrix (2016), and mitigation measures are equally applicable to these small systems as they are to the larger systems which were assessed.

The freshwater resources were assessed and are discussed on a system level in relation to the applicable study areas as dashboard style reports. These dashboard reports aim to present concise summaries of the data on as few pages as possible, in order to allow for integration of results by the reader to take place. Where required, further discussion and interpretation is provided.

The following should be noted when reading the results presented below:

- Although the Blyde River is not situated directly within any single study area covered by this study, the reach of the river within the investigation area was assessed, as this reach is located downgradient of the existing TGME operations, as well as downgradient of the Iota pit and Iota WRD Option 1, and downgradient of the Browns pit and associated topsoil stockpile. The results of the ecological assessment of the Blyde River are presented in Table 28 below;
- Since the impacts and modifications to the various small, unnamed tributaries of the Blyde River associated with the Iota, Browns and Theta pits are similar in nature and magnitude, for ease of reference and in the interests of presenting a concise but factual discussion, the results pertaining to these smaller tributaries associated with these three areas are presented in one dashboard;
- The drainage system located to the east and downgradient of the Theta Pit study area was not assessed individually, as it did not fall within the regulated zone for a river in terms of GN509 as it relates to the National Water Act, 1998 (Act No. 36 of 1998), i.e. it is located further than 100m (approximately 300m) from the WRD associated with the proposed Theta Pit. Additionally, access to this watercourse was limited due to terrain and personal safety concerns. Furthermore, it is located on the eastern side of the town of Pilgrims Rest and is further separated from the area of influence by the R533 road. Therefore, the quantum of risk posed to this watercourse is greatly reduced, although mitigation measures to prevent any potential impacts associated with the proposed activities at Theta Pit on this watercourse must nevertheless be implemented. However, based on analysis of available desktop information and digital satellite imagery, as well as the specialists' experience of freshwater systems within the Pilgrims Rest area, it was concluded that this system is likely to be of a similar ecological integrity and sensitivity to other tributaries of the Blyde River that were assessed. Therefore, it was included in the discussion on the unnamed tributaries of the Blyde River;
- The results pertaining to the unnamed tributary of the Blyde River known locally as the Peach Tree Stream along with the smaller tributary thereof (located downgradient and south of Iota pit) are presented in a single dashboard; and
- Whilst consideration is given to water quality in line with the requirements of the DWS Chief Directorate: Instream Water Use, further details of the water quality

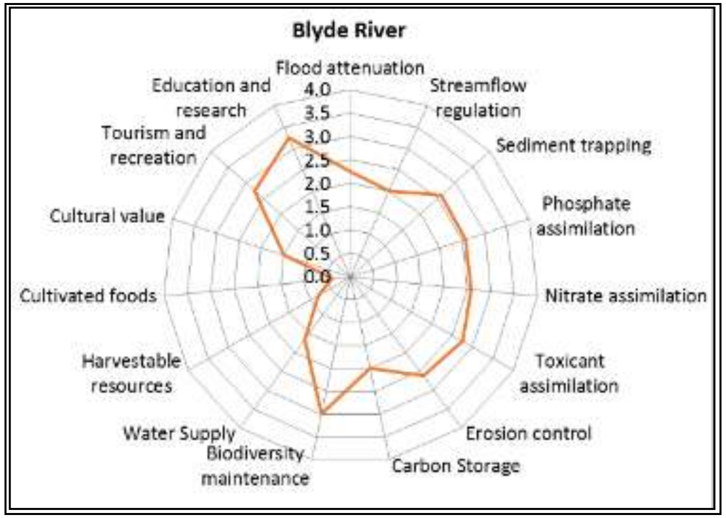
and aquatic ecological assessments of the Blyde River, the Peach Tree Stream and the Pilgrims Creek can be found further on in this section.

The details pertaining to the methods of assessment used to assess the various features is contained in the detailed freshwater assessment report and detailed methods contained in Appendix 9. The results of the PES and EIS assessments are conceptually presented in freshwater assessment report.

Regarding the aquatic ecological assessment, results are similarly presented as “dashboard” style reports. To avoid repetition, the following was applied to each of the aquatic dashboards;

- SASS5 reference score = 188 and ASPT reference score = 6.5;
- For pH "deterioration"/"improvement" significant changes were indicated using red text, as conditions at either end of the spectrum (either too acidic or too alkaline) pose a risk to aquatic systems;
- For dissolved oxygen (DO) percentage change is calculated using concentration values as measured in mg/L and not expressed in percentage saturation values. Classification of "deterioration"/ improvement" was thus not evaluated in terms of the guideline, but a change exceeding 15% was considered significant;
- For electrical conductivity (EC) percentage change is calculated using concentration values as measured in mg/L and classification of "deterioration"/ improvement" was evaluated in terms of the guideline (DWAF, 1996), which advocates that seasonal and temporal changes should not exceed 15%;
- Bold text = significant change (compared to guideline – DWAF, 1996), red text = significant deterioration and blue text = significant improvement; and
- Abbreviations pertaining to the dashboards are as follows: NA = Not Applicable, Var = variation, ref = reference and prev = previous.

Table 31. .Freshwater System Analysis Summary of the assessment reach of the Blyde River associated with the various study areas, and within the investigation area

<table>
<tr><td colspan="2">Ecological & socio-cultural service provision graph:

</td><td colspan="2"> </td></tr>
<tr><td rowspan="2">PES and VEGRAI discussion</td><td rowspan="2">IHI Riparian PES Category: B/C

VEGRAI Category: B/C

It should be noted that the above results pertain only to those areas of the Blyde River that were assessed during the site visits, and not necessarily to the entire reach of the river.

The assessed portions of the Blyde River have been impacted to some extent by historical mining and agricultural activities in terms of the removal of riparian vegetation. In areas which have been subjected to greater disturbances, both alien and indigenous invasive vegetation was observed, although the degree of alteration in this regard is considered minimal at this time. Additionally, some areas of streambank incision were noted although again, at this time, are not considered to be severe. Various bridge crossings exist throughout the reach that was assessed, which will have an effect on flow patterns and distribution of water particularly during high flow periods.</td><td>Photograph notes</td><td>Representative photographs of sections of the Blyde River, depicting the riparian zone associated with the river, as well as a portion of one of the low-lying bridges that traverses the river (right).</td></tr>
<tr><td colspan="2">Watercourse characteristics:

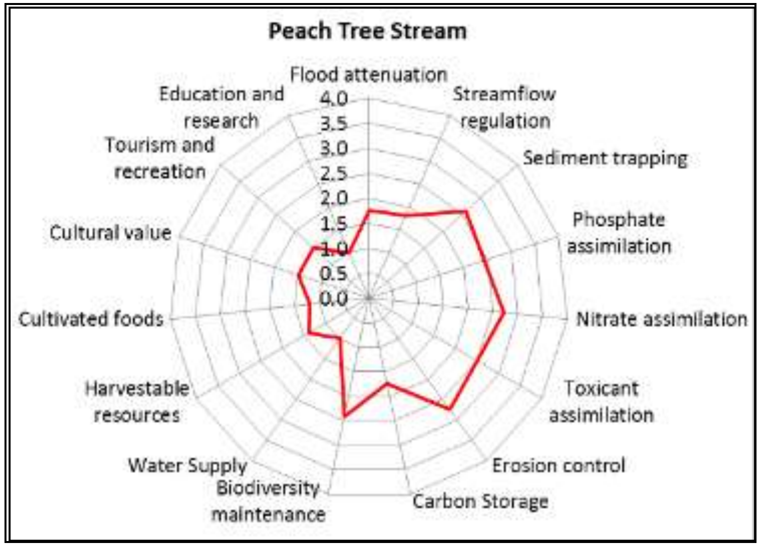
a) Hydraulic regime
Within the assessed reaches of the river, flow-modifying structures within the river (such as bridges and weirs) are likely to have altered flow patterns and connectivity to some extent. For example, connectivity has been slightly impeded where a gravel road traverses the river, and similar impacts were observed both upstream and downstream of the existing TGME mining facilities. Whilst no active abstraction was observed during the site assessment, it is apparent that historically, it has occurred, and is conceivable that in active farming area, still takes place, thus potentially reducing instream flow.</td></tr>
<tr><td></td><td></td><td colspan="2">b) Water quality</td></tr>
</table>

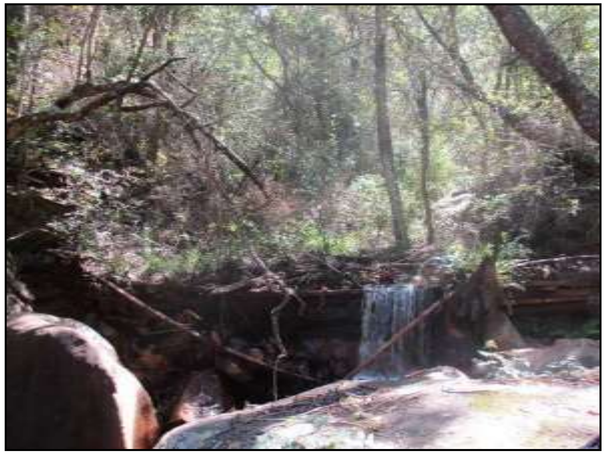
Ecoservice provision	**Moderately High** The Blyde River is considered to provide moderately high levels of ecological services, and intermediate to moderately low levels of socio-cultural benefits. Ecoservices provisioned by the river include flood attenuation, nutrient and toxicant assimilation, sediment trapping, erosion control and biodiversity maintenance. In terms of socio-cultural benefits, it is likely to provide water for human use (e.g. abstraction for agricultural purposes). Although not observed during the site assessment, it may provide some harvestable resources (e.g. fish), although is not considered to be highly important from this perspective, since other sources of food and goods are available nearby. It is, however, considered to be very important in terms of tourism, recreation and education and is likely to retain residual cultural value to local communities.	For details pertaining to water quality within the Blyde River, please refer to Table 11 and Table 12 within the freshwater assessment report – Appendix 9.. In summary, testing of basic water quality parameters (pH, Dissolved Oxygen, Electrical Conductivity and Total Dissolved Solids) at four localities along the Blyde River indicates that overall, the water quality of the upper-reaches of the Blyde River is considered largely natural and unmodified, meeting the Resource Water Quality Objectives (RWQO) of South Africa (DWA, 2011). **c) Geomorphology and sediment balance** Geomorphological processes within the Blyde River remain largely intact, although as illustrated in the photograph above, some areas of streambank incision and erosion have occurred. It is anticipated that sediment inputs to the river have increased due to agricultural activities (historical and current), historical mining activities, in particular the historical Beta Mine Waste Rock Dump (located approximately 50m to the west of the river), and increased gravel roads in the catchment. This (sediment inputs) may in turn influence the composition and structure of instream vegetation, as well as potentially smothering biota.
EIS discussion	**EIS Category: High** Due to the levels of hydro-functionality of the river (such as flood attenuation and streamflow regulation), as well as biodiversity support and regional context of the high ecological integrity, the Blyde River is deemed to be highly ecologically important. It is also considered to be moderately ecologically sensitive to significant fluctuations in water volumes and flood peaks.	**d) Habitat and biota** Although riparian vegetation has been removed or otherwise altered in some areas, the riparian habitat is considered to be reasonably intact, providing suitable breeding and foraging habitat for a number of faunal species, as well as providing an essential migratory corridor. As with the tributaries of this system, the Blyde River is also considered to provide important habitat for species such as *Hadromophryne natalensis* (Natal Ghost Frog) as well as several rare and endangered fish species (see example below), and the Vulnerable damselfly species, *Pseudagrion newtoni* as recorded on the Farm Ponieskranz 543KT by the Mpumalanga Tourism and Parks Board (information obtained from M. Lotter, MTBP). It was considered possible that the rare and endangered species [status indicated as endangered by the International Union for Conservation of Nature (IUCN)], namely, *Enteromius treurensis* (Treur River Barb) would be present at the sites (Kleynhans, 1999) however, it was not collected during the current sampling efforts.

REC/RMO and BAS Categories	**REC: Category B** **RMO: Maintain** **BAS: Category B** Due to the increased ecological integrity and sensitivity, impacts on the Blyde River and its associated riparian zone as a result of the proposed mining activities must not be permitted, and strict adherence to cogent, well-planned mitigation measures must be enforced throughout all phases of the proposed project if it is authorised in order to ensure that the ecological integrity of the riparian zone and aquatic habitat associated with the Blyde River is maintained. It is the opinion of the ecologists that with strict mitigation and appropriate management of the proposed mining activities, the Best Attainable State (BAS) is a Category B.	**Possible significant impacts, business case, conclusion and mitigation requirements:** The Blyde River is located downgradient of the proposed Browns and Iota mining areas, therefore, very strict adherence to mitigation measures as provided in Section 8 must take place during all phases of the proposed project in order to ensure that no impacts associated with the proposed activities occur on the Blyde River. Of particular importance is the prevention of sedimentation of the river, since the aquatic biota associated with the system are considered very sensitive to changes in habitat conditions which may be altered if excess sediment enters the system. In addition, no contaminated runoff or decant (with specific mention of Acid Mine Drainage) must be permitted to reach the river. Thus, it is deemed critical that, should the project be authorised, clean and dirty water separation systems are established on site prior to the commencement of any construction activities, and continued monitoring of clean and dirty water separation controls must take pace throughout the life of the project. It is also deemed critical that post-closure risk of decant be managed in accordance with mitigation measures contained in Section 8, and in accordance with any recommendations made by a suitably qualified geohydrologist in this regard. Additional key mitigation measures include (but are not limited to): ➢ It should be ensured that no development take place within 100m of the Blyde River, its respective tributaries, or any other delineated freshwater resource in line with GN 704 of the National Water Act, 1998 (Act No. 36 of 1998) except for any essential linear features. Linear developments (e.g. road crossings) may be considered permissible provided that all relevant mitigation measures are adhered to, including utilising existing crossings prior to considering construction of new crossings; ➢ All mining infrastructure must remain out of the riparian zones and associated zones of regulation in line with the requirements of GN704 and GN509 of the National Water Act 1998 (Act No. 36 of 1998). The placement of mining infrastructure (such as WRDs) within drainage systems is not supported by the specialist; ➢ It is deemed essential that the mine be designed in such a way as to ensure that decant is prevented for the life of the proposed mine expansion and beyond closure unless measures to treat decant to background water qualities can be ensured until the quality of the decant naturally returns to these background levels; ➢ Detailed investigation of the impact of the proposed mine expansion on the groundwater environment needs to take place. The extent of the cone of dewatering needs to be determined. A suitably sized buffer needs to be placed around the freshwater systems, wherein no activities are to take place which could lead to dewatering of the system or impacts from Acid Mine Drainage; ➢ Mine design and planning must ensure that the cone of dewatering caused by underground mining (as applicable) must not lead to a reduction of stream flow or dewatering of any riparian areas and connectivity of the watercourses must be maintained.

Table 32. .Freshwater System Analysis summary of the assessment of the Peach Tree Stream (a tributary of the Blyde River located downgradient of the Iota Hill mining area) and a reach of an unnamed tributary thereof.

Ecological & socio-cultural service provision graph:

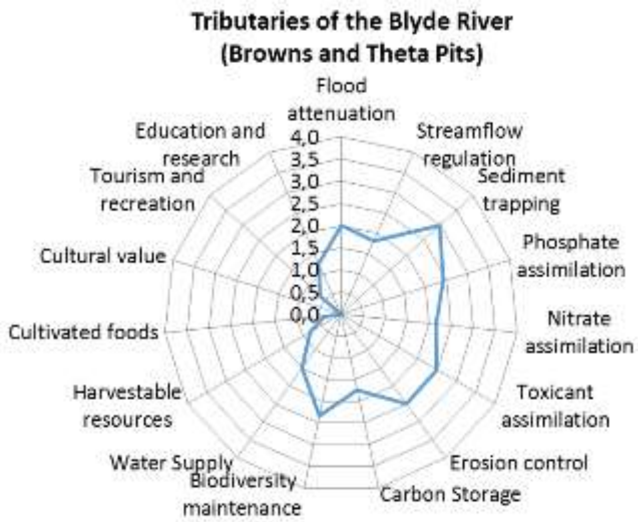




PES and VEGRAI discussion	**IHI Riparian PES Category: B/C** **VEGRAI Category: C** The upper reaches of the system were inaccessible due to dense vegetation, terrain and personal safety concerns; however, these inaccessible areas are likely to be relatively ecologically intact. The lower reach of the system has, however, undergone modification, with specific mention of the presence of weirs, diversion canals (one of which is still in use) and encroachment of alien and indigenous invasive flora due to the historical mining-related disturbances which have occurred.	**Photograph notes**	Representative photographs of a section of the Peach Tree Stream, illustrating weirs within the system, which alter flow patterns as well as causing blockages (as debris accumulates against the weirs) during high flow periods.
		Watercourse characteristics: **a) Hydraulic regime** The hydraulic regime of the system has been historically impacted by the creation of two concrete canals, diverting water away from the original path. Whilst one of these canals was not visible due to overgrowth of vegetation, it was clear during the site assessment that it is still in use, whilst the other canal is in a state of disrepair and was dry at the time of assessment.	
Ecoservice provision	**Intermediate** Whilst the ecological integrity of the system has been compromised to an extent, the system is still considered to provide moderate levels of ecological functioning, particularly in terms of sediment trapping and assimilation of nutrients. The latter is especially important as the system is	**b) Water quality** Please refer to Table 19 below for a detailed analysis of the water quality within this system. Basic water quality parameters (pH, EC and DO) indicate that the water quality meets the RWQO of South Africa (DWA, 2011), with a pH of 7.90, EC of 10.6 mS/m, and DO saturation of 104.8%. **c) Geomorphology and sediment balance**	

	downgradient of several historical mining adits, and observations during the site assessment indicate that decant from the historical mining activities may potentially be reaching the system. Due to the relatively remote locality of the system and connectivity to surrounding natural areas, the potential for biodiversity support is also considered an important ecological service provisioned by the system.	Geomorphological processes have been marginally altered as a result of the construction of weirs in the lower reaches of the system, and it is expected that historical mining activities, specifically adits located upgradient of the system, as well as the proximity of the Waste Rock Dump associated with the Beta Mine area. These activities are likely to have contributed additional sediment to the system, which may in turn be transported into the Blyde River, especially since there are ongoing soil disturbances by informal miners in the vicinity (Pers. Comm. TGME Security Supervisor, October 2018).
EIS discussion	**EIS Category: High** Although the ecological integrity of the system has been compromised to some extent, due to the intermediate levels of ecosystem services provisioned in particular those related to hydraulic functions, and the degree to which the system contributes to sustaining biodiversity in the vicinity, the Peach Tree Stream is considered to be of high Ecological Importance and Sensitivity.	**d) Habitat and biota** As far as could be ascertained during the site assessment, the vegetation communities in the upper reaches of the system are unlikely to have been significantly modified, although due to disturbances in the lower reaches, some encroachment by alien and/or indigenous floral species is expected. The lower reaches of the system have been transformed in terms of vegetation as a result of encroachment by indigenous invasive species. However, the dense vegetation provides suitable cover for various fauna which may utilise the stream as a migratory corridor, as well as providing breeding and foraging habitat.
REC/RMO and BAS Categories	**REC: Category B/C** **RMO: Maintain / Improve** **BAS: Category B/C** Further impacts to the system as a result of the proposed mining activities, in particular the risk of Acid Mine Drainage (AMD) and sedimentation of the receiving environment must be prevented. It is possible that historical and current informal mining activities will have an impact on the system, particularly on water quality, and therefore it is recommended that efforts be made to prevent such impacts from occurring (i.e. improve the system) for example, by sealing old adits which may be decanting correctly. In addition, rehabilitation measures such as clearing of alien vegetation and correct management of the existing Waste Rock Dump will aid in improving the overall ecological condition. It is the opinion of the ecologists that the BAS is a Category B/C, should suitable mitigation and management of impacts, along with cogent, well-developed rehabilitation measures, be implemented.	**Possible significant impacts, business case, conclusion and mitigation requirements:** The Peach Tree Stream is located downgradient of the Iota mining areas therefore, strict adherence to mitigation measures, as contained in Section 8 of this report, will need to take place in order to prevent further degradation of the ecological integrity of the stream should the project be authorised. Key mitigation measures include those listed in Table 10 above for the Blyde River.

Table 33. .Freshwater System Analysis summary of the assessment of the various ephemeral unnamed tributaries of the Blyde River associated with the Browns and Theta mining areas

<table>
<tr><td colspan="2">Ecological & socio-cultural service provision graph:

</td><td colspan="2"> </td></tr>
<tr><td rowspan="2">PES and VEGRAI discussion</td><td rowspan="2">IHI Riparian PES Category: B/C

The assessment was conducted towards the end of the dry season in October 2018, and it was apparent that veld fires had swept through some of the assessment sites in the months preceding the assessment. As the rainy season had not yet commenced, vegetation in the affected areas had not recovered, and therefore conditions were inferred from sites which had not been affected to the same degree. The majority of the ephemeral drainage systems associated with the Browns mining area are relatively inaccessible, therefore have undergone few modifications. However, removal of vegetation for forestry was apparent, particularly in the vicinity of Browns pit and south of the Theta pit area.</td><td>Photograph notes</td><td>Representative photographs of two of the ephemeral unnamed tributaries of the Blyde River in the vicinity of the Brown's mining area, illustrating the proximity of commercial forestry (left) to the systems, as well as the sparse cover at the time of the assessment (right).</td></tr>
<tr><td colspan="2">Watercourse characteristics:

a) Hydraulic regime
The hydraulic regime of these ephemeral systems has not been impacted significantly, although one system associated with the Browns Pit area has been impacted by impoundment in the lower reaches due to the historical Beta Mine Tailings Storage Facility (TSF). This has resulted in ponding between the TSF and the main access road to the mine offices, causing the artificial formation of wetland characteristics.</td></tr>
</table>

Ecoservice provision	**Intermediate** Provision of ecoservices is limited by the lack of water in these systems, however, the extent of vegetation cover within these systems does enable the provisioning of services such as assimilation of nutrients and toxicants, erosion control, sediment trapping, flood attenuation and to a lesser degree, carbon storage. Socio-cultural benefits are limited by the absence of water in the systems.	**b) Water quality** There was no surface water present within any of these systems at the time of the assessment (October 2018), therefore water quality parameters could not be ascertained. However, it is unlikely that water quality is significantly impaired due to the relatively remote locality of these systems and absence of activity in their respective catchments, with the exception of forestry and mining activities in the existing TGME operations area. **c) Geomorphology and sediment balance** Few changes to geomorphological processes could be discerned, although forestry activities – notably clearing of vegetation and regular usage of gravel access roads in close proximity to the drainage systems – is likely to result in additional sediment inputs. Some incision and erosion were observed in those areas where vegetation has been removed, however, it was not extensive at the time of the assessment.
EIS discussion	**EIS Category: Moderate** Although relatively ecologically intact, the Ecological Importance and Sensitivity of the system is deemed to be moderate, due to the decreased provision of ecological services, as well as the relatively small size of the systems and the impacts to the riparian zones. Nevertheless, as noted in the discussion around habitat and biota, they are nevertheless likely to support biodiversity in the surrounding areas.	**d) Habitat and biota** Although in a largely natural condition, these systems are comparatively small when compared to – for example, the Peach Tree Stream – and therefore their use by fauna as migratory corridors may be limited. Additionally, due to the ephemeral nature of these systems, breeding and foraging potential is limited particularly for water-dependent faunal species. Nevertheless, these systems provide good connectivity to surrounding natural areas and thus may be utilised by a number of faunal species for foraging and refugia on a seasonal basis.
REC /RMO / BAS Category	**REC: Category B** **RMO: Maintain** **BAS: Category B** As much as feasible, these systems should not be further impacted by the proposed mining activities. Thus, strict implementation of mitigation measures is required. Where necessary, depending on the locality of surface infrastructure, it is strongly recommended that provision be made for rehabilitation, particularly in the lower reaches of the systems which are more likely to be impacted by the mining activities.	**Possible significant impacts, business case, conclusion and mitigation requirements:** A portion (approximately 1.3ha) of one of the systems located on the eastern side of the proposed Browns Pit as well as the headwaters (approximately 1.5ha) of a small drainage system within the Theta/Browns WRD Option 1 may potentially be completely lost if the pit is to encroach into the drainage system, as depicted in the current layout. This will potentially result in loss of recharge (albeit seasonal) of the larger downstream system, namely the Blyde River, and it is therefore recommended that if possible, this loss be quantified by a suitably qualified hydrologist in order to ascertain the significance thereof on the larger system. Furthermore, the proposed terrace mining activities and the Theta /Browns WRD (both options) may result in increased sediment loading of the downstream system, due to loss of vegetation and ongoing soil disturbances throughout the life of mine. These activities will need to be strictly mitigated during the life of the project and rehabilitation measures implemented during closure in order to minimise the significance of ongoing latent and cumulative impacts. Please refer to Section 8 of this report for applicable mitigation measures.

10.20.3. *Fish Community Integrity*

The fish community integrity of the Blyde River and its associated tributaries, including the Peach Tree Stream and the Pilgrims Creek was assessed on a site by site basis. However, fish are known to migrate along a linear reach and therefore the FRAI index was applied to all the sites to determine the integrity of the fish assemblages associated with the entire focus area. On application of the index, the Blyde River reach assessed achieved an Ecological Category B (minimally modified), and the reach assessed on the Pilgrims Creek, which confluences with the Blyde River, achieved an Ecological Category C (Moderately modified). A number of the sensitive species observed, including Labeobarbus marequensis, Chiloglanis pretoriae and Amphilius uranoscopus require clean, clear, fast-flowing and well oxygenated water over good cobble and stone habitat for their survival. It is therefore deemed imperative that the river is maintained in an ecologically appropriate condition in support of the Resource Management Objectives for the system and that impacts related to sedimentation and loss of water quality integrity be mitigated as far as possible.

The table below provides a full list of the species observed in the Blyde River and the Pilgrims Creek within and in the vicinity of the proposed project area.

Table 34. Fish species observed within and in the vicinity of the proposed project area.

Scientific Name	**Common Name**	**River/stream**	**Conservation Status**	**Photo**
Amphilius uranoscopus	Common/Stargazer Mountain Catfish	Blyde	LC	
Chiloglanis pretoriae	Shortspine Suckermouth	Blyde	LC	
Enteromius anoplus	Chubbyhead Barb	Blyde/Pilgrims Creek	LC	
Enteromius motebensis	Marico Barb	Pilgrims Creek	NT	

Scientific Name	**Common Name**	**River/stream**	**Conservation Status**	**Photo**
Enteromius neefi	Sidespot Barb	Blyde/Pilgrims Creek	LC	
Enteromius paludinosis	Straightfin Barb	Blyde/Pilgrims Creek	LC	
Enteromius cf treurensis	Treur River Barb	Blyde	CR	
Enteromius viviparus	Bowstripe Barb	Blyde/Pilgrims Creek	LC	
Labeobarbus marequensis	Lowveld Largescale Yellowfish	Blyde/Pilgrims Creek	LC	
Oncorhynchus mykiss	Rainbow Trout	Blyde	Alien	

LC = Least Concern; NT = Near Threatened; CR = Critically Endangered

Enteromius cf treurensis (CR) and *Enteromius motebensis* (NT), which were sampled at the time of the January 2020 assessment are both fish species with limited distributions, and impacts to this portion of the Blyde River and its tributaries, may result in significant losses to the cumulative populations of these species.

Should the proposed project proceed, it is considered essential that the further decline of these fish species is managed, through the employment of focussed measures around conservation and rehabilitation targeted at the biology of these species. A conservation initiative should be employed as part of the biodiversity offset/compensation initiative, with well-defined targeted management practices to:

- maintain the integrity of the aquatic resources of the area;
- prevent further losses of these species, and
- enhance recovery of both the Enteromius treurensis and the Enteromius motebensis within the affected reaches of the Blyde River and its associated tributaries on completion of the proposed project, with a focus on the conservation of genetic diversity.

Habitat management (including riparian and bankside habitat), habitat development and maintenance, as well as research data management and monitoring are deemed critical components to address as part of the initiative.

The creation of an aquatic biodiversity management area or biosphere reserve should be considered, whereby the primary goal is to protect the aquatic biodiversity in a given area. This can be achieved by sterilising the Treur River from further development and ensuring that careful catchment management of this system is applied. Further to this, active monitoring and research should be facilitated through the implementation of an ongoing biomonitoring programme, as well as tertiary academic scholarship programmes related to the maintenance of the ecological integrity of the Blyde River and Treur River and/or initiatives such as conservation aquaculture and species relocations.

Finally, ongoing restoration and management initiatives should be employed to continually contribute to the improvement of the instream and riparian habitat and water quality for the duration of the proposed project and into the closure phases to mitigate and limit impacts as far as possible.

10.21. Aquatic Ecological Importance

The Ecological Importance and Sensitivity (EIS) method (DWAF, 1999) was applied to the Blyde River and the Peach Tree Stream in order to ascertain the current sensitivity and importance of the system (as per Figure 38).

The Ecological Importance and Sensitivity Assessment analysis of the Blyde River provided a score of 3.2 which is regarded as extremely important and sensitive. The high importance and sensitivity of the stream is mainly as a result of the presence of intolerant biota, namely, Blepharoceridae, Heptageniidae, Chlorocyphidae, Helodidae, and Psephenidae. The diversity of aquatic habitat types as well as the sensitivity of the habitat to flow changes also added to the high importance and sensitivity rating. The biota in this system have a preference for rocky and gravely substrate in clear fast flowing water thus indicating that the system is sensitive to changes in the total suspended solids. In order for the sensitivity score to remain high, it is vital and of the utmost importance that sedimentation and sediment loading of this system when mining activities commence is prevented. The system is considered unique on a national scale based on its biodiversity and habitat diversity. The Blyde River's water quality is generally excellent and dilutes the relatively poorer water in the Olifants River generated by impacts from mining industry and human settlement in the catchment

Furthermore, the river systems in this area (specifically the Blyde River and Treur River – the latter is not within the study areas but is a tributary of the Blyde River) are important for threatened fish species Amphilius natalensis (DD), Amphilius sp. 'natalensis cf. treur' (DD), as well as the vulnerable Pseudagrion newtoni ("Harlequin sprite" damselfly), and amphibian species (Hadromophryne natalensis – Vulnerable in Mpumalanga).

The Ecological Importance and Sensitivity Assessment analysis of the Peach Tree Stream provided a score of 2.5, which is regarded as highly important and sensitive. The high importance and sensitivity of the stream is mainly as a result of the diversity of aquatic habitats, sensitivity of biota to flow and water quality changes, as well as the possible presence of intolerant biota. The system is considered important in terms of conservation with a National Heritage Site present in the catchment area. This river is considered unique on a national and international level based on unique biodiversity.

Due to the importance of these two systems and the potential impact posed by the proposed mining activities (see Section 8 for detailed risk assessment) it is essential that special attention be paid to protecting these aquatic resources and the biota present. This is further emphasised by the Class I status of the Upper Blyde River in which the classification indicates high environmental protection and minimal utilisation (DWS, 2016).

10.22. Aquatic Sensitivity Mapping

Watercourses with their associated zones of regulation, in terms of GN704 and GN509 of the NWA as well as the NEMA are depicted in Figure 43 and 43 below. These maps must be considered during the planning phase to ensure that all relevant infrastructure is optimally located without encroaching on freshwater habitat and is appropriately authorised.

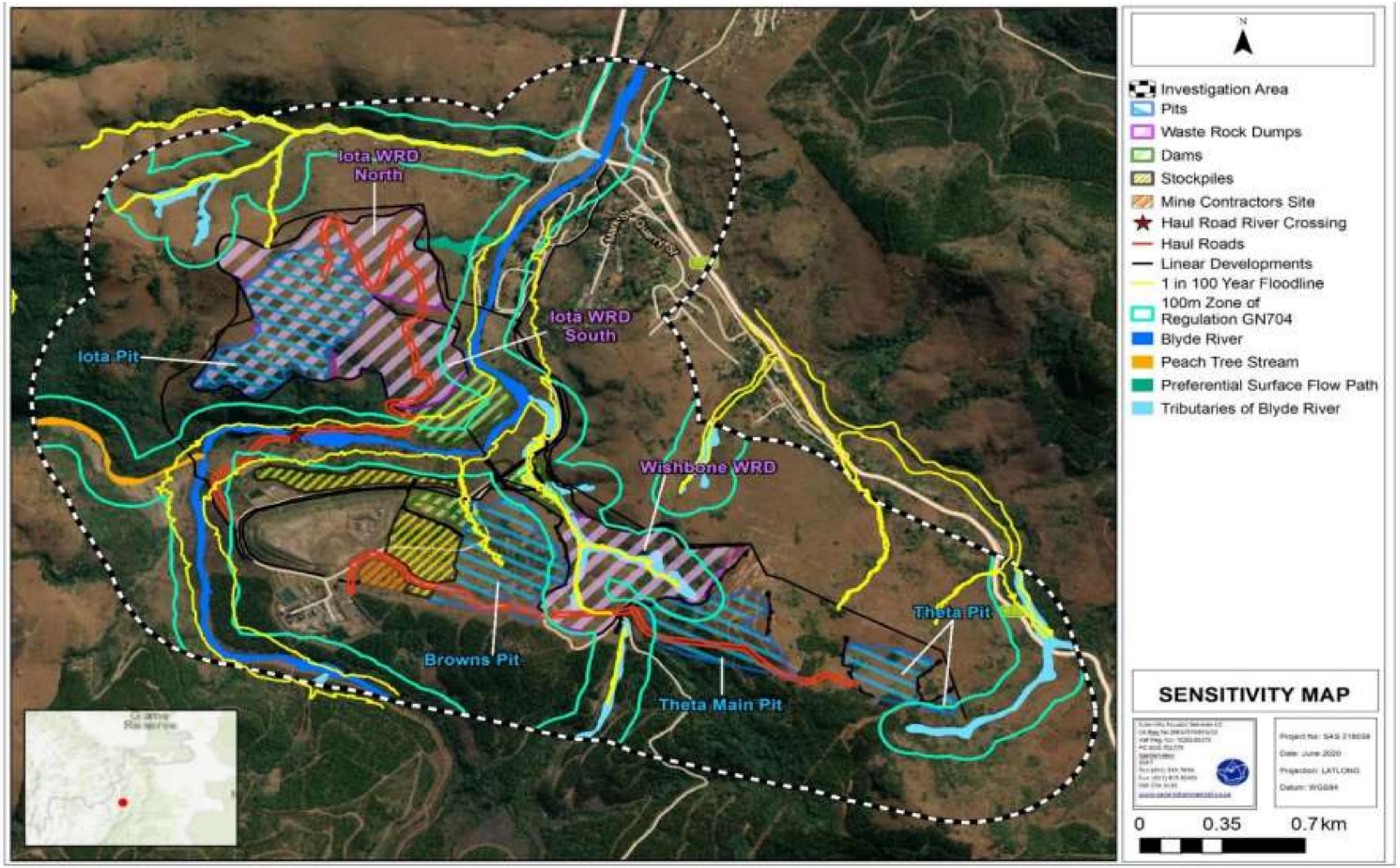


Figure 42. Conceptual presentation of the zones of regulation in terms of GN509 as it relates to the National Water Act, 1998, (Act No. 36 of 1998), in relation to the various study areas and watercourse delineations.

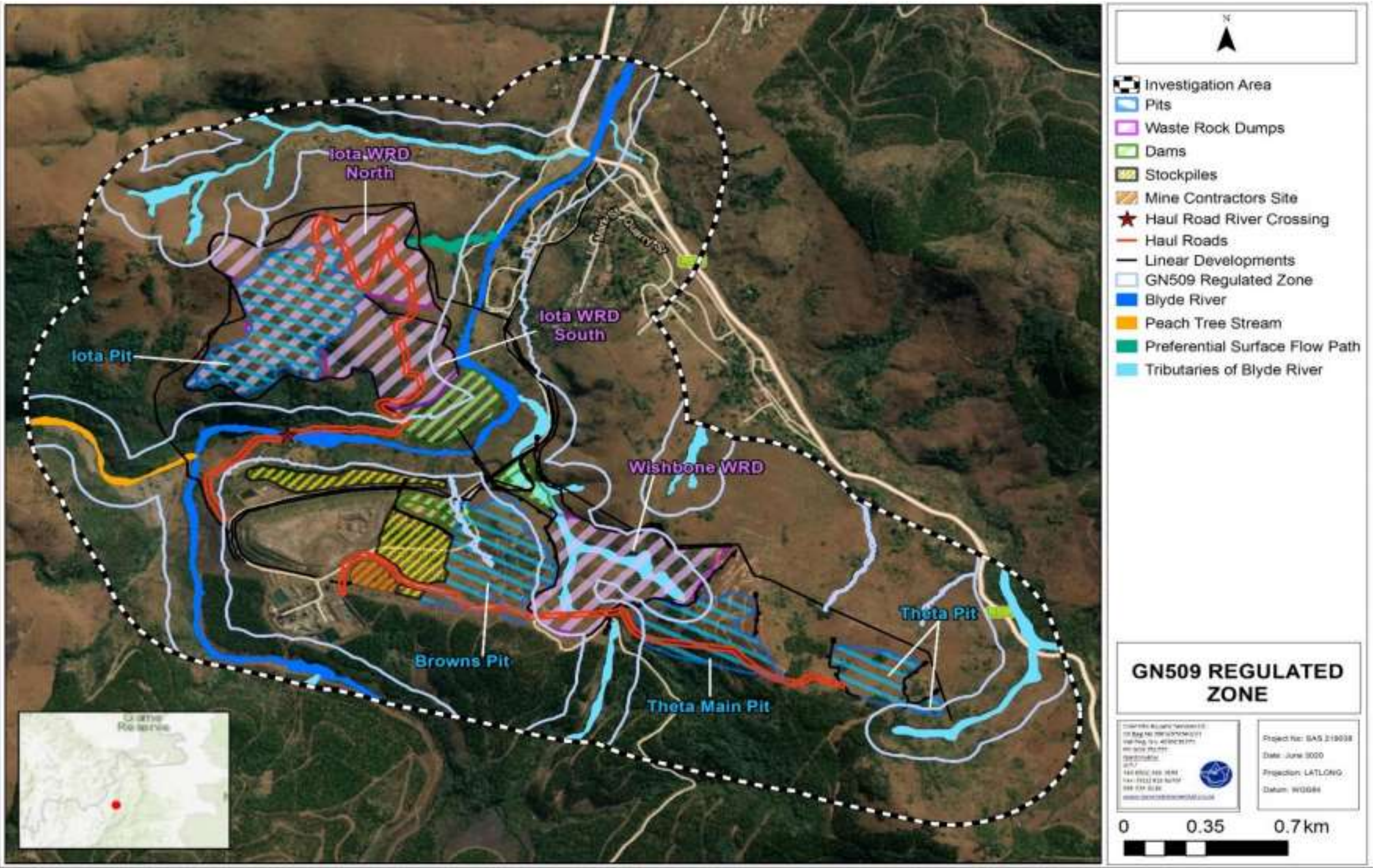


Figure 43. Conceptual presentation of the zones of regulation in terms of NEMA, and GN704 as it relates to the NWA, in relation to the various study areas and watercourse delineations.

10.23. Hydropedology

Typically, there are four primary water course recharge mechanisms:

1. Precipitation (rainfall-direct recharge);
2. Surface flow (runoff);
3. Subsurface flow (interflow) through the unsaturated zone of the surrounding soils;
4. Groundwater discharge.

The study area as well as surrounding areas are characterised by lithic soils known as Mispah and Glenrosa soil forms, as presented in Figure 44. From a hydropedological point of view these soils are referred to as shallow responsive soils which means these soils 'respond' quickly to rain events and typically generate overland flow due to lack of storage capacity attributed to their shallow nature - refer to Figure 45. The surrounding soils are therefore not considered significant hydropedological drivers of the surrounding water courses, however surface water hydrology is considered one of the most significant drivers.

Figure 44. Images depicting the shallow lithic soils of Mispah and Glenrosa occurring within the study area.

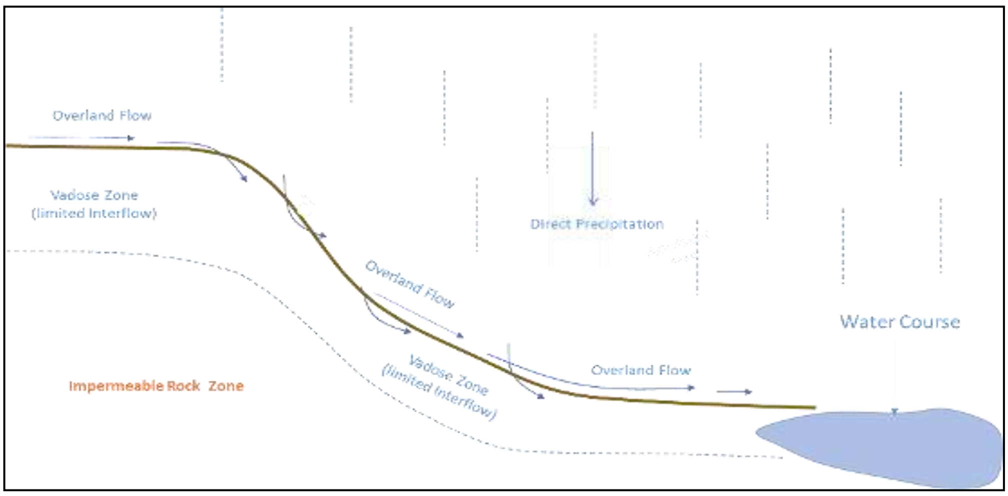


Figure 45. Conceptual recharge mechanism of the water courses associated with the study area.

From a hydropedological point of view, no significant impact from the proposed mining project is foreseen due to the dominance of shallow responsive soils which are event driven. No interflow soils were identified within the study area, thus contribution of vadose zone to the freshwater resources is limited.

10.24. Hydrology

10.24.1. Regional catchment delineation

The project is located in the upper Blyde River catchment, within quaternary catchment B60A, in the Olifants WMA (Figure 42). 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, flowing 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.

10.24.2. Water Resource Management Objectives

The NWA specifies that water resources are to be managed by means of Resource Directed Measures (RDM) which entails the setting of a Reserve and the establishment of Resource Quality Objectives (RQOs). The Classes and RQOs for Water Resources for the Olifants River (GN 466, 22 April 2016) (DWS, 2016), was consulted to obtain the RQOs for the Blyde River in the vicinity of the project. The ecological category and Ecological Water Requirements (EWRs) for the Blyde River up to its confluence with the Lisbon River, are indicated in Table 35.

Table 35. Ecological category and EWR applicable to the Blyde River in the vicinity of the project.

Biophysical Node	Quaternary Catchment	River Reach	Ecological Category to be Maintained	Natural MAR (million m3/a)	EWR as % of Natural MAR
HN117	B60A	Blyde River up to the confluence with the Lisbon River	C	87.1	18.73

The Resource Water Quality Objectives (DWA, 2011) as defined for EC and pH are summarised in Table 36 (SAS, 2019b).

Table 36. Resource Water Quality Objectives for quaternary catchment B60A

Electrical Conductivity (mS/m)		pH	
Ideal Range Limit	30 mS/m	Ideal Range Limit	>6.5 and <8.0
Acceptable Range Limit	50 mS/m	Acceptable Range Limit	8.0 - 8.4
Tolerable Range Limit	85 mS/m	Tolerable Range Limit	No Range Limit
Unacceptable Range Limit	>85 mS/m	Unacceptable Range Limit	<6.5 and >8.4

The RQOs specified for this reach implies that TGME must ensure the EC in the river does not exceed 50 mS/m, and that the pH remains between 6.5 and 8.4.

Further to the above, it is mentioned that the sediment situation within the Blyde River catchment area must be improved, to support the protected status of the river, and that the low and high flows must be suitable to maintain the river habitat and ecosystem condition (DWS, 2016).

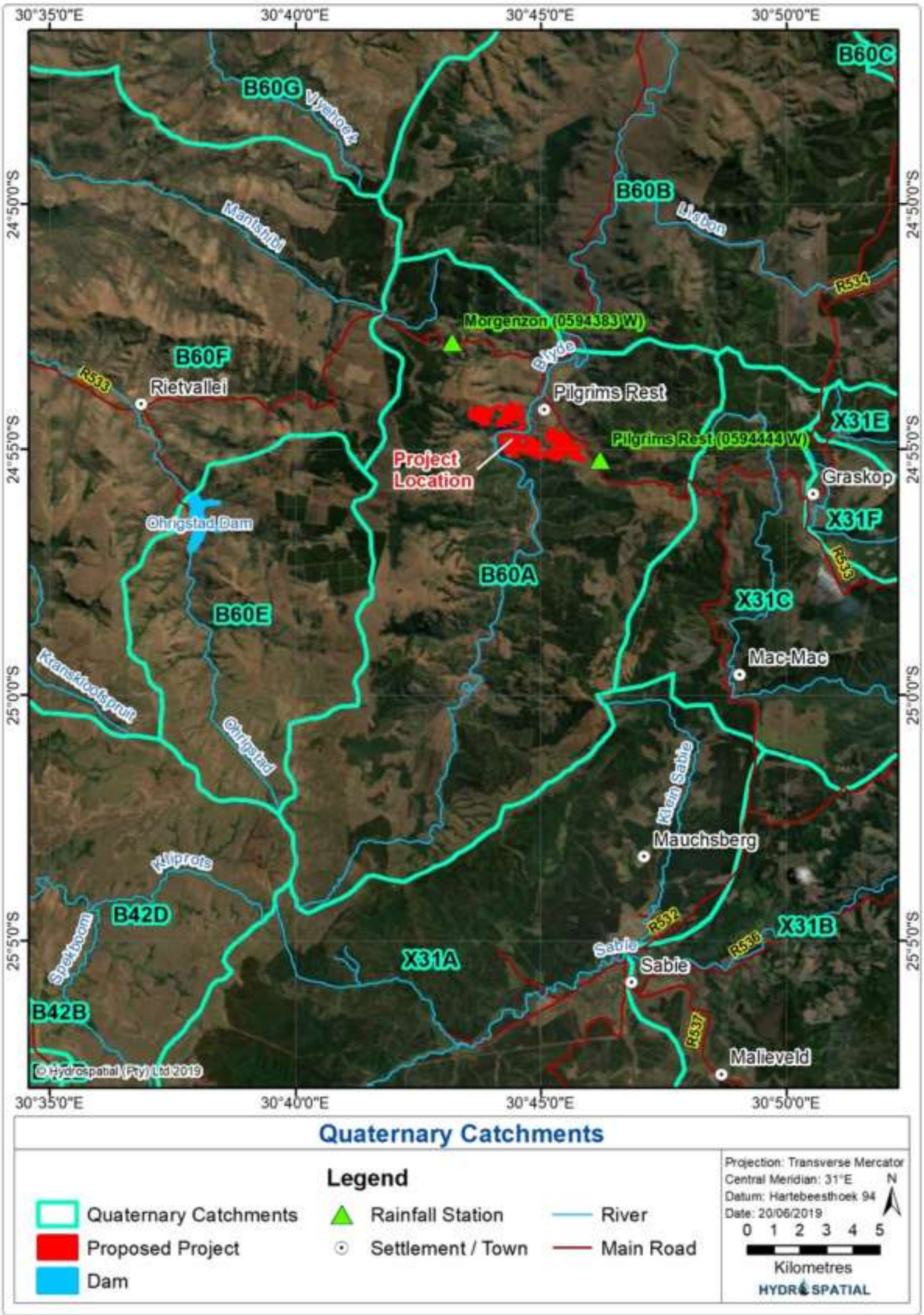


Figure 46. Quaternary catchments Theta study area.

10.25. Surface Water Quality

10.25.1. Data Sources

Surface water quality data was obtained from the following sources:

- Monitoring undertaken by TGME;
- Geohydrological Study for the project (van Biljon, 2019);
- DWS National Water Management System database (DWS, 2018); and
- Sampling undertaken by OMI Solutions.

10.25.2. Monitoring/Sampling Locations

The monitoring/sampling locations provided in Table 37 were selected to describe the water quality of the Blyde River in the vicinity of the project.

Table 37. Summary of the monitoring and sampling locations used to describe the water quality.

Monitoring/Sampling Location	Data Source	Monitoring /Sampling Date	Monitoring/ Sampling Interval	Latitude*	Longitude*
S3	TGME	January 2019 - May 2019	Monthly	-24.920136°	30.738825°
S5	TGME	January 2019 - May 2019	Monthly	-24.911931°	30.735200°
S6	TGME	January 2019 - May 2019	Monthly	-24.905117°	30.745908°
TGME 6	TGME	May 2019 & August 2019	Once off sampling	-24.890381°	30.752197°
S0	Geohydrological Study	6 December 2018	Once off sampling	-24.926778°	30.743795°
S3	Geohydrological Study	6 December 2018	Once off sampling	-24.920199°	30.738830°
S5	Geohydrological Study	6 December 2018	Once off sampling	-24.911963°	30.735175°
S6	Geohydrological Study	6 December 2018	Once off sampling	-24.905071°	30.745987°
L17	DWS	February 2004 - January 2018	Monthly (missing months)	-24.905032°	30.745859°
L18	DWS	February 2004 - January 2018	Monthly (missing months)	-24.886395°	30.762080°
S3	OMI Solutions	14 May 2020	Quarterly	-24.920592°	30.739072°
S5	OMI Solutions	14 May 2020	Quarterly	-24.911922°	30.735044°
S6	OMI Solutions	14 May 2020	Quarterly	-24.905092°	30.745976°
S19	OMI Solutions	14 May 2020	Quarterly	-24.910300°	30.738174°
S20	OMI Solutions	14 May 2020	Quarterly	-24.910080°	30.730077°

Monitoring/Sampling Location	Data Source	Monitoring /Sampling Date	Monitoring/ Sampling Interval	Latitude*	Longitude*
TGME1	OMI Solutions	14 May 2020	Quarterly	-24.932891°	30.747772°
TGME2	OMI Solutions	14 May 2020	Quarterly	-24.910289°	30.746415
TGME5	OMI Solutions	14 May 2020	Quarterly	-24.904594°	30.756579°
TGME6	OMI Solutions	14 May 2020	Quarterly	-24.898405°	30.750352°
TGME7	OMI Solutions	14 May 2020	Quarterly	-24.887844°	30.761695°

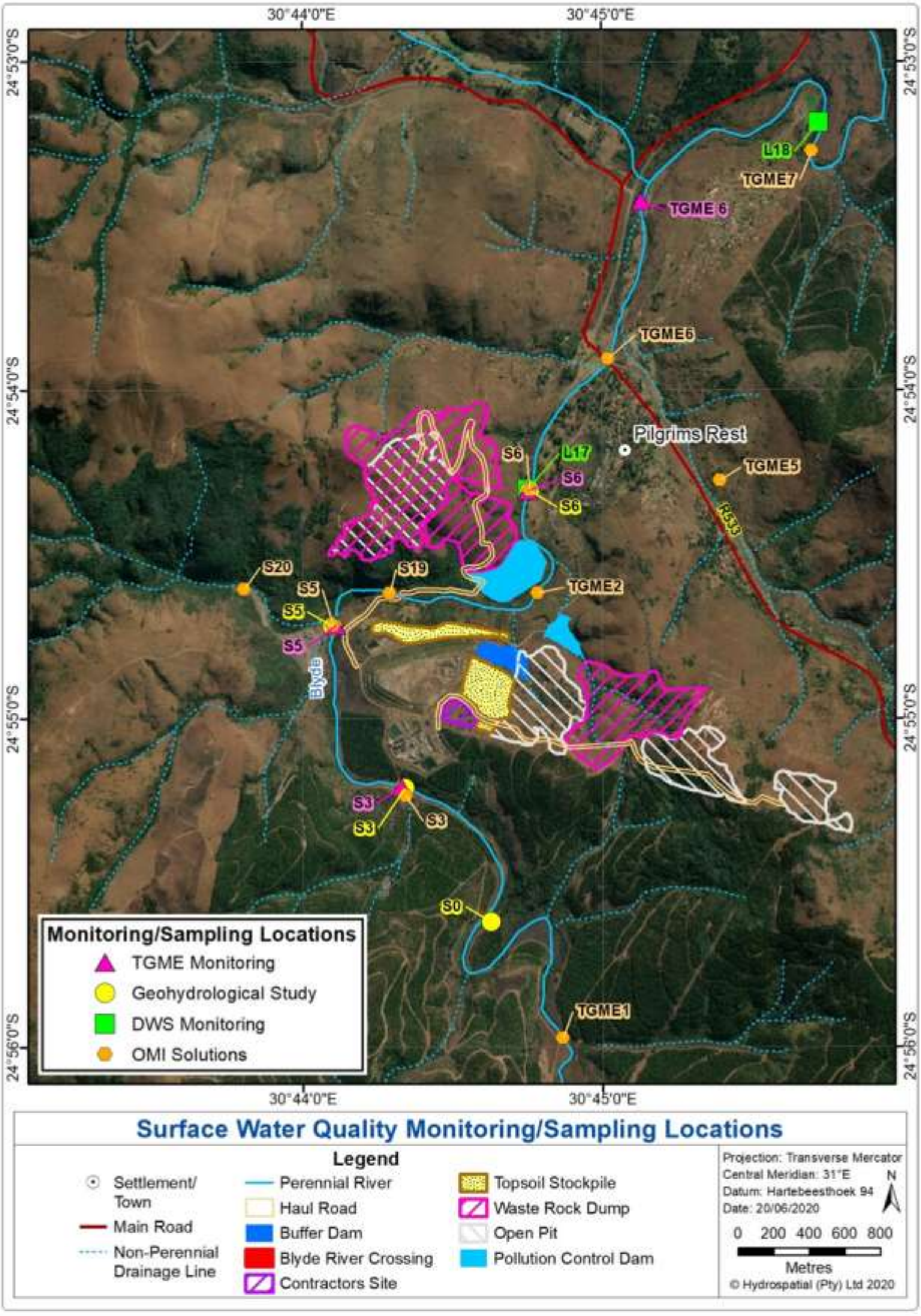


Figure 47. Surface water quality monitoring and sampling locations used to describe the water quality.

10.25.3. Results

The water quality results are shown in **Error! Reference source not found.**. Variables which exceed SANS 241 are indicated in blue, red indicates exceedance of the WUL limits, and green indicates water quality exceeding the RQOs.

The following provides a summary of the surface water quality:

- The pH slightly exceeded the upper WUL limits at all of the Geohydrological Study sampling points and at the OMI Solutions monitoring points S3, S5 and TGME1. The pH has also been slightly exceeded on two occasions at the TGME monitoring points. At the DWS monitoring points, pH levels exceeded the limits on a number of occasions. The lowest pH reading is 5.8, recorded in February 2014 at L17, whilst the highest reading is 10.8, recorded in September 2006 at L18. The pH levels are likely to fluctuate naturally with increasing and decreasing river flows. The pH levels at all sampling points were mostly within the SANS 241 limits and can therefore be considered acceptable;
- EC was well within limits at all monitoring points except at L17 on one occasion, where a reading of 101 mS/m was recorded (the high reading may be due to a misreading or data entry error);
- Magnesium slightly exceeded the WUL limits at L17 on four occasions. Combined nitrate and nitrite exceeded the limit at L18 on one occasion, whilst calcium, magnesium and sodium slightly exceeded the limits on a few occasions at L18. Furthermore, orthophosphate exceeded the WUL limit at TGME7. The exceedance of these parameters is most likely due to discharges from the Pilgrims Rest sewage treatment plant, which is located upstream of L18;
- Aluminium was noted to be elevated above the SANS 241 aesthetic limit at S20. There are no known mining activities upstream of S20 and therefore this is likely to be due to natural sources;
- Turbidity and suspended solids were elevated at the OMI Solutions sampling points S6, S20 and TGME6. It is unknown what the cause of this may be as the other upstream and downstream points indicated low concentrations;
- The heavy metals iron, chromium, copper, nickel, zinc, lead and mercury were all within the SANS 241 limits, however, arsenic exceeded the limit at S3 and TGME2. S3 is located immediately upstream of the existing TGME plant and therefore unlikely that it is impacted by the plant. TGME2 is located downstream of the TSF. The water quality of the boreholes below the TSF indicated no arsenic contamination and therefore seepage from the TSF is an unlikely source. The decant water from an old mine shaft located along the non-perennial stream between S5 and S20 indicated elevated arsenic, however, S19 located between the decant point and TGME2 showed no arsenic. At this point it is difficult to determine why elevated arsenic has occurred. Future quarterly monitoring undertaken by OMI Solutions will provide clarity on this matter;
- Total cyanide was not detected and free cyanide was within the specified limit at all of the sampling points; and
- TGME5, which is located on the non-perennial stream to the east of the project, showed no contamination with parameters within the limits.

Table 38. Surface water quality compared to guideline limits

Parameter	Unit	Guideline Limits			TGME Monitoring			Geohydrological Study				DWS Monitoring	
		SANS 241	**WUL**	**RQOs**	**S3**	**S5**	**S6**	**S0**	**S3**	**S5**	**S6**	**L17**	**L18**
pH	pH	≥5 & ≤9.7	>6.5 & <8.0	>6.5 & <8.4	7.75	7.55	7.95	8.21	8.18	8.21	8.24	7.51	7.49
Electrical Conductivity (EC)	mS/m	≤170	-	50	-	-	-	9	9	9	12	12	15
Total Dissolved Solids (TDS)	mg/L	≤1200	385	-	46.25	47.75	58.3	58	72	66	104	84	106
Alkalinity	mg/L	-	-	-	-	-	-	47	49	52	60	38	44
Chloride	mg/L	≤300	200	-	-	-	-	1.15	1.17	1.41	1.16	2	2
Sulphate	mg/L	≤500	70	-	-	-	-	<0.141	<0.141	<0.141	10.6	9.9	17
Nitrate	mg/L	≤11	-	-	-	-	-	0.291	0.259	0.25	0.423	-	-
Combined Nitrate & Nitrite	mg/L	≤1	-	-	-	-	-	-	-	-	-	0.258	0.421
Ammonia	mg/L	≤1.5	-	-	-	-	-	0.027	0.022	0.024	0.057	-	-
Orthophosphate	mg/L	-	0.04	-	-	-	-	<0.005	<0.005	<0.005	<0.005	-	-
Fluoride	mg/L	≤1.5	-	-	-	-	-	<0.263	<0.263	<0.263	<0.263	0.1	0.1
Calcium	mg/L	-	32	-	-	-	-	9.61	9.87	10.1	12.8	11.4	14.1
Magnesium	mg/L	-	27	-	-	-	-	5.81	5.91	6.11	7.84	7.38	9.9
Sodium	mg/L	-	6	-	-	-	-	1.51	1.48	1.69	2.77	2.67	2.6
Potassium	mg/L	-	-	-	-	-	-	0.24	0.21	0.31	0.47	0.18	0.2
Aluminium	mg/L	≤0.3	-	-	-	-	-	0.013	0.01	0.018	0.03	-	-
Iron	mg/L	≤2	-	-	-	-	-	0.128	0.163	0.127	0.16	-	-
Manganese	mg/L	≤0.4	-	-	-	-	-	0.012	0.011	0.016	0.051	-	-
Chromium	mg/L	≤0.05	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-
Copper	mg/L	≤2	-	-	-	-	-	0.006	0.007	0.008	0.009	-	-
Lead	mg/L	≤0.01	-	-	-	-	-	<0.004	<0.004	<0.004	<0.004	-	-
Zinc	mg/L	≤5	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-

Surface water quality compared to guideline limits (continued)

Parameter	Units	Guideline Limits			OMI Solutions									
		SANS 241	WUL	RQOs	S3	S5	S6	S19	S20	TGME1	TGME2	TGME5	TGME6	TGME7
pH	pH	≥5 & ≤9.7	>6.5 & <8.0	>6.5 & <8.4	8.06	8.53	7.97	7.97	4.57	8.09	7.81	7.94	7.83	7.61
Electrical Conductivity (EC)	mS/m	≤170	-	50	7.24	7.7	8.87	7.86	9.66	7.27	8.29	21.7	9.51	23.8
Total Dissolved Solids (TDS)	mg/l	≤1200	385	-	39	38	44	40	44	37	56	114	48	123
Alkalinity	mg $CaCO_3$/l	-	-	-	12.1	30.9	32.4	30.4	<1.99	31	20.6	100	40.1	80.6
Chloride (Cl)	mg/l	≤300	200	-	0.784	<0.557	3.81	3.35	2.54	2.87	0.831	3.58	1.39	10.3
Sulphate (SO_4)	mg/l	≤500	70	-	19.1	5.81	5.46	4.32	30.1	2.55	25.5	9.32	6.16	18.6
Nitrate (NO_3) as N	mg/l	≤11	-	-	<0.194	<0.194	<0.194	<0.194	<0.194	<0.194	0.432	0.783	<0.194	1.08
Nitrite (NO_2) as N	mg/l	≤ 0.9	-	-	<0.065	0.069	<0.065	<0.065	<0.065	<0.065	0.076	<0.065	<0.065	0.103
Ammonium (NH_4) as N	mg/l	-	-	-	0.075	0.034	0.043	0.037	0.067	0.047	0.107	0.042	0.054	0.395
Ammonia (NH_3) as N	mg/l	-	-	-	<0.005	<0.005	<0.005	<0.005	0.052	<0.005	<0.005	<0.005	<0.005	0.006
Orthophosphate (PO_4) as P	mg/l	-	0.04	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.357
Fluoride (F)	mg/l	≤1.5	-	-	0.334	<0.263	<0.263	<0.263	<0.263	<0.263	<0.263	<0.263	<0.263	<0.263
Calcium (Ca)	mg/l	-	32	-	6.22	7.11	8.34	6.43	5.32	5.98	7.83	21	7.77	17
Magnesium (Mg)	mg/l	-	27	-	3.68	4.63	5.35	4.91	3.28	4.55	6.09	12.1	6.45	9.02
Sodium (Na)	mg/l	≤200	6	-	0.883	0.828	1.13	1.99	1.77	1.91	1.06	3.14	1.21	11.9
Potassium (K)	mg/l	-	-	-	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.103	<0.015	1.95
Aluminium (Al)	mg/l	≤0.3	-	-	<0.002	<0.002	<0.002	<0.002	0.803	<0.002	<0.002	<0.002	<0.002	<0.002
Iron (Fe)	mg/l	≤2	-	-	<0.004	<0.004	<0.004	<0.004	0.008	<0.004	<0.004	<0.004	<0.004	<0.004
Manganese (Mn)	mg/l	≤0.4	-	-	0.004	<0.001	0.005	0.014	0.101	<0.001	0.174	0.019	0.002	0.055
Chromium (Cr)	mg/l	≤0.05	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Copper (Cu)	mg/l	≤2	-	-	<0.002	<0.002	<0.002	<0.002	0.108	<0.002	<0.002	<0.002	<0.002	0.003
Nickel (Ni)	mg/l	≤0.07	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc (Zn)	mg/l	≤5	-	-	<0.002	<0.002	<0.002	<0.002	0.009	<0.002	0.005	<0.002	<0.002	<0.002
Lead (Pb)	mg/l	≤0.01	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Turbidity	NTU	≤5	-	-	1.32	1.26	10.3	1.76	143	1.43	2.16	0.595	32.2	3.34
Chemical Oxygen Demand (COD)	mg/l	-	-	-	<5.1	<5.1	<5.1	<5.1	19.8	<5.1	<5.1	<5.1	<5.1	8.27

Total Suspended Solids (TSS)	mg/l	-	-	-	9	<4.5	14	<4.5	100	<4.5	6	<4.5	40	<4.5
Total Cyanide (CN)	mg/l	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Free Cyanide (CN)	mg/l	≤0.2	-	-	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Arsenic (As)	mg/l	≤0.01	-	-	0.041	0.01	0.006	<0.006	<0.006	<0.006	0.022	<0.006	<0.006	<0.006
Mercury (Hg)	mg/l	≤0.006	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Temperature	°C	-	18 & 25	-	20.2	20.1	20.1	20.3	19.9	20.2	20.2	20.1	20.2	20.4

10.26. Catchments

The delineated catchments for the watercourses are shown in Figure 48 below.

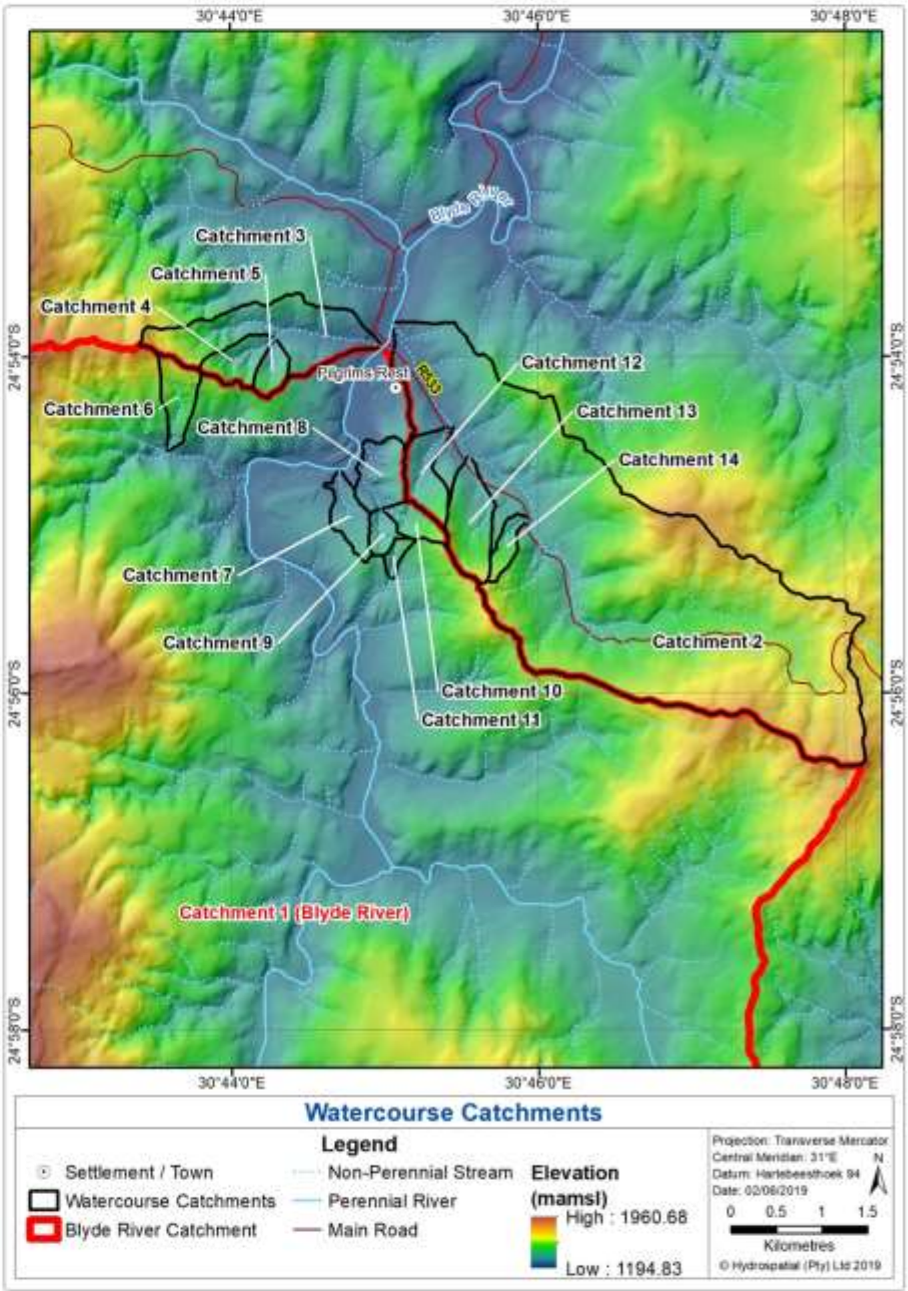


Figure 48. Delineated watercourse catchments for the floodline determination.

10.26.1. Results

For the Blyde River, the peak flows were calculated using the Standard Design Flood (SDF) method, Empirical Deterministic Peak Discharge method, and by downscaling the statically calculated 1:100 year peak flow of 816 m3/s for river gauging station B6H001. The calculated peak flows for the Blyde River in the vicinity of the project are indicated in Table 39. The peak flow of 510 m3/s was adopted for the floodline modelling, as the SDF method appeared to over predict the peak, with a peak similar to the downstream gauge B6H001. The downscaled peak was deemed to be low, and downscaling the peak flow is strictly not hydrologically correct, although it is a useful tool to provide some indication of the peak when no nearby flow gauges are present.

Table 39. 1:100 year peak flows for the Blyde River

Catchment	Catchment Area (km²)	Longest Water-course (km)	Average Longest Water-course Slope (m/m)	Tc (hrs)	Downscaled 1:100 Year Peak Flow (m³/s)	Empirical Deterministic Method 1:100 Year Peak Flow (m³/s)	SDF Method 1:100 Year Peak Flow (m³/s)
Catchment 1 (Blyde River)	157.3	31.61	0.020	4.49	248	510	839

For the non-perennial drainage lines in the vicinity of the project, the peak flows were calculated using the Rational and SCS methods. The parameters and calculated 1:100 year peak flows are indicated in Table 40. The Rational method peak flows were adopted for the floodline modelling.

Table 40. Parameters and 1:100 year peak flows for the non-perennial drainage lines in the vicinity of the project.

Catchment	Catchment Area (km²)	Longest Water-course (km)	Average Longest Water-course Slope (m/m)	Tc (hrs)	Runoff Coefficient	Rainfall Intensity (mm/h)	Rational Method 1:100 Year Peak Flow (m³/s)	SCS Method 1:100 Year Peak Flow (m³/s)
Catchment 2	11.044	8.44	0.049	1.25	0.453	72	100	99
Catchment 3	1.584	2.26	0.111	0.52	0.537	125	30	34
Catchment 4	0.27	0.74	0.234	0.31	0.570	169	7	9
Catchment 5	0.161	0.53	0.291	0.27	0.549	188	5	6
Catchment 6	0.298	0.87	0.266	0.35	0.446	156	6	8
Catchment 7	0.261	0.60	0.133	0.38	0.478	150	5	5
Catchment 8	0.686	1.34	0.109	0.45	0.539	136	14	12
Catchment 9	0.131	0.44	0.191	0.16	0.553	244	5	6
Catchment 10	0.186	0.45	0.274	0.31	0.518	170	5	6
Catchment 11	0.072	0.39	0.140	0.21	0.439	214	2	3
Catchment 12	0.362	0.86	0.094	0.36	0.525	154	8	12
Catchment 13	0.515	1.18	0.177	0.41	0.526	142	11	17
Catchment 14	0.144	0.42	0.250	0.32	0.524	166	3	5

10.26.2. 1:100 Year Floodlines

The 1:100 year floodlines are indicated on Figure 14. As previously stated, according to regulation 4 of GN704, no mine infrastructure or facility must be placed within the 1:100 year floodline or within a horizontal distance of 100 m from any watercourse, unless exemption to do so is obtained from the DWS. For the 100 m watercourse buffer, please refer to the Freshwater Resource and Aquatic Ecological Assessment (SAS, 2019b).

The following proposed infrastructure falls within the 1:100 year floodlines:

- Iota PCD;
- Wishbone PCD;
- Wishbone WRD;
- River crossing bridge;
- Browns Pit;
- Haul road.
- Other linear infrastructure (pipelines, electrical lines, smaller access roads and clean and dirty stormwater measurers).

10.27. Conceptual Stormwater Management

MineLock were responsible for the design of the Stormwater Management Plans (SWMPs) which are provided in the Hydrology Report and Appendix 2.

The purpose of the conceptual Stormwater Management Plan (SWMP) is to ensure that clean and dirty water are adequately separated, by diverting clean water away from dirty areas, and ensuring that dirty water is captured, contained and managed appropriately in accordance with GN704 Regulations and DWS best practice guidelines.

The proposed stormwater measures for the Browns and Theta Hill areas are shown on Figure 50, whilst Figure 51 illustrates the proposed measures for Iota Hill.

The stormwater measures are discussed in the sections below for the proposed infrastructure areas.

10.27.1. Open Pits

The pits will be operated as dirty areas and therefore runoff from the pits will need to be captured and contained. It is proposed that perimeter berms are constructed from the topsoil and waste rock removed during the development of the pit. The purpose of the berms will be to ensure that dirty water runoff is contained within the pits, and that clean water runoff from adjacent areas is diverted around the pits. It is recommended that the pit perimeter berms are vegetated to prevent erosion. The lowest section of the pit will be operated as a sump, into which all dirty water runoff will report. Water from the pit sumps at the Browns and Theta Hill pits, will be pumped and stored in the Buffer Dam, whilst at the Iota Pit, water from the sump will be pumped to the Iota PCD. (see Figure 50)

Clean water channels will be constructed on the upslope side of the pits. The purpose of the clean channels will be to divert clean runoff around the pits and into the nearest watercourse. Energy dissipation measures will be employed along steep sections as well as at the exits of the channels.

10.27.2. Waste Rock Dumps

As with the pits, clean water channels will divert upslope clean water runoff around the Wishbone WRD. Energy dispersion measures will be implemented along steep sections and exits of the channels. Dirty water from the Wishbone WRD will runoff to the Wishbone PCD. (Figure 51)

For the Iota WRD, dirty water channels will be constructed along the periphery. The purpose of the dirty channels will be to capture runoff from the WRD, and to convey it to the Iota PCD.

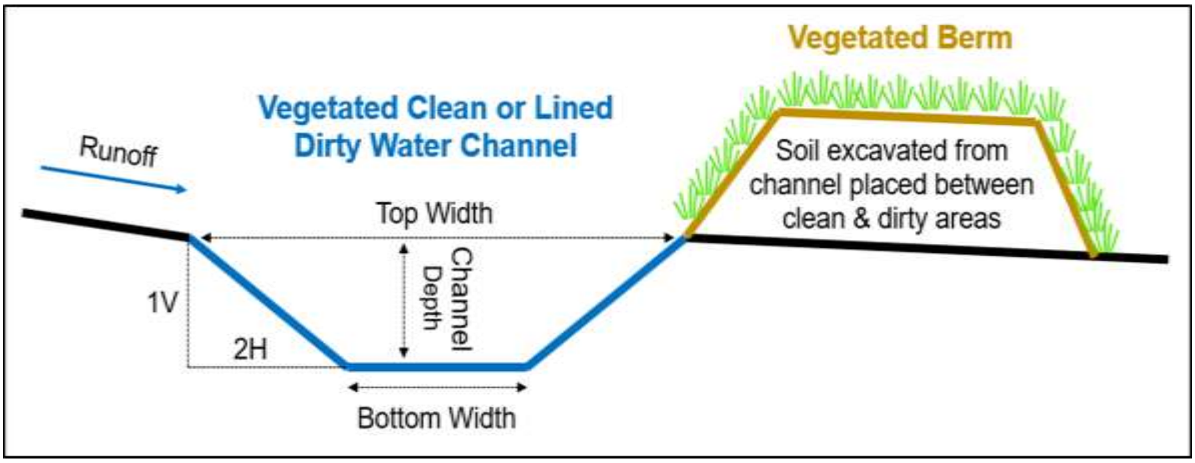


Figure 49. Proposed design of the channels and placement of the berm

10.27.3. Contractors Site

Lined dirty channels are proposed around the contractor's site. The purpose of the channels will be to capture and convey dirty runoff to the downslope stormwater dam/sump and Process Plant Dam (PPD).

10.27.4. Topsoil Stockpiles

No contaminated runoff is expected from the Topsoil Stockpiles, however, due to the sensitivity of the Blyde River to sediment, the stockpiles will be vegetated to prevent erosion.

10.27.5. Haul and Access Roads

The haul roads will need to be constructed on steep topography in order to access the pits. Erosion can be a major issue along roads on steep terrain, due to the high runoff velocities and volumes generated. Furthermore, roads create preferential flow paths that allow runoff to congregate, increasing erosion. It is proposed that berms with gradual slopes which will allow heavy machinery to safely pass over, are constructed across the width of the roads. The purpose of the berms will be to divert runoff off the roads and into the environment. In order to disperse energy and prevent erosion, it is proposed that rock rip rap is employed where the berms discharge water into the environment.

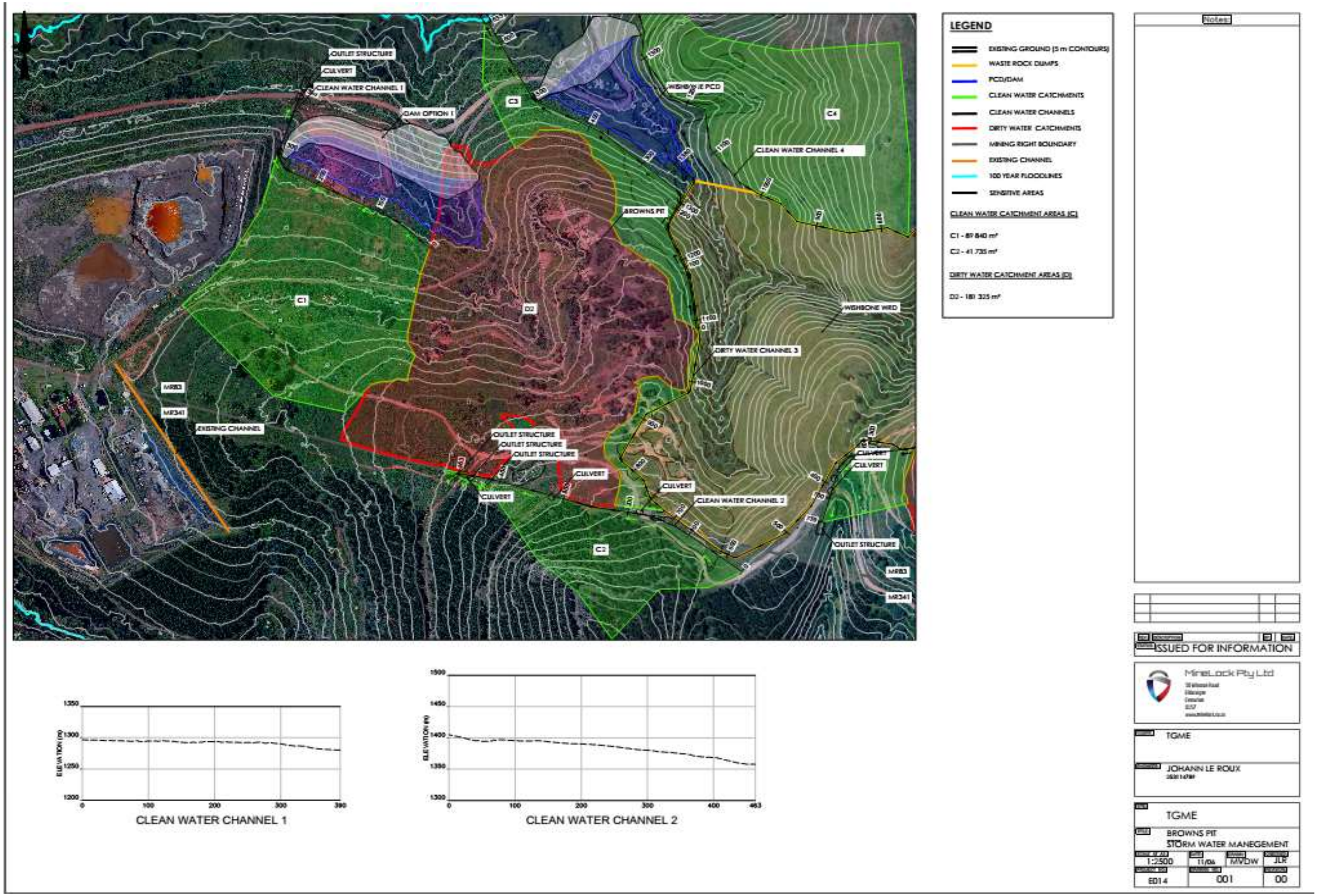


Figure 50. Proposed stormwater management plan for the Browns.

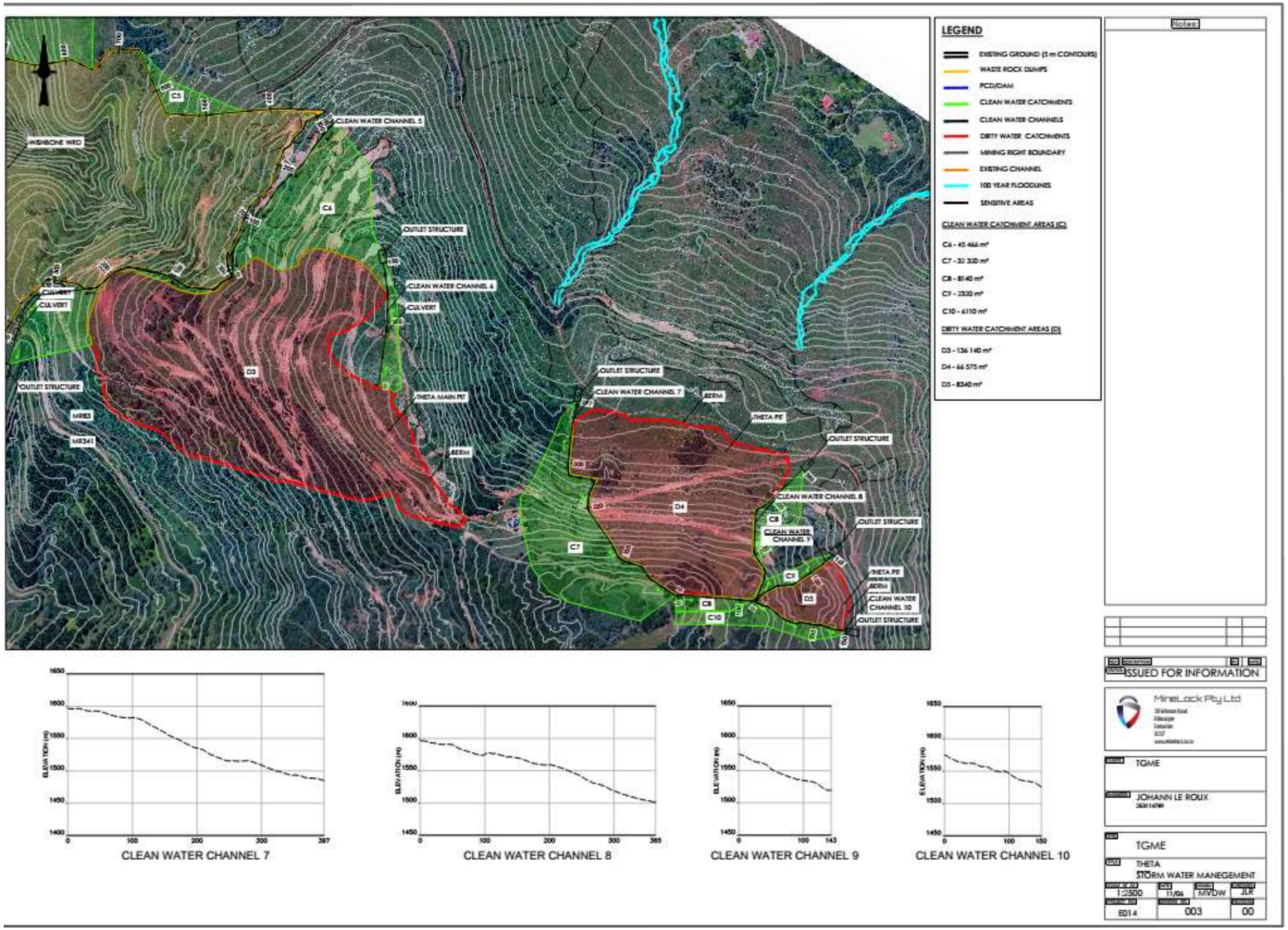


Figure 51. Proposed stormwater management plan for Theta.

10.28. Groundwater

The Sabie-Pilgrims Rest goldfield is situated in eastern Mpumalanga, overlying the preserved eastern rim of the early Proterozoic Transvaal basin. This north-south trending, shallow westerly dipping, metallogenic province (goldfield) extending for approximately 140 km in a north-northeasterly direction, over a maximum width of 30 km along the Great Escarpment of Southern Africa.

The primary reefs that are present in the studied area are as follows:

- Shale Reefs;
- Bevetts Reef;
- Upper Rho Reef;
- Lower Rho Reef;
- Upper Theta Reef;
- Lower Theta Reef;
- Beta Reef.

The region is structurally complex. Two prominent faults dissect the study area, forming a geological feature referred to as the Frazer-Morgan Graben. The eastern boundary of the Browns Hill orebody is the Fraser Fault and the western boundary of the Theta Hill orebody is the Morgan Fault (see figure 49). Karstic aquifers associated with the Malmani Dolomites are underlying the Theta Hill Project mining sites. Karst is a topography formed from the dissolution of soluble rocks such as limestone, dolomite, and gypsum. It is characterized by underground drainage systems with sinkholes and caves. An area currently or formerly undergoing karstification, and thus characterized by karst landforms, is said to be karstified. Geohydrological.

10.28.1. Aquifer Type

Groundwater occurrences in the study area are predominantly restricted to the following types of terrain:

- 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.

A brief description of each aquifer is included in the Groundwater report, attached as Appendix 11.

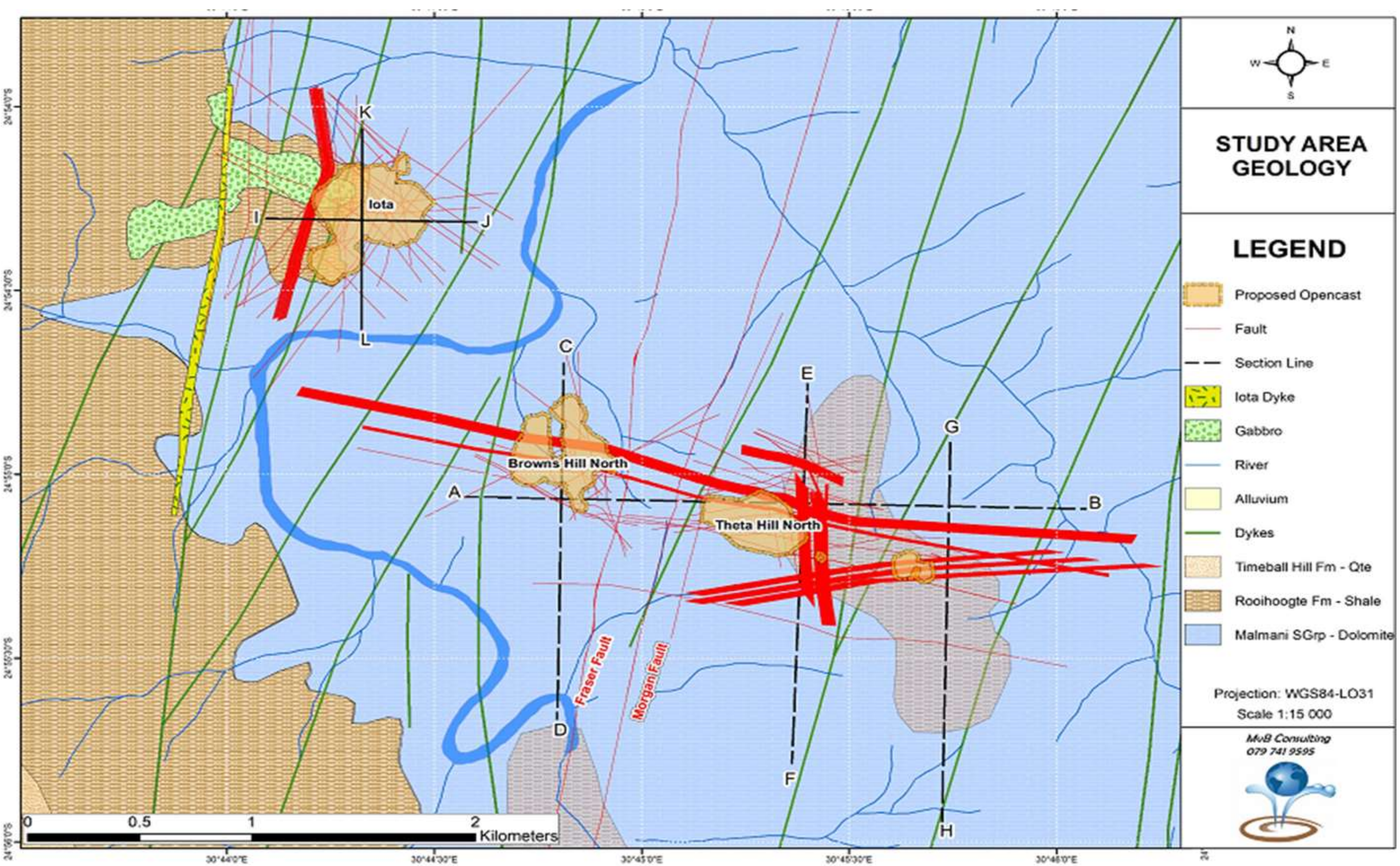


Figure 52. Study area Geology

10.28.2. Groundwater Gradients and Flow

The first important aspect when evaluating the geohydrological regime and groundwater flow mechanisms is the groundwater gradients. Groundwater gradients, taking into consideration fluid pressure, are used to determine the hydraulic head which is the driving force behind groundwater flow. The flow also governs the migration of contaminants and an assessment of the flow was required to determine sub-surface flow directions from the potential contaminant sources.

The groundwater level underlying the Theta Hill project is deep (110m – 380m). None of the exploration boreholes intersected any water, and no water levels could be measured in any of these holes several weeks after they were drilled. Based on the monitoring boreholes in the area the groundwater level varies between 1 224.43 – 1240.52 mamsl. The groundwater levels for the study area that were used are shown in 0.

Groundwater levels at the Theta Hill Project

ID	Locality	Coordinates			Depth	Casing Height	Groundwater Level	
		X	Y	Z	(mbs)	(m)	(mbs)	(mamsl)
BGW2	TGME Plant (Deep)	30.7401	-24.9198	1272.57	20.10	0.53	Dry	-
BGW2a	TGME Plant (shallow)	30.7404	-24.9196	1272.57	9.57	0.30	Dry	-
BGW4	TGME TSF (Deep)	30.7363	-24.9124	1253.29	29.60	0.74	29.60	1224.43
BGW4a	TGME TSF (Shallow)	30.7361	-24.9125	1253.71	10.00	0.00	Dry	-
BGW5	Browns Hill	30.7448	-24.9153	1318.00	40.00	0.00	Dry	-
BGW6	TGME TST SE	30.7442	-24.9127	1275.62	43.00	0.50	36.13	1239.99
BGW7	TGME TSF NE	30.7433	-24.9116	1270.63	38.00	0.45	30.56	1240.52
BGW15	Beta decant	30.7319	-24.9122	1280.00	0.00	0.00	0.00	1280.00

The water table in the dolomitic aquifer is generally a flat surface due to high aquifer parameters, and it is assumed that it is the same in this area.

10.28.3. Groundwater quality

The groundwater monitoring boreholes close to the Theta Hill Project were sampled in December 2018 to obtain an understanding of the current groundwater quality. Follow-up sampling was conducted during May 2020. During the May 2020 sampling the water supply to Pilgrims Rest, who is supplied from fountains, were also included.

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. With reference to the geohydrology report, the following is observed regarding the groundwater quality:

- The groundwater quality is generally good and only a few parameters exceed the WUL limits;
- Most of the pH values are higher (alkaline) than the WUL limits, but falls within the SANS 241 limits;
- With the exception of pH, none of the Blyde River samples exceed either the WUL or SANS 241 guideline limits;
- The TDS, calcium, magnesium and sodium concentrations are slightly elevated in boreholes BGW6 and BGW7. These boreholes are located close to the TGME TSF;
- The manganese concentrations are elevated in the groundwater. This is attributed to the dolomitic aquifer, which is commonly associated with elevated manganese concentrations;
- The sulphate and calcium concentrations in the decant water from the Beta adit exceeds the WUL limit; and
- The waste assessment (see Section 10.28.4) indicated that mercury is present in some of the samples. Cyanide and arsenic were raised as elements of concern during the public participation process and these parameters were therefore included in the May 2020 sampling. None of these parameters were detected in any of the groundwater samples. Arsenic was detected in some of the surface water samples in low concentrations.

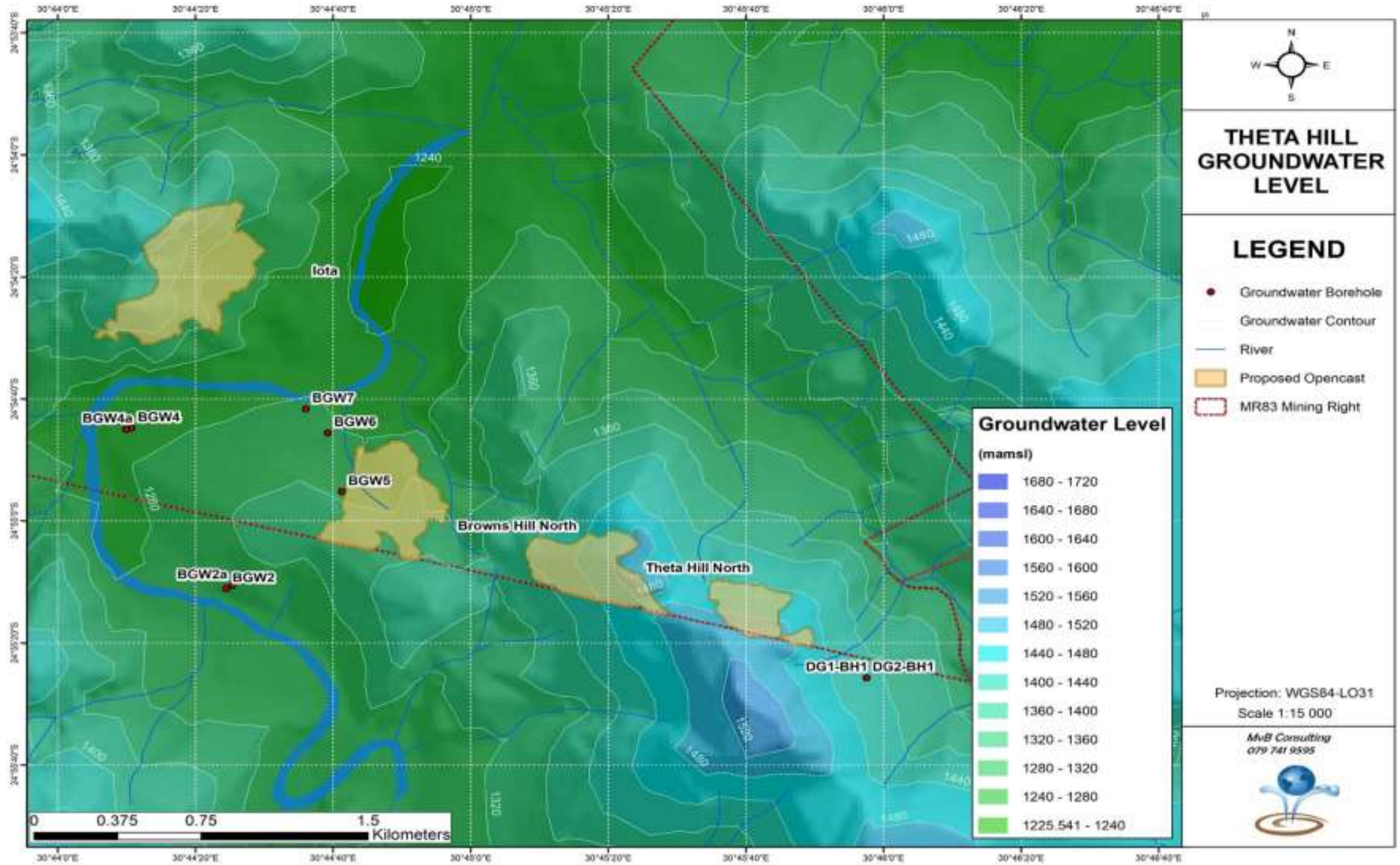


Figure 53. Interpolated groundwater level map for the Theta Hill Project

10.28.4. Waste Classification

The key objective of the study was to conduct an initial screening of representative samples from the overburden material that will be placed on the waste rock dumps and back into the pit during rehabilitation. The samples were obtained from boreholes chips drilled on the respective sites of the study area.

The initial screening consisted of static geochemical testing that included laboratory tests required by the National Environmental Management Waste Act 59 of 2008, in order to classify waste for landfill. Acid Based Accounting was also conducted in order to assess the risk for potential acid rock drainage.

A total of 32 rock samples were collected from various exploration boreholes on the Theta Hill, Browns Hill and Iota mining sites. Some samples were combined to form representative composite samples of the various rock types. The materials were evaluated according to Government Notice 635, National Environmental Management Waste Act 59 of 2008: Waste Act 59 of 2008: National Norms and Standards for the Assessment of Waste for Landfill Disposal (GNR 635). A summary of the Acid Base Accounting (ABA) results obtained from performing static tests is as follows;

- It is evident that only the shale sample is classified as a rock type two and thus have the potential to be acid forming based on the NP:AP ratio;
- All other samples were classified as rock type three and have a low risk of forming acidic drainage;
- The shale sample will likely generate acidic drainage, however the Sulphide-S percentage fall below the 0.3% that is generally needed to sustain long term acid generation. The low Sulphide-S percentage (0.2%) suggest that if there is acid generation, it will only have short term significance;
- All the samples showed a final pH of above 5.5 in the NAG tests.

A summary of the Waste Classification results is as follows:

- At the proposed Theta and Browns Hill opencasts there are no elements that exceed the leachable concentration threshold LCT01. Several elements do however exceed the total concentration threshold TCT0.
- According to the GNR 635, the waste must be classified as a Type 3 waste based on the TC values of Ba, Mn, Cu, B and Ni exceeding their respective TCT0 values. This sample thus do not satisfy the complete criteria for a Type 3 waste (LCT0<LC≤LCT1 and TC≤TCT1) or the complete criteria for Type 4 waste (LC≤LCT0 and TC≤TCT0).
- Manganese (Mn) is the element that show the highest total concentration in most of the samples. The XRD and XRF results suggest that this element occur as an accessory element in the dominant minerals (dolomite and quartz) and the potential leachability of this element will depend on both physical and chemical parameters.
- Several parameters exceeded the LCT0 for the leach test in the Iota rock samples. Chromium and Nickle is the only two parameters of concern. Mercury was present in the majority of the samples, which could be attributed to contamination from drilling.
- Barium, copper and arsenic showed elevated concentrations that exceeded the TCT0 for most of the samples.

- According to the GNR 635, the waste must be classified as a Type 3 waste based on the TC values of the parameters that exceed their respective LCT0 and TCT0 values. The following samples satisfy the criteria for a Type 3 waste (LCT0<LC≤LCT1 and TC≤TCT1):
  - H7179 (Shale);
  - O5881 (Shale);
  - H7025 (Dolerite).
- Samples that showed a concentration of mercury that exceeded the LCT0 for the leach test where excluded because the mercury may be attributed to contamination from drilling.
- The remaining samples from Iota only exceeded TCT0 values and do not satisfy the complete criteria for a Type 3 waste (LCT0<LC≤LCT1 and TC≤TCT1) or the complete criteria for Type 4 waste (LC≤LCT0 and TC≤TCT0).

10.28.5. Groundwater and Geochemical Modelling

MvB Consulting requested Geochemical Dynamic Systems (GeoDyn) to undertake a geochemical risk assessment of planned waste rock deposits (WRD) and pit backfill for the Theta Hill Project with the aim to determine long-term risks and contextualise waste classification results.. The geochemical study was mainly focused on the following aspects:

- The likelihood and rate of leaching of hazardous substances into the post-closure aquifer containing the waste rock material in the short- and long-term (100 years) as a result of the in-pit waste rock disposal;
- The short and long-term (100 years) interaction of aquifer material, waste rock material, groundwater and waste rock pore water to determine the sustainability of the current waste mineral waste management options.

During the project an iterative modelling approach was followed with constant sensitivity analysis and changes to parameters and rates to achieve systems in which a close as possible natural environment can be modelled to evaluate and understand the processes involved. The main aim of the modelling scenarios was to evaluate the short term (5 years), which roughly corresponds to the operational phase of the mine, and long-term, post-operational (>100 year) behaviour of potential contaminants as a result of sulphide mineral oxidation.

WRD facility during the operational and post – operational phase. The following scenarios were assessed:

- **Scenario 1:** Assessment of reactions and resultant source term fluid chemistries after 5 years. **Result**: The Theta and Browns Hill, and Iota waste rock pore waters are slightly alkaline with model pH values of 8.20 and 7.82, respectively. Dominant components of magnesium and bicarbonate is evident. The model pore water solutions display elevated chromium concentrations. Mercury is also elevated above the given guidelines in the Iota model pore water solution.
- **Scenario 2:** Assessment of reactions and resultant source term fluid chemistries after 100 years. **Result**: The long-term WRD pore waters also indicate slightly alkaline pH values with a pH between 7.40 and 7.93 simulated for the respective Iota, and Theta and Browns Hill WRD's. The dominant components include magnesium, bicarbonate and sulphate. The Iota model pore water displays higher concentrations of especially sulphate, which may be ascribed to the higher

proportion shale (associated with sulphide minerals) calculated to be deposited on this dump. The model pore water solutions have elevated metal(loid) concentrations of specifically arsenic, chromium, mercury and nickel.

- **Scenario 3A**: Adsorption model assessing final 5-year source term chemistry with the purpose to determine the importance of adsorption as a potential geochemical process to immobilise leachate contaminants in the site lithologies. **Result**: The modelled waters display slightly alkaline pH values of 8.20 and 7.82 for the respective Theta and Browns Hill, and Iota modelled systems, with dominant magnesium, bicarbonate, sulphate (Iota) signatures. All the parameters are within the acceptable guideline ranges. The model results following Scenario 1, which assess the short-term behaviour of the waste rock material, indicate that although WRD pore water is more alkaline, the pore fluid is still likely to contain elevated concentrations of chromium and mercury (Iota). The adsorption model (Scenario 3A) however indicates that chromium and mercury adsorption is high, and it is therefore likely that these constituents will be sorbed to secondary mineral phases as the source term leachate migrates through the underlying lithologies.

- **Scenario 3B**: Adsorption model assessing final 100-year source term chemistry with the purpose to determine the importance of adsorption as a potential geochemical process to immobilise post-operational leachate contaminants in the site lithologies. **Result**: The modelled waters have a near neutral to slightly alkaline pH of 7.39 and 7.77 for the respective Iota and Theta and Browns Hill systems. Dominant magnesium, bicarbonate and sulphate (Iota) components can once again be observed. The long-term model waste material pore water simulations (Scenario 2) indicate that although near neutral to slightly alkaline pH prevails, the pore fluids are very likely to contain elevated metal(loid) concentrations. These metal(loid)s however have the potential to be sorbed out of solution to secondary mineral phases as shown by the adsorption model (Scenario 3B) that indicate high sorbed fractions for specifically arsenic, mercury and nickel. Although chromium adsorption was high, it still occurs at concentrations above the regulatory guidelines. This suggest that adsorption is an important geochemical process in the immobilisation of potential contaminants.

Pit backfill during post-operational phase. The following scenarios were assessed:

- **Scenario 4**: Assessment of the final 5-year source term chemistry (Scenario 1) in pit backfill reactions and resultant fluid chemistries after 100 years under a sliding oxygen fugacity and a 5:1 water to waste rock ratio. This conceptually represents the disposal of the overburden and waste rock material in the pit after life of mine has been reached. **Result**: The model results of the pit backfill indicate that the modelled pore fluids have slightly alkaline to alkaline pH values. The model pore waters show reduced salinity when compared to the source terms (Scenario 1), however, model arsenic, chromium, and mercury concentrations are above the lowest regulatory thresholds. o

- **Scenario 5**: Adsorption model assessing the source term chemistry with the purpose to determine possible immobilisation of leachate contaminants. **Result**: The modelled water qualities indicate slightly alkaline to alkaline pH and are dominated by magnesium, bicarbonate and sulphate ions. The model results following Scenario 4 indicate that metal(loid)s, arsenic, chromium, mercury, and to a lesser extent nickel, are mobile in the alkaline pH and less oxidising conditions. Additionally, cobalt becomes more mobile in the less oxidising conditions. The adsorption model (Scenario 5) suggest that adsorption is an important geochemical process that stabilise metal(loid) concentrations.

The geochemical assessment, modelling results and interpretation identified metal(loid)s, specifically arsenic, mercury, chromium and nickel as potential contaminants, however due to adsorptive processes provided by clay and iron oxide minerals these constituents may be reduced in concentration or completely immobilized. The geochemical modelling indicated that the risk of the development of acid mine drainage conditions are highly unlikely as enough neutralisation capacity is available within the WRD facility and pit backfill material to buffer the pH of the systems. However, contamination of the shallow soil below any on-surface WRD facilities is likely, although the contaminants will be immobilized through adsorptive processes.

10.28.6. Environmental Geochemical Risks

The aquifer systems are not only a potential transport medium for potential contaminants but should also be viewed as a sensitive receptor from a groundwater use perspective. The Blyde River should also be considered as a sensitive receptor to mine waste drainage as mine waste leachate may have adverse effects on especially the low-flow quality of the receiving stream.

The geochemical assessment, modelling results and interpretation identified metal(loid)s, specifically arsenic, mercury, chromium and nickel as potential contaminants, however due to adsorptive processes provided by clay and iron oxide minerals these constituents may be reduced in concentration or completely immobilized. The geochemical modelling indicated that the risk of the development of acid mine drainage conditions are highly unlikely as enough neutralisation capacity is available within the WRD facility and pit backfill material to buffer the pH of the systems. However, contamination of the shallow soil below any on-surface WRD facilities is likely, although the contaminants will be immobilized through adsorptive processes.

The geochemical environmental risks from the waste rock disposal on waste rock dump facilities were assessed by Dr. Robert Hansen and the result is presented in the Geohydrology Report.

This assessment concluded that:

- The cumulative geochemical environmental risk of the development of acid mine drainage conditions in the operational and post-operational long term are Low. This is due to the overabundant acid neutralisation potential inherent in the site geology.
- The cumulative geochemical environmental risk of the pollution of groundwater by metal(loid)s and sulphate from the waste rock, either in the operational phase or the post-operational phase in the long term (> 100 years) is Low. This is due mostly to the overabundance of adsorption capacity inherent in the site geology as well as the propensity of the site geology to increase the adsorption capacity over time even under reasonably varying environmental and physico-chemical conditions.
- Due to the Low cumulative environmental geochemical risks during the operational and post operational long-term phases, the post-operational in-pit backfilling is an environmentally acceptable remediation method for the waste rock.
- Therefore, the recommendation is made that the TGME waste rock be classified as Type 4, i.e. inert.

The following main conclusions can be made:

- Initial geochemical findings indicate that waste rock disposal on surface and pit backfill have associated risks in terms of the likelihood of leachate containing contaminants exceeding regulatory guideline values and thus pose unmitigated risks in terms of metal(loid) mobilisation in the long-term.

- Adsorption is an important process in controlling metal(loid) mobility and may potentially immobilise metal(loid) contaminants in the site geologic lithologies. The risk however for the contamination of soil by metal(loids) may be significant. The impact, however, will be limited to the footprint of the WRD.
- The risk for the development of acid mine drainage conditions for the Theta and Browns Hill, and Iota WRD material is very unlikely as sufficient alkalinity is provided by the carbonate minerals within the overburden materials to neutralise acidic species.
- The contamination of groundwater by leachate contaminants from the waste rock material in the post operational phase may be unlikely due to adsorptive processes.
- Pit backfilling may lead to reduced sulphate concentrations; however arsenic, mercury, chromium and nickel may reach concentrations higher than regulatory guidelines. However, due to adsorptive reactions, these metal(loid)s may be sorbed to secondary mineral precipitates.
- The initial assessment shows that risks are likely for shallow soil contamination below the on-surface waste rock facility, although natural mitigation processes negate the mobility of these contaminants.

10.29. Air Quality

Emission rates for the proposed activities were calculated using the USEPA AP-42 and the Australian Government National Pollutant Inventory (NPI) emission factors. An emission factor is a value representing the relationship between an activity and the rate of emissions of a specified pollutant. AP-42 emission factors have been compiled since 1972 and contain emission factors and process information for over 200 air pollution source categories. These emission factors have been developed based on test data, material mass balance studies and engineering estimates.

10.29.1. Emissions Inventory

The emissions inventory was uploaded into a Level 2 atmospheric dispersion model, AERMOD, together with prognostic MM5 meteorological data, to calculate ambient air concentrations at specified sensitive receptors of key pollutants associated with the proposed operations. Ten sensitive receptors were selected for this assessment.

Sensitive receptors (i.e. places where sensitive individuals may be impacted, such as residences, schools and medical facilities) within a 10 km radius of the study site that have been selected for evaluation in this impact assessment are listed in Table 39 and shown in Figure 50.

Table 41. Sensitive receptors air quality

ID	Receptor Name	Distance from Boundary (km)	Direction from Boundary	UTM mE	UTM mS
1	Graskop Area 1	6.34	East-south-east	280345	7241113
2	Graskop Area 2	7.54	East-south-east	281506	7240792
3	Pilgrimsrest Area 1	Within mining rights boundary		273403	7245144
4	Pilgrimsrest Area 2	Within mining rights boundary		271629	7244395
5	Pilgrimsrest Area 3	Within mining rights boundary		272253	7244304

6	Pilgrimsrest Area 4	Within mining rights boundary	272834	7244084
7	Pilgrimsrest Area 5	Within mining rights boundary	272589	7243499
8	Pilgrimsrest Area 6	Within mining rights boundary	273385	7243167
9	Pilgrimsrest Area 7	Within mining rights boundary	273882	7242776
10	Pilgrimsrest Area 8	Within mining rights boundary	274133	7242574

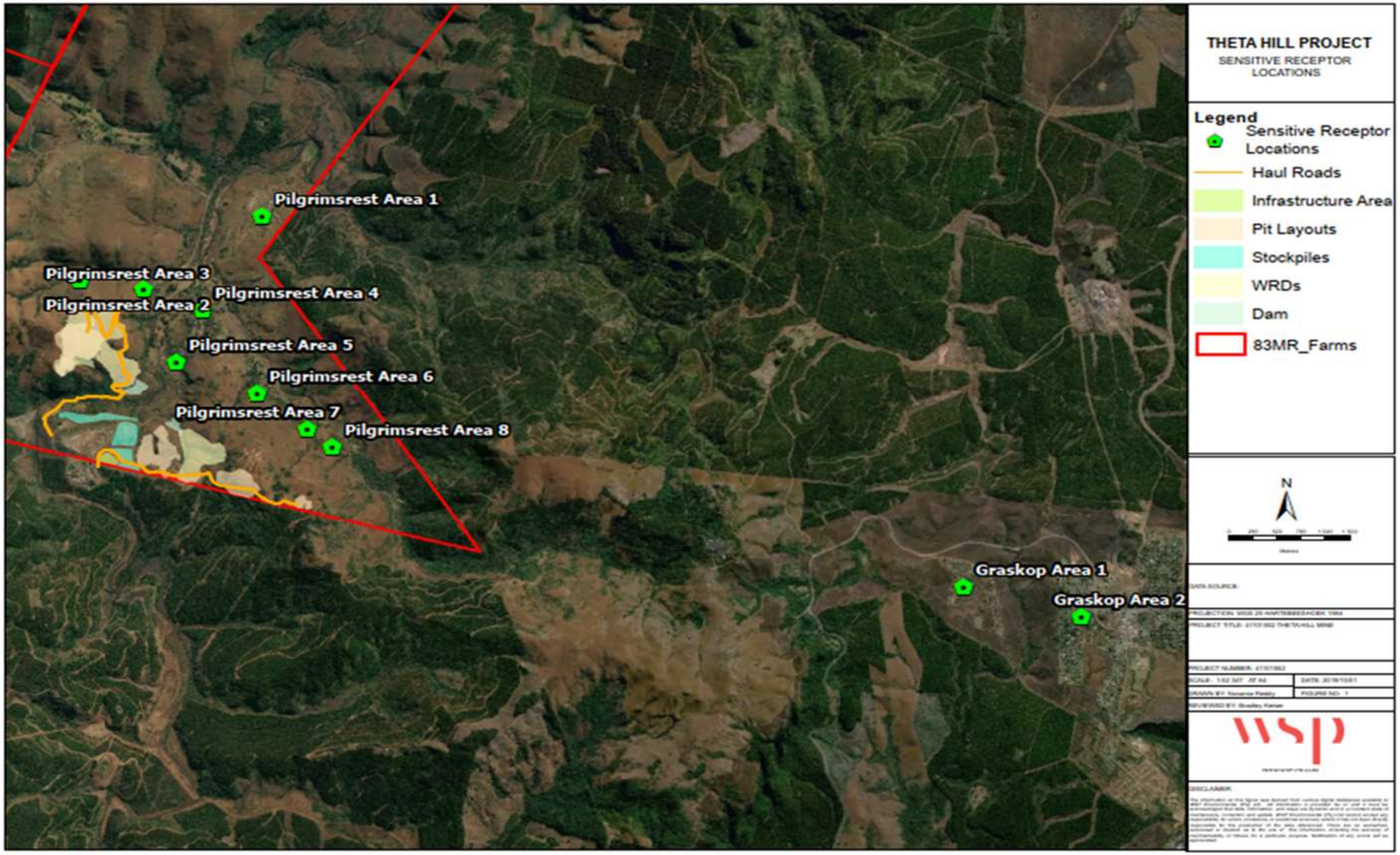


Figure 54. Sensitive air quality receptor locations for the Theta Hill Project

Construction activities for the Theta Hill Project area during the construction phase was estimated on an wide area as base. The emission rate used to calculate such emissions is environmentally conservative for most construction sites, with results likely being higher than those that will be experienced in reality. Further, it must be emphasised that the construction activities are transient in nature. As such, the construction phase has only been semi-quantitatively assessed.

Long-term (annual) and short-term (24-hour average) concentrations for the pollutants of concern for the operational phase were compared with the applicable NAAQS.

Dispersion modelling simulations for the proposed mitigated operational phase indicate that:

- **PM10 Concentrations:**

Fenceline Concentrations:

- The highest fenceline P99 24-hour average PM10 concentrations for the 2016 – 2018 period, 2016, 2017 and 2018 are approximately 98.0 µg/m3 , 97.1 µg/m3 , 96.4 µg/m3 and 109.8 µg/m3 respectively; —
- A number of exceedances of the 24-hour average standard are also predicted on the fenceline each year, exceeding the permitted frequency of exceedances, resulting in non-compliance with the PM10 24-hour standard; —
- These exceedances are predominantly predicted along the southern project fenceline, mainly as a result of the haul road located along this fence operating between the Theta Small Pit, Theta Main Pit, Browns
- Pit and the processing plant. Elevated concentrations are also predicted along the western fenceline, with these concentrations predominantly associated with the various stockpiles in this area and the Iota haul road; —
- Despite the elevated 24-hour average concentrations predicted, and associated non-compliance along the fenceline, these elevated concentrations do not persist for substantial distances beyond the fenceline, with no receptors located in these areas, and limited impacts on the receiving environment; and —
- Highest fenceline annual average concentrations for the 2016 – 2018 period, 2016, 2017 and 2018 are approximately 22.6 µg/m3 , 24.8 µg/m3 , 21.2 µg/m3 , 22.9 µg/m3 respectively, remaining below the annual PM10 NAAQS of 40 µg/m3 . —

Receptor Concentrations:

- Predicted P99 24-hour PM10 average concentrations for the 2016 – 2018 period, 2016, 2017 and 2018 demonstrate compliance with the 24-hour average PM10 NAAQS at all surrounding sensitive receptors; —
- The highest predicted P99 24-hour average concentration of 38.0 µg/m3 occurred in 2016 at the Pilgrimsrest Area 5 receptor, which remains below the standard; —
- Predicted annual PM10 average concentrations for the 2016 – 2018 period, 2016, 2017 and 2018 demonstrate compliance with the annual average PM10 NAAQS at all surrounding sensitive receptors; and —
- The highest predicted PM10 annual average concentration of 7.4 µg/m3 occurred in 2017 at the Pilgrimsrest Area 5 receptor, which remains below the standard.

- **PM2.5 Concentrations:**

Fenceline Concentrations:

- The highest fenceline P99 24-hour average PM2.5 concentrations for the 2016 – 2018 period, 2016, 2017 and 2018 are approximately 11.40 µg/m3 , 11.19 µg/m3

, 11.14 µg/m3 and 12.49 µg/m3 respectively, remaining well below the 24-hour PM2.5 NAAQS of 40 µg/m3 ; and —

- The highest offsite annual average concentrations for 2016 – 2018, 2016, 2017 and 2018 are approximately 2.59 µg/m3 , 2.84 µg/m3 , 2.52 µg/m3 and 2.73 µg/m3 respectively, demonstrating full compliance with the annual PM2.5 NAAQS of 20 µg/m3 .

Receptor Concentrations:

- Predicted 24-hour PM2.5 average concentrations for the 2016 – 2018 period, 2016, 2017 and 2018 demonstrate compliance with the 24-hour average PM2.5 NAAQS at all surrounding sensitive receptors; —
- The highest predicted 24-hour concentration of 4.58 µg/m3 occurred in 2016 at the Pilgrimsrest Area 5 receptor, remaining well below the standard; —
- Predicted annual PM2.5 average concentrations for the 2016 – 2018 period, 2016, 2017 and 2018 also demonstrate compliance with the annual average PM2.5 NAAQS at all surrounding sensitive receptors; and —
- The highest predicted PM2.5 annual average concentration of 0.91 µg/m3 occurred in 2017 at the Pilgrimsrest Area 5 receptor, remaining well below the standard.

Impacts associated with the proposed project were assessed through the application of a risk matrix. Based on these calculations, the impacts associated with both the construction and operation phases on the neighbouring receptors are calculated to be low, recognising these impacts are calculated assuming the various mitigation measures applied in the emissions inventory will be implemented onsite. Should this mitigation not be implemented accordingly, impacts on the receiving environment will be substantial.

10.30. Noise and Vibration Levels

10.30.1. Current Noise sources

The following are noise sources in the vicinity of and the boundaries of the study area:

- Domestic type activities;
- Traffic noise along the feeder roads;
- Insects;
- Birds;
- Wind noise.

10.30.2. Noise survey

The noise survey was conducted in terms of the provisions of the Noise Control Regulations, 1994 and the SANS 10103 of 2008 (The measurement and rating of environmental noise with respect to annoyance and to speech communication) using a digital Larson Davis 831 – Class 1 meter with Logging, Environmental 1/1, 1/3 Octave Band and percentiles Sound Level Meter (Class 1).

The measuring points for the study area were selected to be representative of the prevailing ambient noise levels for the study area and include all the noise sources such as distant traffic noise, agricultural activities but exclude traffic noise which was intermittent in the vicinity of the measuring points. The measuring points used for this determination are illustrated in Figure 55.

To determine a baseline, the different prevailing ambient noise levels for the specific areas were measured. These measurements include all the noise sources currently in the area such as domestic, traffic noise, distant mine noise and natural noise sources such as birdsong. Represented in A-weighted decibels (dBA), the loudest noise was recorded at positions 16 and 10, caused by traffic, domestic noise, birds and insects. The average noise levels over time at these points were 55.0 dBA and 54.3 dBA respectively.

The arithmetic noise level averages throughout the study area were as follows:

- Vicinity of the residential areas – 36.9dBA during the day and 43.7dBA during the night;
- Along feeder roads – 54.7dBA during the day and 35.2dBA during the night.

The ground vibration levels at the different measuring points were all insignificant. The prevailing ground vibration levels were all less than 1.3mm/s.

This noise impact formula and the Interactive noise calculator (ISO 9613) was used to determine the noise levels during the various phases of the project. The noise levels at the noise sensitive areas was added in a logarithmic manner to determine the overall sound exposure at the receptor. The criteria for assessing the magnitude of a noise impact are illustrated in Table 42.

Table 42. Noise intrusion level criteria

Increase Δ-dBA	**Assessment of impact magnitude**
0 <Δ≤ 1	Not audible
1 <Δ≤ 3	Very Low
3 <Δ≤ 5	Low
5 <Δ≤ 10	Medium
10 <Δ≤ 15	High
15 <Δ	Very High

The residential properties used as receptors for the noise level projection are shown in Figure 56. The projected noise levels at each receptor during each phase of the project was calculated based on the equipment planned to be used, the known noise emissions from each and the proposed operating hours. For example, during the construction phase work will only be carried out during daylight hours, while the operational phase will require 24/7 activities.

During operation, there will be no blasting at the site due to the modified terrace mining method where an Eccentric ripper will be used to dislodge the ore. Crushing will be done before hauling the ore to the processing plant. The only ground vibration which may be created would be from the eccentric ripper and/or the hauling vehicles. The threshold values of 3.05mm/s to 6.10mm/s for ground vibration at historical properties (British Standards BS 738525) will have to be complied with at all times.

The detailed noise intrusion levels as calculated for each of the identified measuring points are included in the specialist's report (Appendix 13). In summary, the calculated noise levels mostly range from Not Audible to Low according to the criteria above. However, there are a few exceptions:

- Brown's Hill Pit: One point – F1 - is expected to rate higher than Low at during any phase. This is the point closest to Brown's Hill. The calculated values indicate a rating of High during daytime hours in the construction phase, increasing to Very High during operation activities, and decreasing to Medium during the decommissioning phase.
- Theta Hill: the only point exceeding Low at any stage, is F, which is expected to experience High levels during the construction phase.

- Iota Hill: Points A, B, C and D are expected to experience Medium noise levels during the operation phase. No other points rate higher than Low during any of the phases.

Provided that noise mitigation measures are in place and adhered to, the project will be in line with the environmental noise standards.

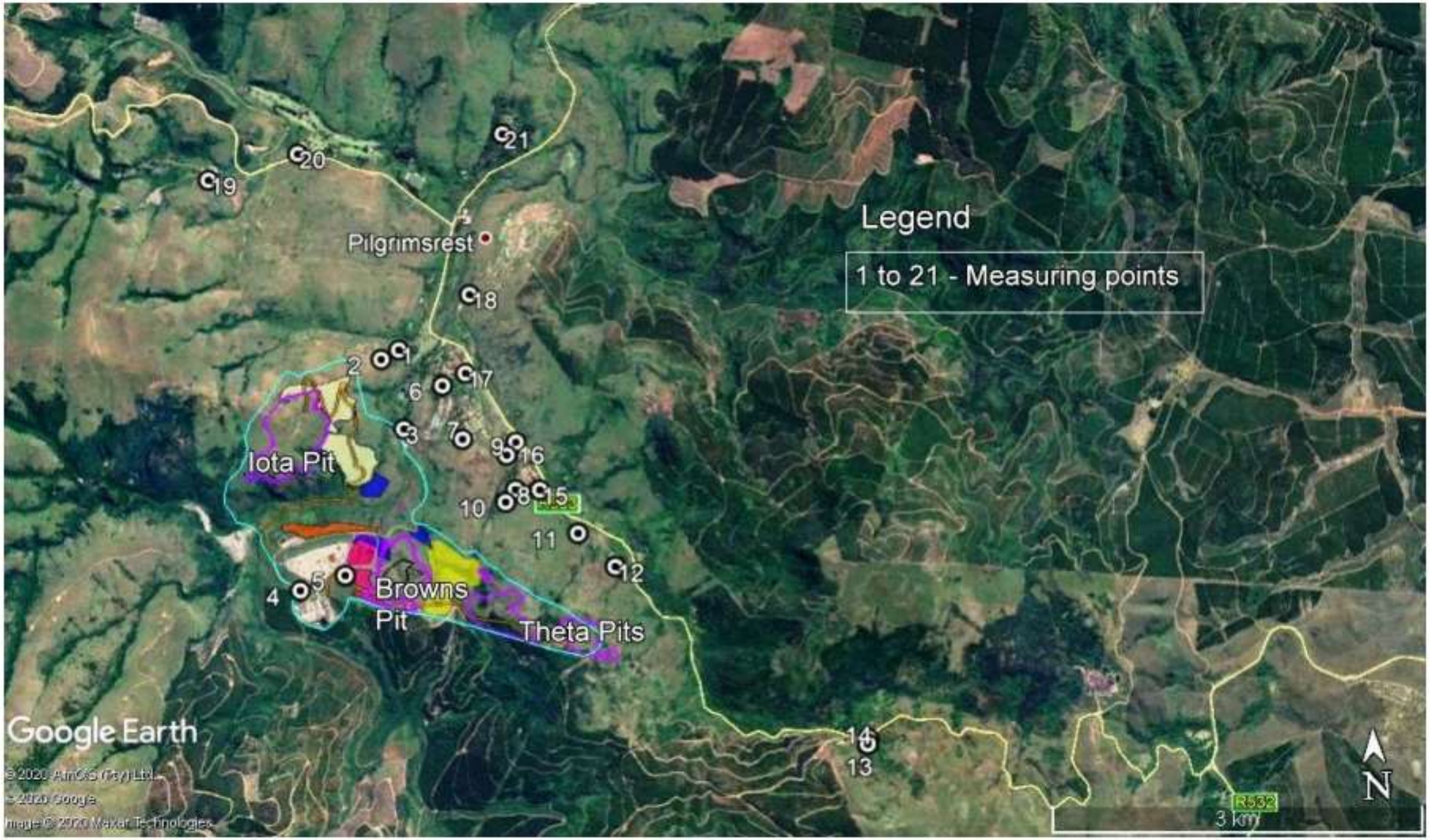


Figure 55. Measuring Points used for the Ambient Noise Level Survey for the Study Area

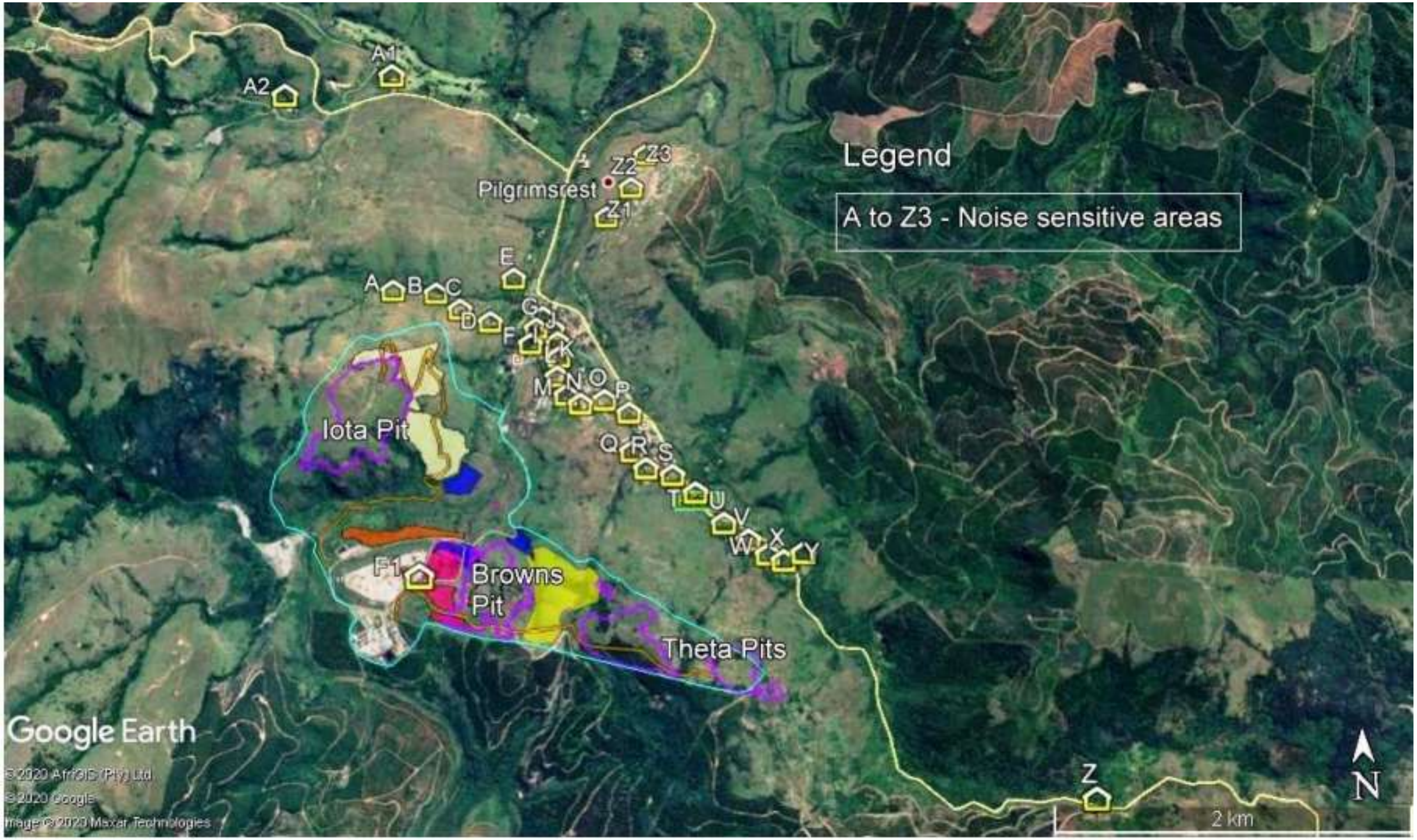


Figure 56. Residential Properties used for the Determination of Noise Intrusion Levels

10.31. Traffic

Haul roads will be utilised for the transport of ore from the mining areas to the various stockpiles and the WRD located on the project area. The haul roads will be constructed to cater for continuous two-way traffic of fully loaded articulated dump trucks.

Access to the site will be obtained from the Provincial R533, which travels towards Graskop. One option is for the existing gravel road towards the TGME plant and office to be upgraded and utilised.

10.32. Climate Change and Green House Emissions

The greenhouse gas emission impacts of the Theta Project are analysed in terms of both South Africa's national greenhouse gas (GHG) emission inventory and climate change, as well as the global inventory and climate change. The impact on South Africa's inventory is the departure point for this assessment because the inventory is one of the tools which government uses to determine national and sectoral GHG mitigation targets, which are set within the context of the global emissions inventory and climate change.

The Theta Project's construction and operational GHG emissions are summarised below (Table 43). The emissions are grouped into direct (scope 1), indirect (scope 2) and other indirect (scope 3) sources for all two phases of the mining project's lifetime.

Table 43. Summary of the GHG emissions calculated for the proposed Theta Mining Project

Emission categories	Total (construction and operations)	Construction	Operations (open cast)
Direct (Scope 1) Emissions	61,870 t CO_2 e	6,952 t CO_2 e	54,919 t CO_2 e
Indirect (Scope 2) Emissions	181,099 t CO_2 e	1,770 t CO_2 e	179,329 t CO_2 e
Other Indirect (Scope 3) Emissions	130,714 t CO_2 e	64,613 t CO_2 e	66,102 t CO_2 e
Total Emissions	373,684 t CO_2 e	73,335 t CO_2 e	300,349 t CO_2 e

Of the expected carbon dioxide equivalent (t CO_2 e) emissions generated by the proposed Theta Project, approximately 17% will be due to direct emissions, mostly from the combustion of diesel, which is considered to be within the direct control of the mine. The bulk (83%) of the mine's lifetime emissions are however categorised as indirect emissions which arise during the operations phase (Figure 57).

Emissions from the consumption of grid-based electricity (energy indirect emissions) during operations accounts for the majority (48%) of the project's lifetime emissions. The bulk of the other indirect emissions (scope 3) arise from purchased goods and services (35%). This category refers to the emissions that arise from goods and services such as concrete, steel, water, cyanide and lime. Steel makes up the bulk of these emissions.

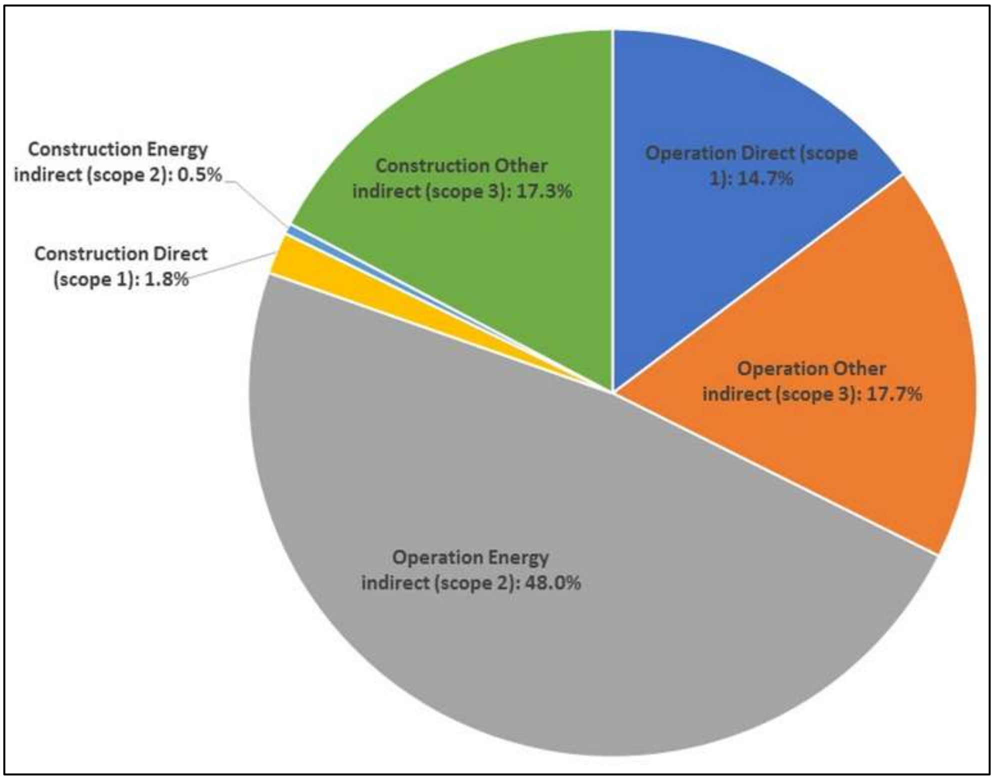


Figure 57. Distribution of lifetime GHG emissions generated by the proposed Theta Terrace Mining Project.

10.32.1. Impact of Project on Climate Change

South African Context

The IPCC's Fifth Assessment Report (IPCC, 2014) indicates that the world can emit 1,010 gigatons of CO_2e if the effect of climate change is to be limited to a 2 °C temperature increase. This figure is the global carbon budget. South Africa's share of this global budget is calculated based on the national population figure of 58 million people (Stats SA, 2018) as a percentage of the global population of 7.7 billion people (Worldometers, 2019). South Africa's carbon budget in this respect is therefore approximately 7,572 Mt CO_2e.

The following impact ratings have been identified as a means of benchmarking GHG inventories, over the lifetime of the specific activity, related to emissions that occur within the boundaries of South Africa:

- Low (inventory of 10 thousand tCO_2e): 0.00013% of South Africa's carbon budget
- Medium (inventory of 1 million tCO_2e): 0.013% of South Africa's carbon budget
- High (inventory of 10 million tCO_2e): 0.13% of South Africa's carbon budget

The Theta Project's calculated emissions inventory, in terms of South Africa's remaining portion of the global carbon budget, is presented in the following (Table 48).

Table 44. Theta Terrace Mining Project's emissions relative to South Africa's carbon budget

South Africa's carbon budget based on proportion of local population	7,572 Mt CO_2e	
Theta Project's Total Scope 1 (lifetime)	0.00082%	

Theta Project's Total Scope 1 & Scope 2 (lifetime)	0.002%	of South Africa's carbon budget
Theta Project's Total Scope 1, Scope 2 & Scope 3 (lifetime)	0.005%	

The impact of the total Theta Project's greenhouse gas inventory within a domestic context is therefore considered to be low-medium because the total lifetime inventory is expected to consume approximately 0.005% of South Africa's carbon budget. The value of 0.005% is above the low-materiality threshold (0.00013%) but below the medium-materiality threshold (0.013%) of South Africa's carbon budget.

Global context

The global nature of climate change makes it difficult to distinguish between local and international climate change drivers. Global anthropogenic climate change is caused by the accumulated GHG emissions from global emitting sources. The GHG emissions from the proposed Theta Project, when considered in isolation, are unlikely to have any specific significant impact on the global GHG inventory which is currently estimated at 37.1 billion tCO2e (Harvey, 2018).

The cumulative impacts of the GHG emissions from the proposed Theta Project must also be considered. The global inventory will undoubtedly increase, particularly when the mine's emissions are quantified in conjunction with the other emission-intensive activities scheduled for implementation around the world.

In terms of the proposed Theta Mining project's impact on climate change, the mine will generate emissions both through its direct operations, and there will be emissions associated with the mine's value chain. It is estimated that the emissions associated with the construction and the operation of the mine will be approximately 62,000 tonnes CO_2e per annum (scope 1 emissions) and 181,000 tonnes CO_2e per annum (Scope 2 emissions). The Scope 3 emissions of the mine amount to 130,000 tonnes CO_2e per annum.

The impact of the total Theta Mining project's greenhouse gas inventory within a domestic context is therefore considered to be low-medium because the total lifetime inventory is expected to consume approximately 0.005% of South Africa's carbon budget. The value of 0.005% is above the low-materiality threshold (0.00013%) but below the medium-materiality threshold (0.013%) of South Africa's carbon budget

10.33. Visual

Historic mining infrastructure such as old mining shaft infrastructure, PCDs and waste rock dumps are present in the area, forming part of the heritage and tourism attraction of the Pilgrim's Rest area. These areas have been decommisioned, and vegetation has been allowed to re-establish, therefore appearing similar to the surrounding natural areas from a visual perspective. No active mining is currently taking place within the TGME Theta Hill Project Area.

The proposed Theta Hill Project will result in a shift of the mining activities from predominantly underground and artisanal mining to opencast mining activities, where three prominent hillside slopes will be mined, which will be visible to a larger area. It can be argued that some tourists visiting Pilgrim's Rest might be interested in experiencing the different mining methods i.e. historic artisanal mining compared to industrial mechanised modern-day mining activities however this remains untested.

Based on the findings from both the desktop and the field assessments it is evident that the TGME Theta Hill Project Area is located within a semi-rural mountainous area, with gentle to steep undulating terrain, which form distinguishing topographical features in the form of prominent hills and outcrops that are dominated by grassland, commercial plantations and forests interspersed with watercourses, most notably the Blyde River, villages, the small town of Pilgrim's Rest and historic mining infrastructure.

Furthermore, the R533 road, otherwise known as the Bonnet Pass, is the main road leading into Pilgrim's Rest from Graskop and the Vaalhoek Road (gravel road) is situated within the vicinity of the TGME Theta Hill Project Area. Even though both the R533 and Vaalhoek Road are considered tourist routes, the Vaalhoek Road is used infrequently, with the majority of tourists utilising the R532 main road to get to Bourke's Luck Potholes and Graskop and the R533 to get to Pilgrim's Rest.

The visual receptors present within a 10km radius comprise the small town of Pilgrim's Rest, farmers, and several nature reserves of which the Mount Sheba Private Nature Reserve (NR) and its hiking trails are of importance due to some of the hiking trails having a clear line of sight towards the TGME Theta Hill Project Area. The R532, R533, Vaal Hoek Road and several gravel roads are present within the vicinity of the TGME Theta Hill Project Area. Permanent residents of the town of Pilgrim's Rest and hikers and people lodging in the Mount Sheba Private NR and Motlatse Canyon Provincial NR are considered highly sensitive receptors, while people at their place of work are moderately sensitive receptors, as they are likely to focus on the activities at hand and not the surrounding environment. Motorists and tourists traveling on the scenic roads are considered moderate to highly sensitive receptors, since tourists' attention are focused towards the panoramic scenic landscape. Since the town of Pilgrim's Rest is a popular tourist destination for both local and international tourists, the tourist attractions (Pilgrim's Rest, God's Window etc. are considered exceptionally highly sensitive receptor areas.

General views of the landscape associated with the Theta Project Area and surrounds with respect to the undulating topography, existing development, and the overall character are indicated in Table 45.

A viewshed is the outer boundary defining a view catchment area, usually along crests and ridgelines. The viewsheds of the proposed Iota pit and the proposed stockpiles, all of which will be more visible than other aspects of the development, are shown in Figure 58 and Figure 59 respectively.

Table 45. Summary of the visual assessment of the TGME Theta Hill Project Area

<table>
<tr><th>Climate</th><th>Topography</th></tr>
<tr><td>As a result of climate variations throughout the year, the appearance and perception of the landscape within and surrounding the TGME Theta Hill Project Area change with the seasons. The TGME Theta Hill Project Area and its surroundings appear muted during the winter months, while it appears vibrant and green during the summer months. Seasonal variation may have some effect on the area from where project components would potentially be visible, with visibility expected to be marginally higher during the winter months when seasonal screening effects such as vegetation density and relative grass cover, is lower. However, during the dry winter months dust suspension is higher due to drier soil conditions and lower rainfall, resulting in atmospheric haziness, which will somewhat limit visibility of surrounding landscape. The visibility of the proposed project will also often be lower at dawn and dusk, due to fog and mist hanging in the mountainous area.</td><td>The topography associated with the TGME Theta Hill Project Area and the surrounding region is considered to be mountainous, with gentle to steep undulating terrain, which form distinguishing topographical features in the form of prominent hills and outcrops that are interspersed with thicketed valleys where the Blyde River, streams (Peach Tree Stream) and ephemeral drainage lines are situated.</td></tr>
<tr><th colspan="2">Land Use and visual receptors</th></tr>
<tr><td colspan="2">The dominant land use in the region is forestry activities. Several other land uses have been identified in the vicinity of the TGME Theta Hill Project Area, namely: mining, agricultural activities although limited with some cattle grazing, old mining shaft infrastructure, recreational facilities (Pilgrim’s Rest Golf Course, caravan park and hiking trails in Mount Sheba Private Nature Reserve and Motlatse Canyon Provincial Nature Reserve) residential development and tourism related activities and accommodation facilities mainly centred in and around Pilgrim’s Rest. Other tourist attractions and facilities in the greater Pilgrim’s Rest area includes, but are not limited to: God’s Window lookout, the Pinnacle Rock, Lisbon and Berlin Falls, Bourke’s Luck Potholes, Three Rondawels, the Blyde River Canyon, hiking trails, horseback, golf, and fishing.

Mining activities have been present in the Pilgrim’s Rest area since 1875 when gold was first discovered near Pilgrim’s Rest. By 1880 most of the underground mining activities were operated by small mining companies who installed stamp batteries and exploited oxide reserves. This continued until sulphide mineralisation was encountered at depth. Due to the resulting mineralogical problem, mining was discontinued in 2005.

According to the South African Conservation Areas Database (SACAD Q4, 2018) the entire TGME Theta Hill Project Area is situated within the Kruger to Canyons Biosphere Reserve. On the 20th of September 2001 the Kruger to Canyons (K2C) Biosphere Reserve was registered by United Nations Educations, Scientific and Cultural Organisation (UNESCO) in Paris, as an official Biosphere Reserve within their Man and the Biosphere (MaB) Programme. Depending on the spatial zonation of a Biosphere Reserve (core area, buffer zone or transitional zone), these areas can either have legal protection or can be used for sustainable developments. Furthermore, the South African Protected Areas Database (SAPAD Q4, 2018) indicate the following nature reserves (NR) are located within 10 km of the TGME Theta Hill Project Area:

➢ Blyderivierspoort NR (± 9 km east of the Theta WRD Option 2);
➢ Henra Private NR (± 8 km west of the Iota WRD Option 2);
➢ Mac Mac Reserve (10km east; - Forest Nature Reserve
➢ Morgenzon Forest Reserve (7.8 km northwest);
➢ Mount Sheba Private Nature Reserve is located approximately 0.84km south-southwest of the TGME Theta Hill Project Area;
➢ Ohrigstad Dam NR (7.8 km southwest);
➢ Oribi Private NR (3.3 km south-southwest); and
➢ Tweefontein Reserve (9.3 km south) – Forest Nature Reserve</td></tr>
</table>

Furthermore, the National Protected Area Expansion Strategy (NPAES, 2009) database the Motlatse Canyon Provincial Nature Reserve is situated approximately 1.6km east of the TGME Theta Hill Project Area.

Based on digital satellite imagery sensitive receptors situated within a 10 km radius of the TGME Theta Hill Project Area comprise predominantly of the Town of Pilgrim's Rest, Pilgrim's Rest Golf Course, Pilgrim's Rest "old" caravan park, farmsteads and settlements. Furthermore, roads such as the:

- R532 main road which is part of the Mpumalanga Tourism Panorama Route and is utilised by various national and international tourists;
- R533 road, otherwise known as the Bonnet Pass, is the main road leading into Pilgrim's Rest from Graskop;
- The Vaalhoek Road (gravel road). Even though the Vaalhoek Road is considered a tourist route, it is used infrequently, with the majority of tourists utilising the R532 main road to get to Bourke's Luck Potholes and Graskop and the R533 to get to Pilgrim's Rest; and
- Several local gravel roads.

Permanent residents of the town of Pilgrim's Rest and villages and people hiking, camping and lodging in the Mount Sheba Private NR and Motlatse Canyon Provincial NR are considered highly sensitive receptors, while people at their place of work such as the TGME workers, cattle herders and in the town of Pilgrim's Rest are moderately sensitive receptors, as they are likely to focus on the activities at hand and not the surrounding environment. Even though motorists traveling on the roads only have momentary views and experience of the receiving environment, the mountainous terrain attracts the eye and is considered of great scenic quality, thus motorists are considered moderate to highly sensitive receptors. Since the town of Pilgrim's Rest is a popular tourist destination for both local and international tourists, the tourist attractions mentioned above are considered exceptionally highly sensitive receptor areas. Additionally, tourists are considered exceptionally highly sensitive receptors since their attention is focused towards the panoramic scenic landscape.

Vegetation Cover	**Sense of Place**
The majority of the TGME Theta Hill Project Area falls within the Mesic Highveld Grassland Bioregion (within the Grassland Biome), with small sections of the Iota WRD South and the Iota Pit, falling within the Zonal and Interzonal Forests Bioregions (within the Forest Biome). Based on the Mucina and Rutherford database (2012 and 2018 (beta version)), four vegetation types are associated with the project footprint area, namely: Northern Escarpment Dolomite Grassland, Long Tom Pass Montane Grassland, Northern Escarpment Quartzite Sourveld and the Northern Mistbelt Forest. The Northern Escarpment Dolomite Grassland (Endangered vegetation type) is the dominant vegetation type associated with the TGME Theta Hill Project Area. Refer to the Terrestrial Ecological Assessment undertaken by STS (2020) for further detail on the conservation status, altitude and dominant floral species expected within the vegetation types as well as floral species observed during the field assessment.	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 semi - rural, mountainous area dominated by grassland, plantations and forest (only applicable to the Iota WRD Option 2 and a small southern portion of the Theta Pit) interspersed with watercourses, especially the Blyde River, villages, the town of Pilgrim's Rest and historic mining infrastructure. It can further be described as calm, tranquil and peaceful and undeveloped, with a strong association to a semi-natural environment. This sense of place is not entirely unique to the TGME Theta Hill Project Area as it extends to the larger Pilgrim's Rest and Graskop region.

Night Time Lighting

The TGME Theta Hill Project Area, in its current state, contains limited sources of night-time lighting in the area associated predominantly with the TGME mine office. Furthermore, the close proximity of the town of Pilgrim's Rest further contributes to the effects of skyglow and affects the intrinsically dark atmosphere of the area.

The lighting environment associated with the TGME Theta Hill Project Area is therefore considered intrinsically dark (Zone E 1 [Natural]),while taking the larger region into consideration, the area is considered to fall within Environmental Zone E2 (Rural) with low district brightness, due to the TGME offices and town of Pilgrim's Rest. The proposed project is therefore expected to further contribute to the effects of sky glow and artificial lighting in the region, particularly as a result of stationary lighting sources. Generally, the impacts of vehicle mounted lighting sources in the areas will be confined to the local and sub-regional setting (up to 10km from the TGME Theta Hill Project Area) due to the effects of distance and intervening undulating topography, existing lighting

sources in the town of Pilgrim's Rest, and vegetation which restrict the potential impact on views from more distant regional points. It is however deemed essential to mitigate impacts from night-time lighting.
No – Go Alternative
Should the proposed project proceed potential economic and social benefits for the area is expected however these will be short term due to the short Life of Mine (5 years). Potential negative visual and environmental impacts are expected, which are likely to be permanent due to the nature of the project. Although rehabilitation will take place, it is considered unlikely that the rehabilitated hills will provide a similar visual experience to visual receptors as the crest of the hills will be mined. Should the proposed project not take place, the status quo of no additional negative social, visual or environmental impacts than what is currently experienced is expected.
Visual Exposure and Visibility and Key Observation Points (KOPs)
Based on the viewshed analysis the proposed TGME Theta Hill Project Area will be highly visible to receptors situated within a 2km radius, as the TGME Theta Hill Project will be in the fore ground of sensitive receptors. The viewshed for the TGME Theta Hill Project becomes scattered after 2km, due to the strongly undulating topography of the area. According to the viewshed analysis more receptors situated within a 2 km radius will observe the Iota WRD North than the Iota WRD South. According to the viewshed analysis, the Wishbone WRD will be the most visible from sensitive receptors situated within a 2 km radius. These receptors include, but are not limited to, residents and tourists of the town of Pilgrim's Rest, motorists traveling on the R355 as well as hikers vising the Lost City Hiking Trail within the Mount Sheba Nature Reserve. The viewshed analysis indicates that the Browns Pit will be the least visible of the pits, while the Theta Pit will be observed the most from vantage points within a 5km radius. Even though the viewshed analysis indicates that the TGME Theta Hill Project will be visible within a 5 km radius, there are limited receptors within these areas. It is important to note that the viewshed analysis does not take into account the vegetation and existing anthropogenic structures of the area, therefore the field assessment displays a more accurate outcome of the visual intrusion and visibility of the proposed project on the receiving environment.

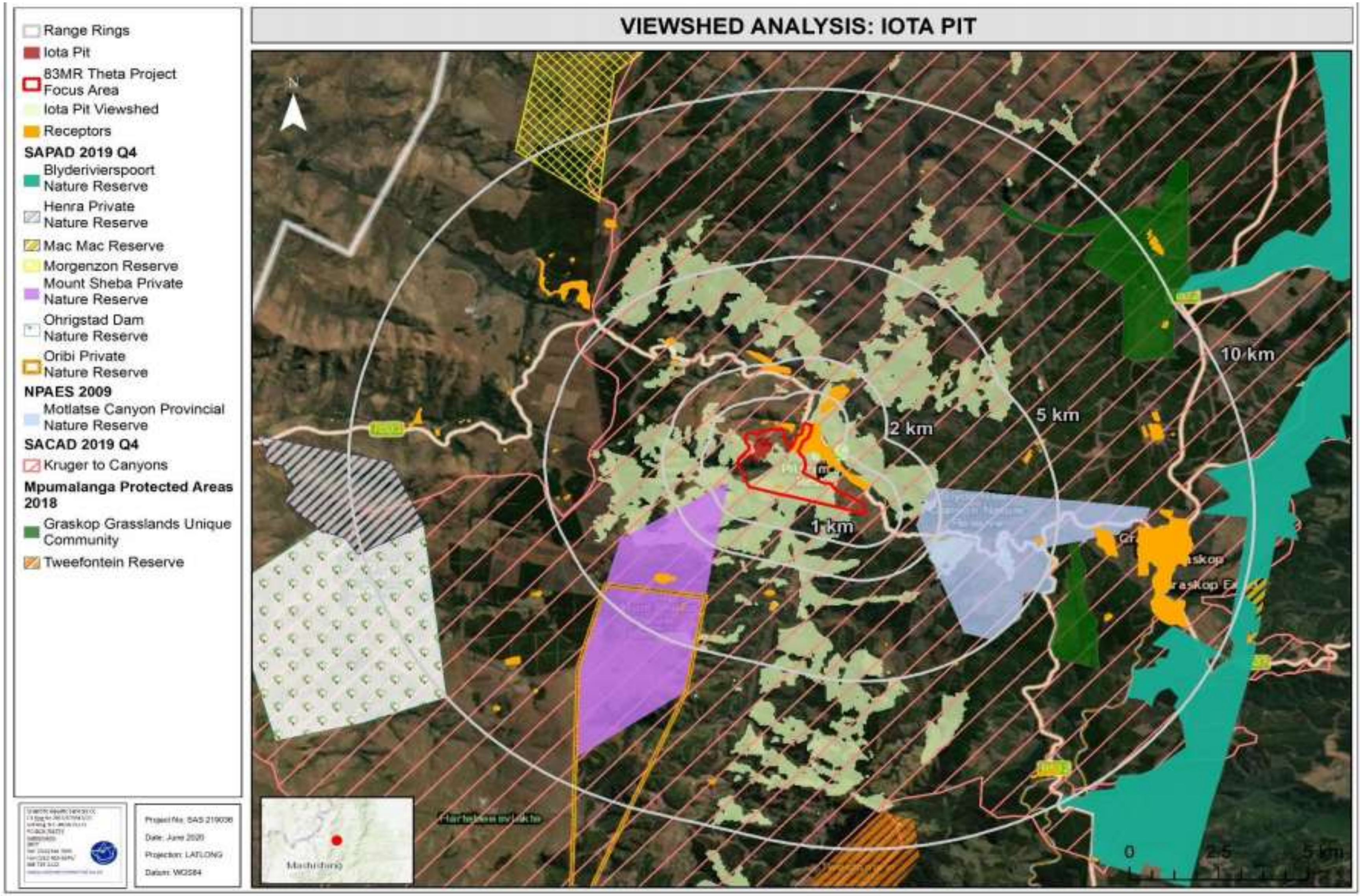


Figure 58. Viewshed of the proposed Iota Pit overlaid onto digital satellite imagery

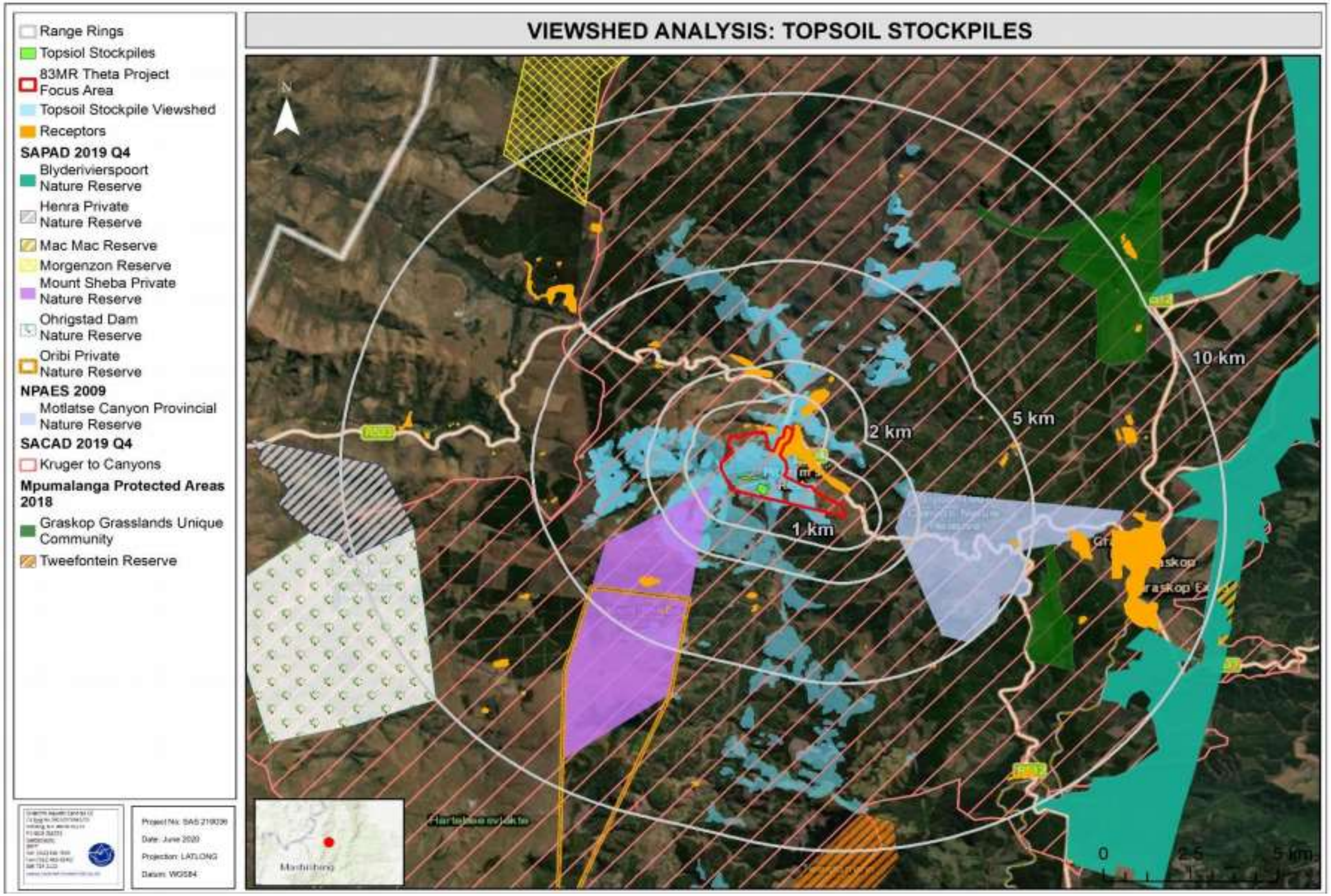


Figure 59. Viewshed of the proposed Topsoil Stockpiles overlaid onto digital satellite image.

10.33.1. Landscape Character and Visual Absorption Capacity (VAC)

The landscape character type associated with the TGME Theta Hill Project Area can be described aa9’s semi-rural in character and characterised by mountainous terrain, with open grassland, forestry, commercial plantations and the Blyde River and associated tributaries are present in the landscape. The vegetation component (grassland, forest, plantations), mountainous terrain and man-made elements provides visual variety and diversity within the greater Pilgrim’s Rest area and within the TGME Theta Hill Project Area.

Key aesthetic aspects of the landscape character associated with the TGME Theta Hill Project Area are described in Table 49 below and it may be concluded that the landscape in its current state provides a positive viewing experience and that the proposed mining development will result in loss of this landscape character type within the local and regional area. The Mpumalanga Province is associated with existing mining activities, which already negatively affects the landscape character of the larger region (province). The Pilgrim’s Rest area however, has fewer mining activities and more commercial forestry plantations which are periodically harvested, resulting in negative viewing experiences of bare ground, logs and tree stumps at times.

Furthermore, historic mining infrastructure such as old mining shaft infrastructure and waste rock dumps are present in the area, forming part of the heritage and tourism attraction of the area. No active mining is taking place within the TGME Theta Hill Project Area, and the existing TGME metallurgical plant and offices bordering the proposed TGME Theta Hill Project Area are still in use. The proposed Theta Hill Project will further result in a shift of the mining activities from predominantly artisanal and underground mining to opencast mining activities, where three prominent hills will be mined, which will be visible to a larger area than the historic and current underground mining areas. Although the larger Pilgrim’s Rest, Graskop and Sabie area is considered significant for ecotourism, the town of Pilgrim’s Rest is associated with tourism directed towards historic artisanal mining methods and infrastructure, it can be argued that some tourists visiting Pilgrim’s Rest might be interested in experiencing the different mining methods i.e. historic artisanal mining compared to industrial mechanised modern day mining activities. However, this remains untested.

According to the calculation the VAC of the area is considered moderate, indicating that the proposed project will be absorbed in the area to a degree. Due to the relatively short vegetative cover of the TGME Theta Hill Project Area and the proposed mining activities situated on high ground (on hilltops) the proposed project will not be screened resulting in a very significant visual intrusion on the immediate surrounding visual environment (Pilgrim’s Rest as well as the Mount Sheba hiking trial). The vast mountainous terrain of the larger region is the main contributing factor to the VAC being increased to a moderate level, since the hills and mountains are blending, making it difficult to observe distinguishing features within the landscape from significant distances.

Since the TGME Theta Hill Project Area is situated within close proximity to the town of Pilgrim’s Rest, the proposed project is considered in the foreground of the town particularly the Iota WRD North and to degree the Iota WRD South and is expected to be clearly noticeable in relation to its surroundings and will have a significantly high visual intrusion on residents and tourists of the town of Pilgrim’s Rest. The wishbone WRD associated with the Theta and Browns Pits will be less visible as opposed to the initial WRD options, and the visual impact in this regard have been reduced. The town of Pilgrim’s Rest is situated in a valley, thus undulating landscape, and local vegetation associated with the town, will serve to somewhat limit the intrusion from certain receptor sites. The entire TGME Theta Hill Project Area will be highly visible from the Mount Sheba hiking trial, especially from the S3 viewpoint of the Lost City Hiking Trail.

10.33.2. Line of Sight Analysis and Key Observation Points

A line of sight and elevation profile analysis was conducted through drawing of a line between two points on a surface that shows where along the line the view is obstructed.

A summary of the findings from the KOP analysis is included in Table 50 and figure 56.

Table 46. Key Observation points (KOP) applicable to the TGME Theta Hill Project Area

Key Observation Points (KOPs)				
	Location	**Visibility**	**Receptor Sensitivity**	**Motivation**
KOP1	Mount Sheba Private Nature Reserve – Lost City Hiking Trail lookout point, situated approximately 2.45km south west of the TGME Theta Hill Project Area	High	High – Hikers visiting the Mount Sheba Private Nature Reserve	The Iota Pit and Iota WR, Theta Main Pit, Theta Main Pit b, Theta Wishbone WRD, Browns Pit, Stockpiles and surface infrastructure will be visible in the panoramic view of the hiking trail. Since hikers utilise the trail for the scenic view, the proposed Theta Hill Project will have a significant negative visual impact on the hikers.
KOP2	Grootfontein Village approximately 2.92km south of the TGME Theta Hill Project Area	None	High – Permanent residents	The TGME Theta Hill Project Area will not be visible from the Grootfontein Village due to it being situated in a valley and the mountainous terrain (undulating topography) of the surrounding area screening the view.
KOP3	The R533 roadway approximately 3.68km east of the TGME Theta Hill Project Area	Moderate	Moderate – road users with a limited viewing time	The Theta Small North Pit will be visible, however due the distance, it is situated in the background of the road users and will not be clearly visible in the surrounding landscape.
KOP4	The R533 roadway approximately 2.29km north of the TGME Theta Hill Project Area	High	Moderate – road users with a limited viewing time	The Theta Main Pit, Theta Small North Pit, Theta Wishbone WRD and Iota WRD 1 and 2 will be visible in the distance. Due to the contrast between the bare soil exposed at the open pit, the waste rock dump and the green colour palette of the grassland, forest and plantations in the surrounding landscape, the proposed TGME Theta Hill Project Area will be clearly visible from this point on the road.
KOP5	Within the town of Pilgrim's Rest (downtown) situated approximately 1.3km north of the TGME Theta Hill Project Area	High	High – permanent residents	The Iota WRD 1, Stockpiles and Browns Pit will be clearly visible from the downtown area of Pilgrim's Rest due to its close proximity.
KOP 6	Within the town of Pilgrim's Rest (uptown) situated approximately 350m north of the TGME Theta Hill Project Area	High	High – permanent residents	The Theta Small North Pit, Iota Pit and Iota WRD 1 will be clearly visible from the uptown area of the town of Pilgrim's Rest, due to its close proximity.
KOP 7	Vaalhoek road situated approximately 2.47km north of the TGME Theta Hill Project Area	Marginal	Moderate – road users with a limited viewing time	The Theta Pit will be marginally visible in the distance, however due the distance, it is situated in the middle ground to background of the road users and will not be clearly visible in the surrounding landscape. Should the roadside vegetation and vegetation associated with the housing not be present the Iota WRD 1 will also be visible from this point.

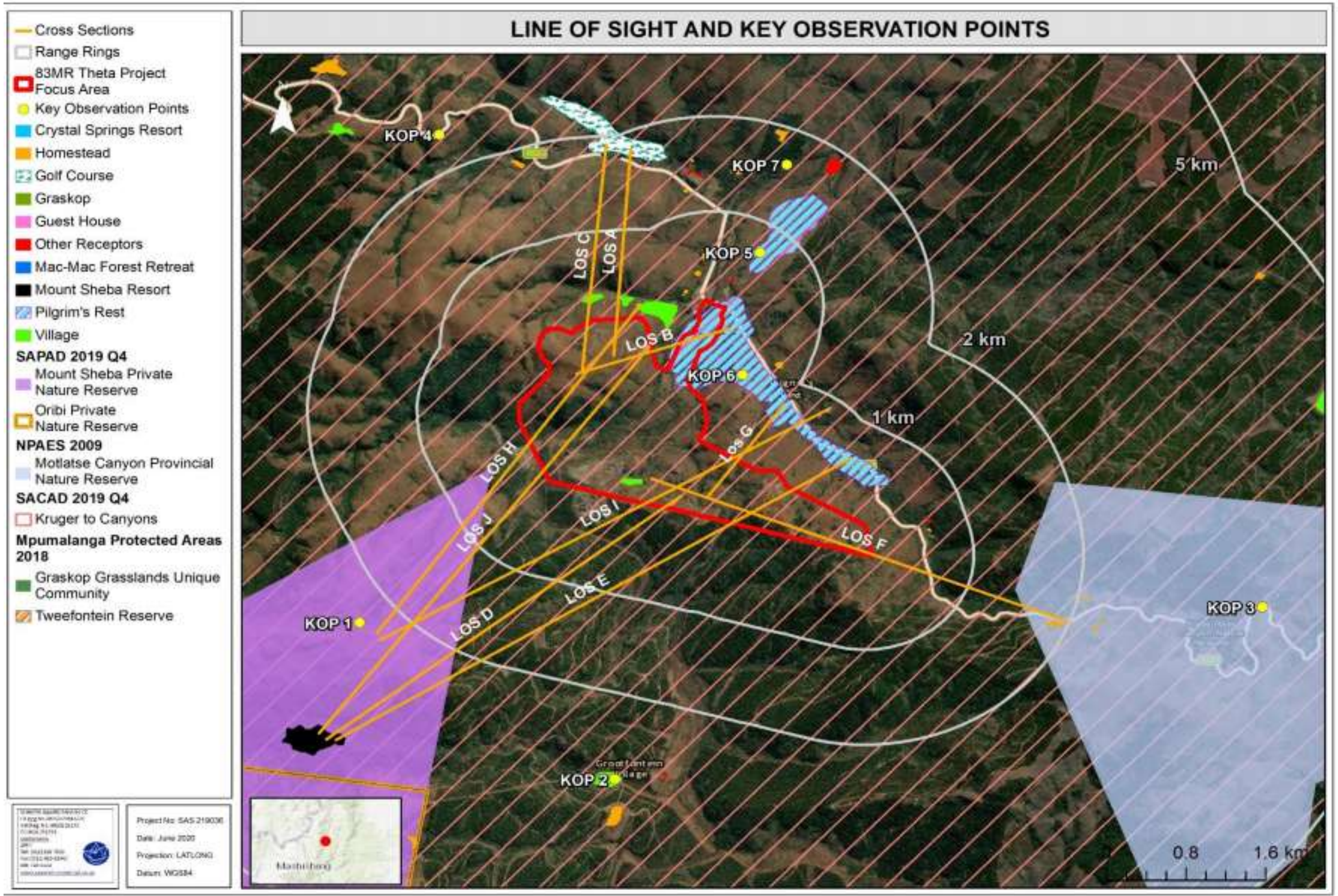


Figure 60. Map indicating the cross sections and Key Observations Points (KOPs) for the proposed Theta Hill Project

10.34. Description of the current land uses

The current land use activities associated with the study Area and surrounding areas are largely dominated by wilderness, forestry, grazing, residential as well as some mining operations. No commercial agricultural activities were observed occurring within the study Area and the immediate (at least within a 3 km radius) surrounding areas except forestry. Photo's below (Figure 61) provides as an illustration of the current land use together with the land use map as depicted in Figure 62.

Figure 61. Photographic presentation of the dominant land uses within the Focus Area

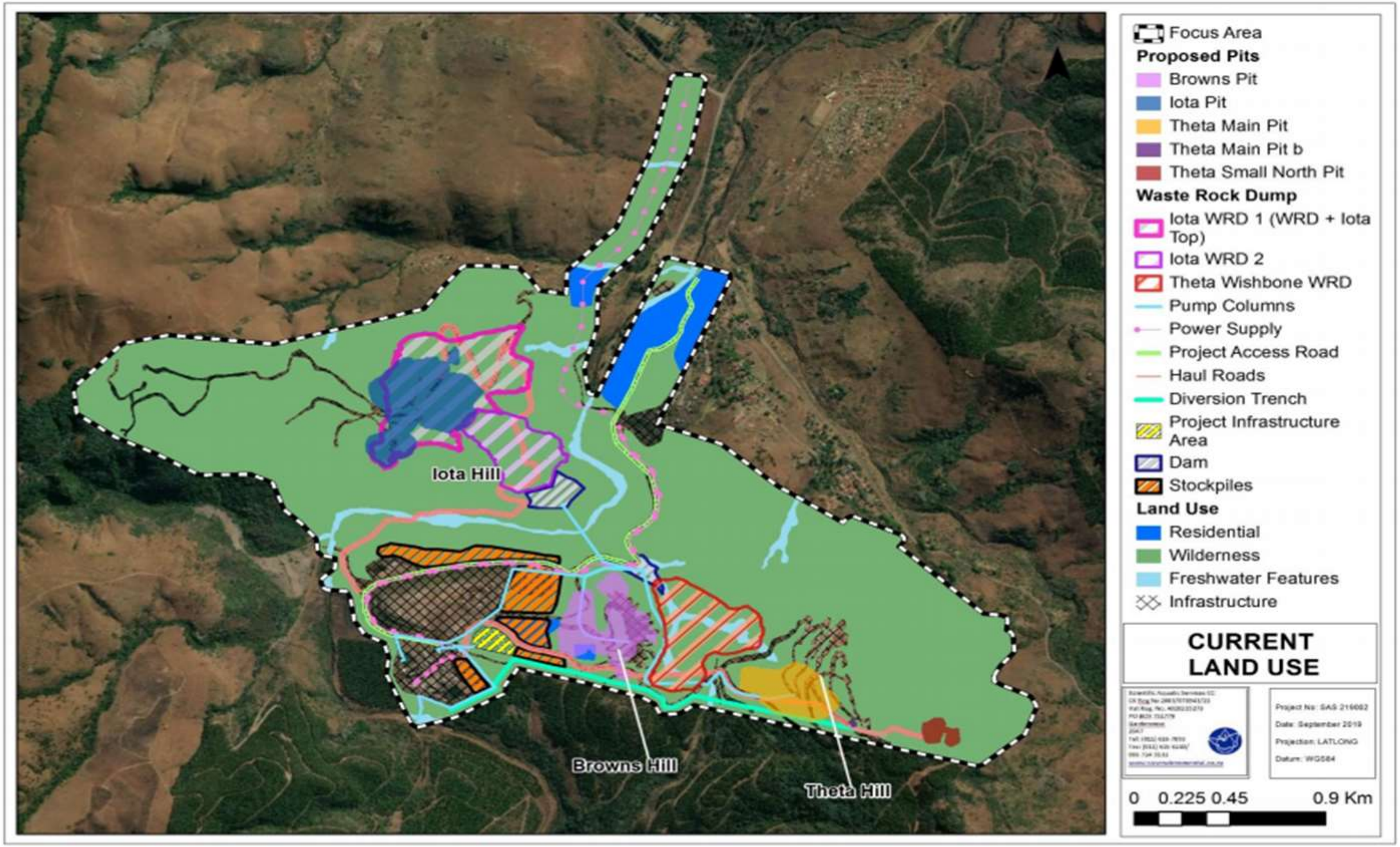


Figure 62. Map depicting land use within the study area

10.35. Description of specific environmental features and infrastructure on the site

Theta Hill study area is located within a semi-rural mountainous area, with gentle to steep undulating terrain, which form distinguishing topographical features in the form of prominent hills and outcrops that are dominated by grassland, commercial plantations and forests interspersed with watercourses, most notably the Blyde River, villages, the small town of Pilgrim's Rest and historic mining infrastructure. The town of Pilgrims Rest is 2,5km to the north east of the proposed new mining site. The 100m mining buffer from the boundary of the mining layout plan is reflected in figure 17. The railway road and main road through Pilgrims Rest is approximately 2km to the north of the site.

Historic mining infrastructure such as old mining shaft infrastructure and waste rock dumps are present in the area, forming part of the heritage and tourism attraction of the Pilgrim's Rest area. These areas have been decommissioned, and vegetation has been allowed to re-establish, therefore appearing similar to the surrounding natural areas from a visual perspective. No active mining is currently taking place within the TGME Theta Hill Project Area.

The following specific environmental features are present on site:

- According to the Mining and Biodiversity Guidelines database, the majority of the project footprint falls within an area considered to be of Highest Biodiversity Importance.
- The entire project footprint is located within the Kruger to Canyons Biosphere Reserve.
- The project footprint is located within the remaining extent of the Malmani Karstlands endangered (EN) ecosystem (National Threatened Ecosystems database, 2011);
- Various water catchment areas were identified within the study area, and the Blyde River traverse the site.;
- From a heritage value the town of Pilgrims Rest dates back 1873, with various historic appearances in and around the town

Available/existing infrastructure at the Project area includes:

- Tarred R533 regional main access road leading to the project;
- Single lane gravel site access road;
- Offices;
- Process plant and associated stores, ore handling and ore feed infrastructure;
- Tailings storage facility with return water dams;
- Workshops;
- Water reservoirs and water supply pumping system
- Plant change house facility;
- Stores and laydown yard;
- 6.6 kV line supplying power to the operation from the existing Eskom consumer substation;
- Site distribution substation and power distribution transformers;
- Process plant motor control centres;
- Process plant pollution control dams;
- Historic heap leach ponds;
- Fuel storage tanks;
- Salvage and reclamation yard;
- Access control fencing (process plant).

11. Impacts and Risks Identified

The EIA phase aims to identify the potential positive and negative biophysical, socio-economic and cultural impacts that may be associated with the proposed project. Anticipated impacts that were identified by the project team and through the stakeholder engagement process are summarised in Table 51.

Figure 63. Summary of Potential Environmental Impacts Associated with the Proposed Development

Element of Environment	Potential Impact Descriptions
Socio-Economic	Possible job opportunities during the construction and operation
Mine Rehabilitation and Closure	Possible impact on the end land-use
Topography	Changes in the topography in the area
Hydrogeology	Possible impact on groundwater contamination
Surface water	Possible impact on surface water contamination
Air Quality	Possible impact on Air Quality in the area
Climate Change	Possible contribution to climate change through emission of Green House Gases
Economic Impact	Potential impact on existing economic activities in the area
Noise	Possible generation of noise during construction and operation
Visual	Visual impact associated with the mine infrastructure and operation
Soils/Land Use/Land Capability	Loss of soil resource and change in land capability and land use
Biodiversity	Disturbance and loss of biodiversity, especially Species of Conservation Concern (SCC)
Aquatic ecology	Possible loss, sedimentation and contamination of the Blyde River.
Heritage	Possible impact on heritage and cultural resources in the area
Cumulative Impacts	Cumulative Impacts

These impacts have been further refined and assessed according to the quantitative impact assessment methodology in Section 12; the results are presented in Section 13 and Appendix 18.

12. Methodology used in determining the significance of environmental impacts

The main issues and potential impacts associated with the proposed project were determined at both a desktop level based on existing information as well as field work and specialist input. The following methodology was used:

- Identify potential sensitive environments and receptors that may be impacted on by the proposed project
- Identify the type of impacts that are most likely to occur (including cumulative impacts);
- Determine the nature and extent of the potential impacts during the various developmental phases, including, construction, operation and decommissioning;

- Identify potential No-Go areas (if applicable);
- Summarise the potential impacts that will be considered further in the EIA phase through detailed specialist studies.

Appendix 2 of GNR 982 requires the identification of the significance of potential impacts during scoping.

In order to adequately assess and evaluate the impacts and benefits associated with the project it was necessary to develop a methodology that could scientifically achieve this and to reduce the subjectivity involved in making such evaluations. For proper decision making it is necessary to assess all legal requirements and clearly defined criteria in order to accurately determine the significance of the predicted impacts or benefits on the surrounding natural and social environment.

This section aims to discuss the methodology to be followed to determine, assess and describe possible impacts as a result of project implementation. Impacts will be discussed in terms of the construction, operational and decommissioning/closure phases of the project. The evaluation of impacts is conducted in terms of the criteria discussed below. The various environmental impacts and benefits of this project will be discussed in terms of the nature of the impact, as well as the status, certainty, duration, magnitude, extent, intensity, frequency and significance. The significance rating of each impact will determine whether or not mitigation will be required.

The EIA will also aim to achieve the following:

- Provide an overall assessment of the social and biophysical environments affected by the proposed project;
- Assess the study area in terms of environmental criteria;
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts, and
- Successfully analyse all public issues raised to date in order to recommend appropriate mitigation measures for all social and environmental related concerns.
- Impacts and benefits are assessed before and after the application of mitigation measures.

The following section presents the criteria used to assess the potential impacts presented in the previous section.

12.1. Criteria for assigning significance to potential impacts

The evaluation of impacts is conducted in terms of the criteria detailed in Table 47 to Table 52. The various environmental impacts and benefits of this project are discussed in terms of impact status, extent, duration, probability, and intensity. Impact significance is regarded as the sum of the impact extent, duration, probability and intensity and a numerical rating system has been applied to evaluate impact significance. Therefore, an impact magnitude and significance rating is applied to rate each identified impact in terms of its overall magnitude and significance (Table 57).

In order to adequately assess and evaluate the impacts and benefits associated with the project, it was necessary to develop a methodology that would scientifically achieve this and to reduce the subjectivity involved in making such evaluations. To enable informed decision-making, it is necessary to assess all legal requirements and clearly defined criteria in order to accurately determine the significance of the predicted impact or benefit on the surrounding natural and social environment.

Impact Status

The nature or status of the impact is determined by the conditions of the environment prior to construction and operation. A discussion on the nature of the impact will include a description of what causes the effect, what will be affected and how it will be affected. The nature of the impact can be described as negative, positive or neutral.

Table 47. Status of Impact

Rating	Description	Quantitative Rating
Positive	A benefit to the receiving environment	P
Neutral	No cost or benefit to the receiving environment	-
Negative	A cost to the receiving environment	N

Impact Extent

The extent of an impact is considered as to whether impacts are either limited in extent or if it affects a wide area or group of people. Impact extent can be site specific (within the boundaries of the development area), local, regional or national and/or international.

Table 48. Extent of Impact

Rating	Description	Quantitative Rating
Low	Site Specific; Occurs within the site boundary	1
Medium	Local; Extends beyond the site boundary; Affects the immediate surrounding environment (i.e. up to 5 km from the Project Site boundary).	2
High	Regional; Extends far beyond the site boundary; Widespread effect (i.e. 5 km and more from the Project Site boundary).	3
Very High	National and/or international; Extends far beyond the site boundary; Widespread effect	4

Impact Duration

The duration of the impact refers to the time scale of the impact or benefit.

Table 49. Duration of Impact

Rating	Description	Quantitative Rating
Low	Short term; Quickly reversible; Less than the project lifespan; 0 – 5 years.	1
Medium	Medium term; Reversible over time; Approximate lifespan of the project; 5 – 17 years.	2
High	Long term; Permanent; Extends beyond the decommissioning phase; >17 years	3

Impact Probability

The probability of the impact describes the likelihood of the impact actually occurring.

Table 50. Probability of Impact

Rating	Description	Quantitative Rating
Improbable	Possibility of the impact materialising is negligible; Chance of occurrence <10%.	1
Probable	Possibility that the impact will materialise is likely; Chance of occurrence 10 – 49.9%	2
Highly Probable	It is expected that the impact will occur; Chance of occurrence 50 – 90%.	3
Definite	Impact will occur regardless of any prevention measures; Chance of occurrence >90%.	4
Definite and Cumulative	Impact will occur regardless of any prevention measures; Chance of occurrence >90% and is likely to result in in cumulative impacts	5

Impact Intensity

The intensity of the impact is determined to quantify the magnitude of the impacts and benefits associated with the proposed project.

Table 51. Intensity of Impact

Rating	Description	Quantitative Rating
Maximum Benefit	Where natural, cultural and / or social functions or processes are positively affected resulting in the maximum possible and permanent benefit.	+5
Significant Benefit	Where natural, cultural and / or social functions or processes are altered to the extent that it will result in temporary but significant benefit.	+4
Beneficial	Where the affected environment is altered but natural, cultural and / or social functions or processes continue, albeit in a modified, beneficial way.	+3
Minor Benefit	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are only marginally benefited	+2
Negligible Benefit	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are negligibly benefited.	+1
Neutral	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are not affected.	0
Negligible	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are negligibly affected	-1
Minor	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are only marginally affected.	-2
Average	Where the affected environment is altered but natural, cultural and / or social functions or processes continue, albeit in a modified way.	-3
Severe	Where natural, cultural and / or social functions or processes are altered to the extent that it will temporarily cease.	-4

Rating	Description	Quantitative Rating
Very Severe	Where natural, cultural and / or social functions or processes are altered to the extent that it will permanently cease.	-5

Impact Significance

The impact magnitude and significance rating is utilised to rate each identified impact in terms of its overall magnitude and significance.

Table 52. Impact Magnitude and Significance Rating

Impact	Rating	Description	Quantitative Rating
Positive	High	Of the highest positive order possible within the bounds of impacts that could occur. +	+12-16
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. Other means of achieving this benefit are approximately equal in time, cost and effort	+6-11
	Low	Impacts is of a low order and therefore likely to have a limited effect. Alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming	+ 1–5
No Impact	No Impact	Zero Impact	
Negative	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural, and economic activities of communities can continue unchanged.	-1-5
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly possible. Social cultural and economic activities of communities are changed but can be continued (albeit in a different form). Modification of the project design or alternative action may be required	-6-11
	High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or a combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt.	-12-16

13. The positive and negative impacts that the proposed activity and alternatives will have.

This section contains the assessment of potential positive and negative environmental impacts that can be caused by the proposed project. The impacts are linked to the proposed activities to be conducted during the project, broadly relating to pre-construction, construction, operations and decommissioning phases. Specific emphasis was placed on relevant environmental, social and economic impacts identified by the specialist studies, comments received during the stakeholder engagement process, issues highlighted by relevant authorities, as well as a professional judgement by the EAP team through appraisals of the project description, listed activities and the receiving environment.

The objectives were to determine impact significance and to then develop mitigation measures / solution to negate the impacts or to reduce the impacts to an acceptable level. Key potential positive and negative environmental issues relating to the proposed project were assessed according to the adopted methodology for assessing impacts as described in Section 12.

13.1. Pre-construction and Construction Phases

The pre-construction phase, also referred to as the planning phase, must take into account all the environmental concerns as identified in the specialist reports. This is essential to ensure that activities associated with all phases of the project have the lowest possible impact on the receiving environment.

During the pre-construction phase, the following main activities may take place:

- Mine planning and design for:
    - Identification and minimisation of environmental impacts associated with mining, based on site sensitivities;
    - Development of projects which, through mine planning for environmental protection, can meet community expectations.
    - Site surveillance for any Red Data Listed (RDL) species and Species of Conservation Concern (SCC;
    - Floral search and rescue / permitting Process, as stipulated under the Biodiversity Act;
    - Biodiversity offset and compensation plan Approval;
    - Prepare a Rehabilitation Plan, Biodiversity Action Plan, and Alien and Invasive Plant Management and Control Plan;
    - A summer biodiversity assessment is deemed essential and should ideally take place in both late November and early February to fully saturate the species lists developed as part of the study and to ensure the EMP is comprehensive in the management of floral SCC and robust to ensure appropriate execution;
    - A site-specific soil rehabilitation plan should be put in place prior to commencement of mining and related activities to ensure that the natural topography and wildlife/wilderness land capability is reinstated as far as is practicably possible post closure and residual impacts minimised;
    - Surveillance and marking of graves and cultural artefacts (fort);
    - If required, conduct a Phase 2 Heritage assessment, which may require the application for permits allowing for grave relocation and/or application for destruction permits from SAHRA Mpumalanga Province;
    - A buffer zone of at least 15m is created around the outer edges of the fort and that this is formalised with a suitable, permanent fence (with an access gate), before construction can commence.

- It is therefore proposed that the section of the track extending from the road towards TGME (at the old pump station) westwards across the metal bridge crossing the Blyde River westwards as far as possible be declared a no-go section and that it is protected and retained as a sample of this type of technology.
- Environmental noise management plan must be in place during all the phases;
- All acoustic screening measures must be in place before commissioning;
- Earth berms to be constructed along the perimeter, which face the abutting residential areas, of the Iota, Brown's and Theta Pits;
- Demarcation of no-go areas;
- Resettlement plan for Brown's Hill community;
- Integrated Water Use Licensee Application (IWULA) in terms of Section 40 of the NWA and Integrated Water & Waste Management Plan (IWWMP).
- Site preparation: removal of protected vegetation (shrubs and trees) to be relocated, monitored and maintained. Required permits for the removal and/or relocation of trees to be confirmed.

The construction phase of the project will entail:

- Earthworks:
  - Stripping / Storing of topsoil and sub-soil;
  - Stockpiling of topsoil and sub-soil;
  - Digging of trenches and foundations;
  - Establishing of stormwater controls as per the stormwater management plan;
- Civil works:
  - Installation of a liner for the PCD per the approved design report;
  - Erection of structures and general building activities;
  - Foundation excavations and compaction;
  - Concrete work including the mixing of concrete;
  - Steelwork including grinding and welding.
- Construction and ground preparation for the planned mining areas and infrastructure; Rehabilitation of disturbed areas after general site construction is completed.
- Construction and maintenance of stormwater management measures;
- Stockpiling of topsoil for the construction;
- Trench excavations;
- Backfilling as associated with the project;
- Re-vegetation trials;
- Preparation of mining activities associated with the project;
- Vegetation clearing of the construction footprint.

Where significance ratings differ between alternatives, these are indicated in the assessment tables. The impact assessment for the pre-construction and construction phases can be found in *Appendix 18*. The following impacts are envisaged during the pre-construction and construction phases.

13.1.1. Socio–Economic Impacts

Potential positive impact:

The following socio – economic impacts are envisaged as a result of the pre-construction and construction phases of the proposed project:

- Positive impact on employment: both the pre-construction and construction phases of the proposed project will create employment opportunities. Contractors will be appointed for the planned activities;
- Positive impacts on the local economy due to economic opportunities for local and regional business, e.g. supply of construction materials, accommodation, food and general supplies.

The construction phase of the proposed mine will involve activities such as engineering and design, site and infrastructure development, construction of buildings and facilities, installation of machinery and equipment, civil engineering works, and other business activities related to the construction of the mine.

The cumulative economic impact arising from the initial investment will be felt throughout the economy with windfall effects benefitting related sectors in the economy. The effect is allocated according to direct, indirect and induced impacts, together forming the "multiplier effect". The initial investment will give rise to a production effect where manufacturers and suppliers of goods and services would experience the need to expand current production levels by ramping up employee numbers and operations.

The Construction activities related to the project could also thus significantly increase local income levels. The GVA of the town is currently estimated in the region of R20 million. Direct spending on construction activities alone could be 3 times the current size of the Pilgrim's Rest economy. The direct income from construction activities is also expected to have some distributive impact as low-income households are expected to earn a slightly higher portion (25%) of total income compared to their 11% contribution in provincial income and 16% in national income.

Due to the limited spending opportunities of these increased wages and salaries in the local economy of Pilgrim's Rest, the adjacent towns of Sabie and Graskop is expected to receive spending benefits from increased income levels. Spending on construction suppliers/inputs will also mainly occur outside the local Pilgrim's Rest's economy. Within Pilgrim's Rest the income of the general dealer/hardware store could more than double, and activities could ensure a high turnover to the local petrol station. Some of the restaurants and accommodation facilities might also experience some increase in turnover during the short (18 month) construction boom.

It should, however, also be noted that the increased illegal mining activities have a significant existing impact on the water quality and quantity of the Blyde River. The flow of the river is being changed by their activities and the risks of sedimentation has increased. At this stage, the illegal mining activities cannot be controlled. Should the project not proceed, the illegal mining activities are anticipated to significantly increase, with dire consequences for the local and downstream environment. If the project is authorised, it is anticipated that TGME could assist in controlling and possibly eradicating the illegal mining activities through their safety and security measures to be put in place. Adherence to environmental regulations and guidelines can then be managed and audited through the formal processes.

Activities that have the potential, if unmitigated, to negatively affect the social and economic status quo include, but are not limited to:

- Formal/structured in-migration: workers associated with project moving into the local area due to a lack of semi-skilled and skilled positions within Pilgrim's Rest.
- Informal/unstructured in-migration: influx of individuals to an area in search of employment.
- Pressure on local accommodation, increased potential of land invasion and informal settlement on nearby landowners.
- Pressure on other public services due to influx of people.
- Health and safety risks: As mentioned above, the per capita crime rates in Pilgrim's Rest is already high. The informal influx of people could increase the risk of crime in the local area.
- Health and safety risk as a result of the movement of construction vehicles increasing the risk of accidents.
- Social conflict between newcomers and the local community could arise due to the factors above e.g. possible increase in crime due to these jobseekers being unemployed, increased pressure on already strained infrastructure and additional pressure on health and community services and competition for local jobs.
- The Brown's Hill settlement is located within the mining site. This settlement would be exposed to safety and health risks and resettlement is recommended.
- Close proximity to Dark's Gully and town of Pilgrims Rest.
- Clearing of land which may potentially impact on the sense of place.
- Construction vehicles could pose a threat to livestock that often graze along the access road to the TGME processing plant and within the proposed mining area. Livestock should thus be moved away from the construction activities and/or be fenced off. This could impact on the cattle owners' unauthorised/opportunistic use of the land for grazing.
- Construction activities could impact negatively on tourist numbers due to perceptions and communication of nuisance factors such as noise and dust, visual intrusions on sense of place and increase in criminal activities due to in-migration.
- Recruiting informally skilled agricultural, forestry or tourism workers could increase the training and recruiting costs for the local agricultural and forestry sector.

The socio-economic impacts are expected to be the same for both the proposed project layout alternatives investigated. Recommended mitigation measures are also similar for the various phases.

13.1.2. Biodiversity Impacts – Floral

The perceived impact significance of the proposed mining activities prior to mitigation affecting floral habitat, diversity and SCC are mostly high significance impacts, with some considered medium significance impacts. Even with effective mitigation taking place, most of the impacts will retain a high significance rating, with only a few reduced to a medium significance rating. Low significance ratings were only obtained for areas that are currently degraded and already have a loss of floral diversity and very few (if any) floral SCC present

Placement of infrastructure and mining activities within areas of intact floral habitat of the Mountain Outcrops Habitat, Montane Grasslands Habitat, the Riparian Habitat and indigenous Forest Remnants will negatively impact on floral diversity and habitat within the focus area and potentially within the region if mitigation measures are not fully implemented. The proposed project, if authorised, will result in the loss of not only rare and/or protected plant life, but also primary grasslands with habitat suitable to sustain and support diverse ecosystems. The impacts will be especially significant associated with the Iota Pit, Iota WRDs, Wishbone WRD and Theta Pits.

Threatened vegetation types and ecosystems will be directly impacted by the proposed Theta Project. The focus area is located within Optimal and Irreplaceable CBAs as well as an ESA: Protected Area Buffer (MBSP, 2014). The Mining and Biodiversity Guidelines (2013) consider the area of High to Highest Biodiversity Importance. Thus, no mining-related activities are deemed suitable to allow biodiversity targets to be met and the floral habitat is therefore of high conservation importance.

Activities that may have the potential, if unmitigated, to negatively affect the floral habitat integrity of the study area includes, but are not limited to, the following:

- Potential poorly planned placement of the proposed infrastructure within natural areas and areas identified as increasingly sensitive during ecological studies.
- Contaminated soils could lead to a loss of viable growing conditions for plants and result in a decrease of floral habitat, diversity, SCC and medicinal species – rehabilitation effort will also be increased as a result;
- Site clearing and the removal of vegetation leading to a loss of sensitive floral habitat and floral SCC as well as fragmentation of SCC populations;
- Continuous stretches of vegetation cleared along proposed linear developments leading to fragmented habitat and the potential loss of floral SCC, floral diversity and of favourable floral habitat
- Dust generated by mining activities;
- Proliferation of alien and invasive plant species resulting from increased disturbances;
- Movement of construction vehicles and access road construction through sensitive floral habitat;
- Waste from construction material, e.g. bricks, concrete and/or wood damaged or unused for various reasons during construction, leading to disturbance of natural vegetation;
- Destruction of vegetation due to unplanned construction related fires;
- Removal or collection of medicinal/ protected floral SCC beyond the project footprint area
- Soil compaction and erosion as a result of development activities and storm water runoff, reducing the efficiency of floral re-establishment and leading to a loss of favourable floral habitat and consequently a further loss of diversity.
- Increased human populations in the surrounding area leading to greater pressure on natural floral habitat.

The pre-construction phase is essential in ensuring that activities associated with all phases of the project have the lowest possible impact on the receiving environment. As part of the pre-construction phase, of utmost importance will be to prepare a Rehabilitation Plan, Biodiversity Action Plan, an Alien and Invasive Plant Management and Control Plan, Erosion Control Plan, as well as initiating an investigation into the applicability of a biodiversity offset. The construction phase will have the largest direct impact on floral ecology due to extensive vegetation clearing. The proposed project may result in the following *potential impacts* on the floral environment during the construction phase. The changes made in layout from the Scoping Phase layout to the EIA layout are mitigatory in themselves, as noted in the report.

- Loss of faunal habitat and ecological structure as a result of site clearing, alien invasive species, erosion, and general construction activities;
- Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal specie trapping;
- Impact of faunal species of conservational concern due to habitat loss and collision with construction vehicles;

- Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase.
- Based on the EIA Phase layout, the Iota Pit will have the most significant impact on floral ecology as it will impact on intact, sensitive and floristically diverse vegetation types. The southern portion of the Iota Pit traverses a steep cliff which could result in increased erosion risks and, hence, impact on lower slope vegetation and sedimentation of the Blyde River.
- Based on the revised layouts, the proposed Theta Pits mostly fall within fragmented Montane Grassland and the Degraded Habitat unit which mostly consists of plantations.
- The footprint of the Theta Pits will result in the loss of favourable floral habitat and diversity within the focus area, but the impact will be smaller than what was anticipated with the Scoping Phase layouts as the sensitive Mountain Outcrops have mostly been avoided. The footprint of the Theta Pits is expected to be smaller, and thus of lower impact significance, than the Iota Pit footprint.
- Historically, Browns Pit has experienced the most disturbance from mine-related activities. The habitat integrity is therefore compromised, which is evidenced by the irregular landscape profile and proliferation of AIPs. Nevertheless, the proposed Browns Pit will impact on floral ecology within its northern and southern portions where Montane Grassland and Mountain Outcrops are still present, fairly intact and harbour several floral SCC
- The Iota WRDs will impact on sensitive habitat – most significantly the primary Montane Grasslands and Mountain Outcrops. The Montane Grassland within the Iota WRD has lost some habitat integrity due to the construction of prospecting roads and encroaching AIPs. It can also be assumed that several floral SCC are present within the WRD footprint based on suitable habitat and field assessment results. Design of the WRD footprint should be reconsidered seeing that small sections fall within the recommended DAFF 30 m buffer around natural forests; development within the buffer should be avoided as much as possible. Erosion control will be essential for Iota WRD 2, especially given that the Blyde River is located downslope of this WRD.
- The Wishbone WRD will have a significant impact on floral habitat associated with the Freshwater Habitat unit and intact Montane Grassland. From a purely floral perspective, the Wishbone WRD will have a smaller impact to the Scoping Phase WRDs.
- The current proposed placement of the Project Infrastructure, Stockpiles and Dams is in vegetation that has been degraded, either as a result of previous mine activities or of the proliferation of alien invasive plants (AIPs).
- The proposed Stockpiles and the Balancing Dam are not anticipated to contribute to significant impacts on floral ecology, if mitigation measures are adhered to.
- The Browns Dam, although also considered to be within degraded vegetation, is located within the Freshwater Habitat and will require authorisation from the DWS.
- No floral SCC were recorded within the footprint of the Stockpiles and the Dams.
- The linear developments, particularly the construction of Haul Roads, will lead to continuous strips of vegetation being cleared regardless of placement on existing roads and, within Iota Hill, this will likely result in the clearing/removal of SCC;
- The linear developments, particularly the construction of Haul Roads, will lead to continuous strips of vegetation being cleared regardless of placement on existing roads and, within Iota Hill, this will likely result in the clearing/removal of SCC. Habitat fragmentation should be minimised when it comes to linear developments as diversity is lost when habitat becomes fragmented. This is already evident on both Iota and Theta Hills where floral diversity is lower, and AIP proliferation higher, where construction of prospecting roads has resulted in fragmented habitat. All

linear developments will require erosion monitoring and the control of AIPs (typical corridors of spread). The final EIA phase layout (as discussed in section 8.3) is expected to have a lower impact on biodiversity as it will result in a reduced footprint, with particular mention of SCC affected by the proposed infrastructure on the initial Scoping phase mining layout.

Even with mitigation, significant latent impacts on the receiving floral ecological environment are deemed highly likely.

Fragmentation of sensitive floral habitat as a result of mining activities, and limited rehabilitation opportunities, could result in the cumulative loss of floral diversity within the region. It would be ideal if all mining infrastructure and related activities could be kept to the habitat units considered to be of low ecological importance and sensitivity, but that is not an economically feasible option for the entire proposed Theta Project.

Biodiversity offsets are being investigated in conjunction with MTPA to compensate for the residual impacts that will result.

13.1.3. Biodiversity Impacts – Faunal

The following Biodiversity (faunal) impacts are envisaged as a result of the pre-construction and construction phases of the proposed project.

The faunal assessment revealed a two faunal Species of Conservation Concern (SCC) present in the focus area namely Pelea capreolus (Grey Rhebok, NT), Rhinolophus smithersi (Smithers Horseshoe Bat, NT) and Rhinolophus blasii (Blasius's Horseshoe Bat, NT).

Based on information gathered from databases as well as data obtained during the March 2019 and January 2020 assessments, there is an increased likelihood that other faunal SCC may also occur, either permanently or temporarily within the focus area. The habitat units within the focus area have all been exposed to varying levels of disturbances, with the net result being that the ecological sensitivity of the habitat units varied accordingly, fluctuating between High (Blyde River) to Moderately high (Mountain Outcrops, Montane Grasslands, Riparian and Forest Remnants), Intermediate (Forest Remnants) and Moderately low (Degraded Habitat).

The displacement of faunal species will have a knock-on effect in the surrounding areas due to the likely increased competition rates for remaining areas of habitat and food resources, as well as inter and intra- species competition.

The proposed haul roads are anticipated to impact upon the Blyde River itself as well as the riparian habitat due to the upgrading of the river crossing and road network. Clearing activities of the riparian areas associated with the haul roads is likely to result in the loss of habitat and displacement of amphibian and freshwater associated avifaunal species which inhabit and utilise these areas.

Several faunal SCC may be associated with the proposed areas of activities. As such, vegetation clearance during the construction phase, may result in the loss of faunal SCC from the focus areas as well as reduced numbers in the surrounding habitats which are impacted by edge effects. The loss of the habitat and faunal SCC therein will have a negative bearing on the current conservation efforts undertaken to ensure the continued survival of these species. The loss of SCC in the focus area is likely to have far reaching impacts as breeding pockets and individuals may be lost, of paramount concern with slower reproducing species and species that have a low fecundity rate.

Activities that may have the potential, if unmitigated, to negatively affect the faunal environment during the construction phase:

- Destruction of ecologically intact, irreplaceable faunal habitat;
- Loss of faunal habitat and habitat diversity;
- Loss of/altered faunal species diversity;
- Continued loss of faunal SCC and suitable habitat;
- Disturbed areas are highly unlikely to be rehabilitated to baseline levels of ecological functioning and significant loss of faunal habitat, species diversity and faunal SCC will most likely be permanent.

It is recommended that, if approval is granted, the proposed mining footprints and infrastructure locations be inspected by a suitably qualified and experienced ecologist to conduct thorough walkdowns of the proposed areas to minimize the possible impact to SCC.

13.1.4. Groundwater Impacts

Activities during the pre-construction and construction phases of the proposed project which have the potential to negatively impact on groundwater quality if unmitigated, include but is not limited to:

During construction of infrastructure and ground preparation for the mining operations, additional machinery is required, increasing the potential for fuel leakages and spillages that could infiltrate the underlying groundwater system. There is also a slight risk of contamination of the aquifer by spilling/leakages of wastewater from the construction site, including associated onsite sanitation facilities.

The removal of vegetation and topsoil in preparation for mining, will increase infiltration rates and lower evapotranspiration.

As the groundwater is deep (minimum 50m below the construction level), no groundwater impact of any kind is expected during the construction phase and as such this phase of the project was not rated.

13.1.5. Hydrology Impacts

The following possible surface water (hydrology) impacts are envisaged as a result of the pre-construction and construction phases of the proposed project.

The majority of the project is proposed to be developed on moderate to steep topography surrounding the Blyde River. The project is located in a high rainfall area, with a MAP of approximately 940 mm. The mean monthly discharge for the Blyde River in the vicinity of the project is relatively high, ranging from 2 mcm during the dry season, to 15 mcm during the wet season.

Soils are shallow with deep groundwater levels occurring in the vicinity of the project. No interflow soils or wetlands were identified within the project area, and therefore the contribution of groundwater to the surrounding drainage lines is limited. Monitoring has indicated that the quality of the water in the Blyde River is good, with an average pH of approximately 7.5, and low salinity and metal concentrations. Visual inspections of the Blyde River during the site visit indicated that suspended solids and turbidity levels are likely to be low.

Activities that may have the potential, if unmitigated, to negatively affect the surface water integrity of the study area during the construction phase includes, but is not limited to, the following:

- Removal of vegetation and the exposure of soils during construction, excavation of channels and trenches and the construction of berms,
- Stripping and stockpiling of topsoils;
- Widening of roads;
- Use of heavy machinery, trucks and vehicles for construction purposes;
- The construction of the Blyde River bridge crossing (due to the construction of the bridge there may be an increase in erosion, suspended solids, turbidity, sedimentation loss and alteration of the natural river flows on the Blyde);
- Loss of contributing catchment area impacting on water quantity in the Blyde River.

To mitigate these impacts, the following is recommended:

- Vegetation clearance and the exposure of soils must be kept to an absolute minimum;
- Temporary erosion control measures (e.g. sediment nets, berms, etc.) must be employed around working areas;
- The recommended water quality monitoring programme is implemented at least a year prior to construction, to obtain a suitable baseline for the wet and dry seasons;
- The proposed SWMP is implemented. Erosion and sediment control, as well as the containment and management of dirty water runoff, are the most important aspects to prevent negative impacts on the Blyde River;
- Energy dissipation measures are implemented at steep sections as well as at the exits of the proposed channels;
- The construction of the bridge over the Blyde River must take place during the low flow months. The river must be appropriately diverted around working areas, and the generation of sediment must be controlled through suitable measures. The river flows, geomorphology and aquatic fauna and flora must be considered in the design, construction and operation of the bridge;

13.1.6. Aquatic Environmental Impacts

Construction phase activities that may have the potential, if unmitigated, to negatively affect the watercourses associated with the project area include, but are not limited to, the following:

- Placement of infrastructure (including the Wishbone WRD, road crossings and fences) within preferential surface water flow paths and watercourses with riparian vegetation;
- The construction phase of the proposed new mining activities may potentially lead to destruction or alteration of habitat, in turn leading to loss or alteration of ecological structure and indirect impacts on freshwater resources.
- Clearing of vegetation prior to construction, and ongoing disturbances to vegetation during operational activities will result in exposed soils. This, combined with the steep slopes, will, in turn, increase the risk of erosion and potentially sedimentation of downgradient watercourses.
- Construction of hard standing areas that increase runoff volumes, including roads, buildings and paved areas;
- Canalisation of run-off may potentially lead to the creation of supercritical flows, which would lead to erosion and incision of drainage systems affected.
- Build-up of sediments and of contaminants in sediments leading to the creation of a sediment sink and chronic source of potential water contamination.
- Discharge and/or spills and seepage from mining surface infrastructure;
- Potential creation of Acid Mine Drainage (AMD) due to failure of tailings storage facilities;

- Construction of clean and dirty water separation areas leading to a loss of catchment yield;
- Construction of clean and dirty water separation areas leading to a loss of catchment yield; and
- Build-up of contaminants in sediments leading to the creation of a sediment sink and chronic source of potential water contamination.

From a hydropedological point of view, no significant impact on the watercourses is foreseen from the proposed mining project, due to the dominance of shallow responsive soils which are event driven. No interflow soils were identified within the study area, thus contribution of vadose zone to the freshwater resources is limited.

Although impact is anticipated to be low, if mitigation measures are carefully implemented and recommendations are considered, the impact significance can be further reduced to ensure that there is a minimised net loss of catchment yield to the watercourses of the region.

It is expected that the alternative of utilising infrastructure on the final EIA phase mining layout will have a lower significance impact on the watercourse systems within the study area as it will result in smaller watercourse areas that could be affected, compared to the Scoping phase layout plan. In particular the previous Theta/Browns waste rock dump option 1 was placed within a sensitive tributary.

The various watercourses were found to be of high ecological importance and sensitivity, ecologically important and sensitive, and to provide intermediate to moderately high levels of various ecological services such as biodiversity maintenance (especially in the upper reaches of systems[with special mention of the Blyde River] where disturbances were fewer), flood attenuation, assimilation of nutrients and toxicants and streamflow regulation. As a result of the increased ecological integrity and the degree to which ecoservices are provisioned, all systems were deemed to be of moderate to high ecological importance and sensitivity.

The aquatic assemblages of the various rivers and streams assessed (i.e. the Blyde River, the Peach Tree Stream and the Pilgrims Creek) of the assessed sites can be defined as being extremely sensitive to water quality changes as well as changes in flow regimes, with these two parameters also considered to be the most important ecological parameters in the Blyde River system (affected by both natural seasonal variation as well as existing anthropogenic impact) with more significant influence from the changes in flow regime. Two species of concern, the Treur River Barb (Enteromius cf treurensis) (Critically Endangered) and the Marico Barb (Entromius motebensis) (Near Threatened) were observed within and in the vicinity of the proposed project during the January 2020 assessment. Special mention is made of the Treur River Barb, which is isolated to a single population in the upper reaches of the Blyde River catchment.

The results of the geohydrological study (MVB Consulting, 2019) indicate that decant is not expected to occur during the life of the project. These impacts can mostly be managed, but if done so inadequately or not at all, the proposed TGME project may contribute to cumulative impacts on the freshwater resources within the Pilgrims Rest area, leading to a localized loss of freshwater resources and freshwater resource integrity. Whilst this may potentially contribute to impacts on the ecological integrity of downstream watercourses, the extent of impact is not expected to reach as far as tourism hotspots such as Bourke's Luck Potholes.

If the project is well managed, with specific mention of clean and dirty water separation and containment off all contaminated runoff, the extent and severity of impact is considered to be limited.

13.1.7. Air Quality Impacts

Activities that may have the potential, if unmitigated, to negatively affect the air quality of the study area, include but are not limited to, the following:

- Materials handling;
- Vehicle entrainment of dust on the haul roads;
- Windblown dust from stockpiles;
- Vehicle emissions;
- Bulk earthworks, operation of heavy machinery, and material movement could cause an increase in dust generation, PM_{10} and $PM_{2.5}$;
- Movement of vehicles and operation of machinery/equipment would increase the carbon emissions and ambient air pollutants (NO_2 and SO_2).

The resultant environmental air quality risks for sensitive receptors were ranked "low" during the construction phase, with mitigation in place. The final EIA phase mining layout will have an improved outcome on air quality impacts, as the reduction in the size of the pit shells would lead to a reduction of dust, PM_{10} and $PM_{2.5}$ generation compared to the original Scoping Phase mining layout plan.

Continuous ambient monitoring data for the project area was not available, and thus the cumulative values associated with the Theta Hill Project air quality impacts could not be assessed. Predicted impacts are therefore limited to incremental impacts. It is recommended that ambient monitoring of the project area be conducted to determine the future cumulative impact.

13.1.8. Visual Impacts

The following visual impacts are envisaged as a result of the pre-construction and construction phases of the proposed project:

Several potential risks to the receiving aesthetic and visual environment as a result of the proposed mining operation have been identified, relating to impacts on visual character and sense of place, visual intrusion and visibility of mining infrastructure. Based on the impact assessment, it was found that the various potential visual impacts identified will be most significant during the operational phase of the project.

Activities that may have the potential, if unmitigated, to negatively affect the visual impact of the study area, include but are not limited to, the following:

- Site clearing, including the removal of topsoil and vegetation;
- Visual intrusion as a result of the movement of vehicles and machinery and the erection of contractor camps;
- Use of security lighting during the construction phase;
- Planning and placement of mining infrastructure within sensitive habitat such as the freshwater resources (Blyde River and tributaries thereof) as well as the high lying hills, which will alter the landscape, terrain and scenic value of the resources;
- The proposed mining activities will have a significant negative visual impact on the sense of place of the area, especially for people residing and visiting the town of Pilgrim's Rest and hikers utilising the Lost City Hiking Trail within the Mount Sheba Private Nature Reserve (PNR);
- The expected level of visual intrusion through the development of a mine within the TGME Theta Hill Project Area is considered high due to the proposed project

situated on hilltops with short vegetation cover - mostly grassland (medium VAC), and its close proximity to the town of Pilgrim's Rest and the Lost City Hiking Trail. within the Mount Sheba PNR

The Theta Hill Project Area is located in an area where commercial forestry, agricultural activities, historic and existing mining activities, settlements and the town of Pilgrim's Rest are present in the landscape. Cumulative impacts as a result of these land uses results in the loss of aesthetically pleasing mountainous terrain.

13.1.9. Noise Impacts

Activities that may have the potential, if unmitigated, to create negative noise impacts during the pre-construction and construction phases of the proposed project:

- Clearing and stripping of topsoil and vegetation at opencast footprint;
- Construction of the waste rock dumps;
- Construction of the infrastructure;
- Civil construction activities;
- Construction of haul roads.

The potential environmental impact will be insignificant during the construction and decommissioning phases (provided that the noise mitigatory measures will be in place) and moderate during the operational phase at the abutting residential areas. NO blasting will be required as part of the mining method proposed.

13.1.10. Soils, Land Use and Land Capability Impacts

The following impacts on soils, land use and land capability are envisaged as a result of the pre-construction and construction phases of the proposed project:

- The Focus Area is characterised by steep and gradual slopes in areas comprised of shallow soils. The mining activities will be located among the mountainous setting and thus the risk of *erosion* is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. The significance of this impact is anticipated to be moderate and can be reduced to a moderately low impact if mitigation measures outlined in this document are adhered to;
- Heavy equipment traffic during construction and mining operation activities is anticipated to cause *soil compaction*. The severity of this impact is anticipated to be low as Alluvial soils (Dundee) contain minimal clay. Soils with a relatively shallow bedrock and lithocutanic character (partly weathered rock material) such as the Glenrosa/Mispah soil forms are anticipated to be less at risk due to the resistance offered by the underlying bedrock;
- All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leaks in construction developments. The significance of soil contamination is considered to be medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern.

It is recommended that strict contamination (i.e. accidental spill and leakages) and waste management protocols and activity-specific EMP guidelines should be adhered to during the construction activities.

The proposed mining and related infrastructure are not anticipated to result in a significant loss of agricultural land capability since the majority of the soils where mining and associated infrastructure is to occur are shallow and disturbed in some instances.

The proposed mining project is not anticipated to cause significant cumulative loss of herbaceous material for grazing after mitigation measures have been put in place. It should be noted that cumulative loss of wilderness soils is likely to occur during opencast mining activities, particularly on sloping areas, some of which will be unavoidable even when mitigation measures have been implemented.

13.1.11. Heritage Resources

For the proposed Theta project, the assessment has determined that, whilst there are a number of historical sites, features or objects of heritage significance in the area around Pilgrim's Rest, occur in the study area. If heritage features are identified during construction, as stated in the management recommendation, these finds would have to be assessed by a specialist, after which a decision will be made regarding the application for relevant permits.

During the survey, the following sites, features or objects of cultural significance were identified, only some of which are deemed to be conservation/documentation worthy:

- Currently, the Theta Pit boundary approaches the fort to within about 22m. It is recommended that a buffer zone of at least 15m is created around the outer edges of the fort and that this is formalised with a suitable, permanent fence (with an access gate).
- Cocopan track and bridge: A section of the remaining cocopan track will be impacted on due to the proposed construction of a pollution control dam (PCD). "Built" adits (situated outside the development footprint, and avoid if possible)
- Various Burial sites and Cemetery (situated outside the development footprint, and avoid if possible)

If any of the identified structures is to be demolished, it must be fully documented – mapped, photographed and described – beforehand. A section of the track will be impacted on by a proposed new haul road.

As an off-set to this, it is proposed that the section of the track extending from the road towards TGME (at the old pump station) westwards to the metal bridge across the Blyde River be declared a no-go section and that it is protected and retained as a sample of this type of technology.

The site of historic significance closest to Theta Hill Pit, namely the old fort, can easily be avoided as it falls outside the mining area – please just note the buffer area needed.

Should archaeologically important sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

13.1.12. Topography

The construction phase will have an inevitable and irreversible impact on the topography of the study area. Activities that will negatively affect the topography include, but are not limited to, the following:

- Stripping of overburden in preparation for mining operations;
- Commencement of stockpiles.

13.1.13. Climate Change Impacts

The calculated impacts on climate change during the construction phase indicate that emissions during this phase would account for ±19% of the total emissions of GHG during the project's lifetime.

The following climate change impacts are envisaged as a result of the pre-construction and construction phases of the proposed project

The emissions from the proposed Theta Mine, are likely to have environmental impacts with a low (during construction) significance score. The duration that greenhouse gases are assumed to remain in the atmosphere renders the impact effectively irreversible with the impacts of anthropogenic climate change, in many cases resulting in the irreversible loss of resources.

The Green House Gas (GHG) emissions produced as a result of constructing the proposed Theta Project will contribute to the global phenomenon of anthropogenic climate change. Numerous global changes are likely to manifest due to climate change, although none that can be attributed directly or indirectly to the specific GHG emissions of any individual source, such as the proposed mining project.

Emissions from the consumption of grid-based electricity (energy indirect emissions) during operations accounts for the majority (48%) of the project's lifetime emissions. The bulk of the other indirect emissions (scope 3) arise from purchased goods and services (35%). This category refers to the emissions that arise from goods and services such as concrete, steel, water, cyanide and lime. Steel makes up the bulk of these emissions.

Cumulative impacts: The emissions from the construction phase of the mine are globally cumulative in their impact, although minimal, due to the global scope of climate change and the long timeframes that GHG emissions are expected to remain in the atmosphere.

Climate change is expected to have the following impacts on the Theta Project:

- Rising temperatures 2-2.5°C, and potentially up to 6°C;
- Changing rainfall patterns;
- Climatic changes resulting in heat waves, longer periods of drought and extreme rainfall events.

Resulting from these changes, the following impacts are anticipated:

- Health risks resulting from the higher temperatures and severe storms;
- Increased dust generation and resulting dust management requirements during extended dry periods;
- Flooding of work areas and roads;
- Changes in water availability;
- Increased risk of soil erosion due to heavy rainfall and extended dry periods;
- Value Chain: vulnerability to interruptions in electricity and diesel supply.

13.1.14. Traffic

The movement of construction vehicles in the project area will result in an increase in traffic on the roads but will be bound to the study area only. Haul roads will be utilised for the transport of ore from the mining areas to the various stockpiles and the WRD located on the project area. The haul roads will be constructed to cater for continuous two-way traffic of fully loaded articulated dump trucks. The position of the new haul roads is depicted in Figure 14.

No provincial or local roads within Pilgrims Rest will be used during the construction phase, except for personnel travelling to work. The main tarred road in the study area that is expected to be used is the R533 between Lydenburg, Pilgrim's Rest, Sabie and Graskop.

13.1.15. Rehabilitation and Closure Action Plan

The following rehabilitation and closure activities are recommended to be undertaken during the pre-construction and construction phase:

Search and rescue program

It is recommended that, as one of the first pre-mining site preparations, a search-and-rescue program should be implemented to salvage fauna and flora SCC. This should be executed for all potentially disturbed sites. Those species that occur within the mining perimeter but outside of the actively mined areas, should be identified and protected from accidental disturbance through clear marking or fencing; this should remain in place for the duration of the mining activity. A search-and-rescue program is subject to the necessary permitting as well as the identification of a suitable relocation site or temporary holding facility.

On-site nursery

It is recommended that an on-site nursery be established which can nurture and propagate as many as practicably possible of the salvaged plant species. This will facilitate future transplanting as part of the rehabilitation process. A site should be identified during the design and construction phase which is large enough for the nursery and has access to water for irrigation purposes. The expertise of ecologists and horticulturalists should be acquired to recommend specific nursery practices.

Topsoil stripping and storing

Stripping and storing of the topsoil from the proposed mining footprints, is considered essential. A complete topsoil management program is required to regulate the depth of stripping on each of the areas in order to prevent mixing with the underlying sub-soil layers. Ideally, topsoil should be stripped and directly applied as part of a progressive rehabilitation strategy, but in some instances, it is required to be stored for longer periods. A topsoil management program should address:

- The ideal location for short- and long term storing of the topsoil (<6 months and >6 months respectively);
- The appropriate height of the stockpiles to maintain healthy soil chemistry;
- Erosion control measures for the duration of storage;
- Revegetation of the stockpile to encourage sub-surface soil microbial activities;
- Alien and invasive control for the entire time of storage.

Re-vegetation trials

Re-vegetation trials can be invaluable in establishing more practical, successful rehabilitation methods, especially considering that a part of the site is located in a CBA. Trial sites should be identified, potentially on previously disturbed areas near the project site that represent a near identical scenario. The trials should be purposed to test various growth mediums on different slope gradients in order to monitor the success of vegetation establishment, thereby developing achievable biodiversity targets. The data should translate to the formulation of an appropriate cover system, erosion control measures and planting regimes. Such trial programs should be done as scientifically as possible and be properly documented by a knowledgeable person in order to achieve the most value from them.

13.2. Operational Phase

During the operational phase, the following main activities will take place:

- Operation mining of opencast areas and concurrent rehabilitation;
- Operation and use of diesel storage;
- Water and stormwater management;
- Operation of infrastructure and roads;
- Operation of met grade product stockpile and topsoil stockpiles;
- Machinery movement during mining activities, including ore and waste transportation.

Where significance ratings differ between alternatives, these are indicated in the assessment tables. The impact assessment for the operational phase can be found in Appendix 18. The following impacts are envisaged during the operational phase.

13.2.1. Socio-Economic Impact

The Theta project is expected to have the following positive socio-economic impacts during the operation phase of the project:

Direct employment and income:

The operational phase related to the mining application is expected to last 4 full years over a 5-year period. Between 400 and 450 direct jobs could be created over the four years, representing close to 2% of total employment across the whole TCLM - a very high percentage for any single project. The jobs are directly related to the proposed mining activities and will be created as a combination of in-house jobs by the mining license holder itself, the mining contractor as well as service providers such as security, tailings facility management, administration and gold handling. It is estimated that 15% of the direct jobs will be skilled; 63% semi-skilled and 22% could be unskilled/elementary jobs.

Most of these jobs will be contracted through service providers and the mine contract manager on behalf of TGME. The potential number of local jobs on the mine could well double local employment figures in Pilgrim's Rest. Most of these direct job opportunities for Pilgrim's rest will benefit low income households.

The operations will invest 1.2% of its annual payroll (between R1.2m and R1.5m per annum for 4 full years) in skills development activities as provided for in a Social and Labour Plan (SLP) budget. The SLP should also make provision for a skills development, career progression, mentorship, bursary and internship and employment equity plans.

Flow-on employment and income:

In addition to the direct employment and income generation of the mine, its supply spending and further induced spending due to higher income levels could add some flow-on income of between R50m and R100m to the regional economy during mining operations. Between 130 and 250 flow-on job opportunities could also result due to mining activities. Most of the additional income and employment will be generated in the larger regional economy due to the limited economic activity in Pilgrim's Rest.

While a large portion of skilled and semi-skilled mine workers might not stay in Pilgrim's Rest, they will still spend their working days close to the town; if they should spend a small portion of their income in town on fuel, restaurants and basic food stuffs (bread, milk etc.), it could also have a relatively high impact on income levels in the town. It is estimated that this joint supply and induced spending impact could potentially increase total sales in Pilgrim's Rest on average between R6m and R8m per annum over the 5-year period

Increase in Public Revenues:

The project could possibly create between R600m and R730m in public revenues over the 5-year period. This is made up of royalties, National Skills Fund, a variety of taxes and inputs into local economic development, and accounts for 35% of the project's total GVA. In context, this is more than the norm of around 26% of the National GVA which arises from taxes.

Activities that have the potential, if unmitigated, to negatively affect the social and economic status quo include, but are not limited to:

- Informal/unstructured in-migration (job-seekers looking for economic opportunities into the area): The negative secondary impacts related to project-induced in-migration is the same as during the construction phase and include pressure on scares local accommodation and land, public services (municipal services, roads, health and education), health and safety risks as well as potential negative impacts on community cohesion resulting in conflicts;
- The mining activities could have a negative sense of place on the predominantly rural and historic character of Pilgrim's Rest due to visual scarring of the landscape as well as a potential increase in noise and activity levels. The mine will be operational 6 days per week (excluding Sundays) and work will be done in two shifts 6am to 4pm and 4pm to 2am. This risk is rated medium.
- The proposed mining activities would be in very close proximity to Brown's Hill. Although the impact on the Brown's Hill Community is rated as medium, the location of the settlement requires resettlement due to the Brown's Hill Pit and the topsoil stockpile being planned within this area.
- Impacts that are rated medium that would have negative intrusion impacts on the residents of Darks Gully relate to the possible noise and dust pollution impacts as well as the close proximity of the Iota WRD1.
- In terms of the mine's potential impact on Pilgrim's Rest's tourism industry, there are conflicting views on the actual nature of the impact. While nature-based tourist activities in Pilgrim's rest are at a high risk to experience negative economic impacts from the mining project, other businesses could experience positive impacts. The risk however remains that the nett impact of the mining project could be some out-crowding of long-term tourism jobs while offering only short term benefits to the town. This risk is rated medium.
- Illegal miners already present in the local area form factions with regular violent infighting. These illegal miners could come in conflict with mine workers. Potential loss of gold through smuggling could further result in negative impacts on the formalised gold mining companies with subsequent negative local economic impacts filtering through to grassroots level.
- Possible dust pollution as a result of the mining activities, WRD's and vehicle movement could impact on the timber companies operating in the area (SAFCOL and York Timber). This could again impact on their compliance to the Forest Stewardship Certification (FSC) which is critical for their economic sustainability and maintaining of their current markets.
- The livelihood of the farmers, community members, as well as the timber industry in the area and the residents in the towns depends on their water quality and quantity. In this regard, it should however be noted that the geohydrology assessment's groundwater model concluded that the "contaminant risk to the aquifer system and the Blyde River is minimal". Even though the risk was found to be minimal, from a socio-economic perspective it must still be noted that any possible negative impacts on ground and surface water could have a negative impact.

- Illegal Mining: Increased illegal mining activities have a significant existing impact on the water quality and quantity of the Blyde River.
- The flow of the river is being changed by their activities and the risks of sedimentation has increased. At this stage, the illegal mining activities cannot be controlled. Should the project not proceed, the illegal mining activities are anticipated to significantly increase, with dire consequences for the local and downstream environment. If the project is authorised, it is anticipated that TGME could assist in controlling and possibly eradicating the illegal mining activities through their safety and security measures to be put in place. Adherence to environmental regulations and guidelines can then be managed and audited through the formal processes.

Activities that have the potential, if unmitigated, to negatively affect the economic sectors in and around Pilgrim's Rest as well as the larger downstream region include but are not limited to:

- Recruiting informally skilled agricultural or forestry workers could increase the training and recruiting costs for these sectors.
- There could be an intrusion on forestry and conservation areas, with safety and fire risks as a result of the presence and movement of workers in close proximity to these areas.
- Mining activities could have a negative sense of place on the predominantly rural and historic character of Pilgrim's Rest due to visual scarring of the landscape as well as a potential increase in noise and activity levels. The mine will be operational 6 days per week (excluding Sundays) and daily working hours will be from 6am to 2am. This risk is rated medium.
- Increased traffic on the roads could have higher safety risks to general road users, tourists, cyclists and pedestrians.

From a socio–economical perspective, there is no preferred mine layout alternative, as the impact on the socio–economic environment remains consistent for both layout alternatives.

13.2.2. Biodiversity - Floral

Activities that may have the potential, if unmitigated, to negatively affect the floral habitat integrity of the study area includes, but are not limited to, the following:

- Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC, and/or the harvesting of protected floral species by mining and operational personnel;
- Loss of floral habitat due to removal of material from opencast pits, as well as vehicle access and other operational activities;
- Further loss of floral habitat beyond the project footprint as a result of:
    - vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps;
    - on-going disturbance of soils due to operational activities;
    - edge effects associated with mining activities.
- Increased introduction and proliferation of alien and invasive plant species and further transformation of natural habitat beyond the project footprint;
- Risk of discharge and contamination from all operational facilities may pollute receiving environment leading to altered floral habitat;
- Seepage affecting soils and the groundwater regime leading to altered floral habitat;

- On-going disturbance may lead to erosion and sedimentation resulting the further loss of favourable floral habitat beyond the project footprint;
- Additional pressure on floral habitat by increased human populations associated with the proposed mine leading to a loss of floral habitat and increased harvesting of medicinal species and floral SCC;
- Increased fire frequency and intensity, as well as uncontrolled fires during operational activities due to increased human activity impacting on floral communities;
- Potential failure to implement a biodiversity action plan, rehabilitation plan and alien floral control plan during the operational phase, potentially leading to a permanent transformation of floral habitat due to long-term degradation.

13.2.3. Biodiversity – Faunal

Activities that have the potential, if unmitigated, to negatively affect the Faunal Biodiversity include, but are not limited to, the following:

- Ongoing disturbance of habitat due to operational activities leading to a loss of sensitive species;
- Increased introduction and proliferation of alien plant species and further transformation of faunal habitat leading to a loss of faunal diversity;
- Risk of contamination from operational facilities may pollute receiving environment leading to a loss of faunal SCC;
- Increased risk of poaching and trapping of sensitive species;
- Collision of vehicles with faunal species;
- Additional pressure on sensitive species by increased human populations associated with the proposed mine;
- Potential increased fire frequency during operation leading to a loss of sensitive species;
- On-going risk of contamination from mining facilities beyond closure leading to permanent impact on amphibian life and fauna dependent on the Blyde River for sustenance.

13.2.4. Groundwater Impacts

The waste assessment showed that the waste material is largely inert, and seepage of contaminants is unlikely. The seepage rate is also expected to be low, which will minimise the volume of water seeping through the rehabilitated opencast areas.

Activities that have the potential, if unmitigated, to negatively affect the groundwater include, but are not limited to, the following:

- Assessment of the waste material which indicated low potential risk
- Geochemical modelling that showed sufficient neutralising and adsorption capacity to prevent contaminants from reaching the groundwater table
- Management measures such as compaction and the installation of a drain system at the base of the waste pile
- Monitoring to assess the impact

Considering all aspects, utilising the final EIA phase mining layout is considered the most suitable. A positive aspect of this layout is that the Iota pit will be largely backfilled.

The geochemical modelling has shown that this lowers the potential for the mobilisation of contaminants. The remaining waste rock is distributed over a smaller area. Although steep slopes remain a problem, the monitoring of impacts will be easier.

13.2.5. Hydrology Impacts

Aspects that have the potential, if unmitigated, to negatively affect surface water quality include, but are not limited to, the following:

- Loss of hydrological connection and function (note that the non-perennial drainage lines in the project area are not fed by wetlands or groundwater);
- Loss of water quantity reporting to the Blyde River;
- Alteration of surface water drainage patterns;
- Damming/ponding of water upslope of the WRDs;
- Runoff and spills from the mine infrastructure impacting on the water quality of the Blyde River. Parameters of concern include elevated suspended solids, turbidity, dissolved salts (TDS), heavy metals and pH (it must be noted that the geochemical assessment indicated an unlikely potential for AMD);
- During the dry months, approximately 20,000 m^3/month of water may need to be abstracted from the Blyde River, which will result in a loss of quantity flowing downstream. The mean monthly runoff during the dry months for quaternary catchment B60A is approximately 2 mcm; 20,000 m3/month is less than 1% of the mean monthly runoff;
- Potential hydrocarbon spillages washed into downslope watercourses impacting on water quality;
- Erosion along roads leading to increased suspended solids and sedimentation of downslope watercourses impacting on water quality.

During the *operational phase*, open pit mining through non-perennial drainage lines, and the deposition of waste rock within these lines, will need to be mitigated as far as possible, to reduce high impacts from occurring. Furthermore, runoff from these facilities must be captured and contained in a closed system, to prevent negative impacts on water quality.

Planned mitigatory measures include the proposed design of berms and run-off channels around pits, WRDs and roads as detailed in section 5 of this document.

In terms of the preferred layout option, the EIA layout option is preferred, as potential impacts are confined to a single valley for the Wishbone WRD, where dirty water runoff can be controlled and contained, in comparison to a number of WRDs as proposed in the original layout.

13.2.6. Aquatic Systems

Aspects that have the potential, if unmitigated, to negatively affect the aquatic ecosystems include, but are not limited to, the following

- Loss of catchment yield and surface water recharge, potential creation of seepage (from the WRD) within the active drainage systems which can lead to a loss of general loss of aquatic and riparian biodiversity as well as SCCs, impaired water quality, loss of instream habitat integrity and overall EcoStatus as well as impacts to aquatic resources further downstream of the proposed mining activity
- Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soils and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems (watercourses);
- Potential for erosion of terrestrial areas as a result of the formation of preferential flow paths, leading to sedimentation of the watercourses;
- Reduction in volume of water entering the watercourses, leading to loss of recharge (and thus desiccation) of downstream system;
- Altered vegetation communities due to moisture stress.

- Possible contamination of surface and ground water, leading to impaired water quality and salination of soils within riparian areas;
- Sedimentation of watercourses could lead to altered water quality, altered channel integrity and altered vegetation community structures;
- Changes to vegetation growth due to increased nutrients as a result of altered groundwater properties.
- Proliferation of alien vegetation due to disturbances, which will impact natural flow regimes;
- Potential visual scars, affecting aesthetic features and faunal habitat.

Operational activities may result in the contamination of soils and groundwater by, for example, increased salt loads and Chemical Pollutants of Concern (CPC's). Such contamination may, in turn, lead to the alteration or loss of habitat for floral and faunal species associated with these freshwater areas.

As discussed in 13.1.6, the final EIA mine layout plan will result in lower risk of impacts than the original scoping phase layout.

13.2.7. Air Quality Impacts

Activities that may have the potential, if unmitigated, to negatively affect the air quality of the study area, include but are not limited to, the following:

- Materials handling;
- Vehicle entrainment of dust on the haul roads;
- Windblown dust from stockpiles;
- Vehicle emissions;
- Bulk earthworks, operation of heavy machinery, and material movement could cause an increase in dust generation, PM_{10} and $PM_{2.5}$;
- Movement of vehicles and operation of machinery/equipment would increase the carbon emissions and ambient air pollutants (NO_2 and SO_2).

As for the construction phase, it is expected that the alternative of using the final EIA phase mining layout will have less impact on air quality when compared to the proposed Scoping Phase mining layout plan. The resultant environmental air quality risks for sensitive receptors were ranked "low" during the mitigated operational phase.

13.2.8. Visual Impacts

Activities that may have the potential, if unmitigated, to negatively affect the visual impact of the study area, include but are not limited to, the following:

- Ongoing mining activities including removal of ore, transportation thereof and potentially increasing the height of the stockpiles and WRDs;
- Potential increased introduction and proliferation of alien plant species leading to further change in landscape character;
- Continued opencast mining and vehicular movement leading to increased dust suspension;
- Disturbance of soils and ongoing erosion due to mining operational activities;
- Ground excavation leading to increased dust suspension;
- Increased amount of human activity and presence of mining vehicles on local roads
- Ongoing vegetation clearing, scarring of the terrain and altering of landforms or contours
- Exterior lighting around the offices, parking areas as well as associated infrastructure and opencast footprint areas
- Lighting at night from operational vehicles

- Security and other lighting around and on support structures could also contribute to light pollution
- Maintenance activities conducted at night

The operation of the mine will inevitably change the landscape. Rehabilitation will mitigate this to some extent but it can never be restored.

13.2.9. Noise Impacts

Activities that may have the potential, if unmitigated, to negatively affect the visual impact of the study area, include but are not limited to, the following:

- Eccentric ripper activities;
- Crushing activities;
- Pit activities;
- ROM;
- Hauling of material to the plant;
- Hauling of waste rock to the waste rock dump;
- Traffic;
- Emergency generator.

As discussed in section 10.30, the various noise intrusion levels during the construction phase at the Iota, Brown's and Theta Hill pits will be different depending on the distance between the activities and the abutting residential properties. In most cases, the noise disturbance rating is Low to Not Audible. However, there are areas where the threshold values of 3.05mm/s to 6.10mm/s for ground vibration at historical properties (British Standards BS 738525) will be exceeded.

The potential environmental noise intrusion levels can however be controlled by means of approved acoustic screening measures, state of the art equipment, proper noise management principles and compliance to the Noise Control Regulations, 1994. The environmental noise management plan must be in place during all the phases of the open cast pit activities so as to identify any noise intrusion and/or ground vibration increase on a pro-active basis and to address the problem accordingly.

The potential environmental impact at the abutting residential areas will be moderate during the operational phase. NO blasting will be required as part of the mining method proposed.

It is expected that during the operation phase, the noise impacts from implementation of the proposed project will be the same for both considered layouts. Cumulative impacts are also expected to be low since the project area is currently considered to have low ambient noise levels.

13.2.10. Soils, Land-use and Land Capability

The Focus Area is characterised by steep and gradual slopes in areas consisting of shallow soils. The mining activities will be located in a mountainous setting and thus the risk of erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for operation activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events.

Activities that have the potential, if unmitigated, to negatively affect the Soils, Land-use and Land Capability include, but is not limited to, the following:

- Constant disturbances of soils, resulting in reduced soil quality and land capability, and risk of erosion, attributed to mining activities;

- Ineffective rehabilitation may lead to terrestrial habitat transformation, which will ultimately lead to lower soil quality;
- Ongoing soil erosion and sedimentation of freshwater resources downgradient;
- Heavy equipment traffic during construction and mining operation activities is anticipated to cause soil compaction. The severity of this impact is anticipated to be low due to the types of soils involved and the shallow bedrock, which will resist compaction;
- Accidental fuel and oil spills from mobile machinery: it is recommended that the contamination and waste management protocols plus activity-specific EMP guidelines developed during construction be extended and adhered to during the operation phase.

The significance of this impact is anticipated to be moderate and can be reduced to a moderately low impact if mitigation measures outlined in the specialist report are adhered to.

As for the construction phase (13.1.10), there is not expected to be a significant loss of agricultural land as most of the land is either not suitable for agriculture or has already been disturbed.

13.2.11. Heritage Impacts

During the survey, the following sites, features or objects of cultural significance were identified, only some of which are deemed to be conservation/documentation worthy:

- Currently, the Theta Pit boundary approaches the fort to within about 22m. It is recommended that a buffer zone of at least 15m is created around the outer edges of the fort and that this is formalised with a suitable, permanent fence (with an access gate).

- Cocopan track and bridge: A section of the remaining cocopan track will be impacted on due to the proposed construction of a pollution control dam (PCD). "Built" adits (situated outside the development footprint, and avoid if possible)

- Various Burial sites and Cemetery (situated outside the development footprint, and avoid if possible)

If any of the identified structures is to be demolished, it must be fully documented – mapped, photographed and described – beforehand. A section of the track will be impacted on by a proposed new haul road.

As an off-set to this, it is proposed that the section of the track extending from the road towards TGME (at the old pump station) westwards to the metal bridge across the Blyde River be declared a no-go section and that it is protected and retained as a sample of this type of technology.

The site of historic significance closest to Theta Hill Pit, namely the old fort, can easily be avoided as it falls outside the mining area – please just note the buffer area needed.

Should archaeologically important sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

13.2.12. Topography Impacts

Activities that will negatively affect the topography include, but are not limited to, the following:

- The continuous placement of ore material onto the demarcated ore stockpile area will modify the local topography of the site-specific area;
- Progressive mining of the Theta Gold Mine will ultimately alter the topography.

The rehabilitation program, including back-filling of the pits, will reduce the impact but the topography could never be restored to pre-mining condition.

The impact of the final EIA mine layout will be less than that of the original scoping phase layout, in that the number of WRDs has decreased and the size of the Theta pits have been modified.

13.2.13. Climate Change Impacts

The calculated impacts on climate change during the operation phase indicate that emissions during this phase would account for ±81% of the total emissions of GHG during the project's lifetime.

Unlike the construction phase, the largest generator of GHG during the operation phase will be energy indirect emissions from electricity consumed by the project, which would account for an estimated 60% of emissions. Direct emissions, such as those from fuel consumption, is expected to account for 18% of total emissions during the operation phase.

Climate change is expected to have the following impacts on the Theta Project:

- Rising temperatures 2-2.5°C, and potentially up to 6°C;
- Changing rainfall patterns;
- Climatic changes resulting in heat waves, longer periods of drought and extreme rainfall events.

Resulting from these changes, the following impacts are anticipated:

- Health risks resulting from the higher temperatures and severe storms;
- Increased dust generation and resulting dust management requirements during extended dry periods;
- Flooding of work areas and roads;
- Changes in water availability;
- Increased risk of soil erosion due to heavy rainfall and extended dry periods;
- Value Chain: vulnerability to interruptions in electricity and diesel supply.

The assessment results indicate that the emissions from the operations phase of the mining project will have a low-medium impact significance rating in the context of South Africa's available carbon budget.

It must be noted, however, that the project-related GHG are assumed to remain in the atmosphere long enough to render the impacts (limited as they may be) effectively irreversible, with the impacts of anthropogenic climate change in many cases resulting in the irreversible loss of resources.

There are options to mitigate the GHG emissions from the operation phases of the mining project. However, these options cannot alter the impact that the GHG emissions will have on climate change in terms of their extent, duration or probability. It is only the magnitude of the GHG emissions impact that can be reduced by reducing the quantity of emissions.

13.2.14. Traffic

The movement of construction vehicles in the project area will result in an increase in traffic on the roads but will be bound to the study area only. Haul roads will be utilised for the transport of ore from the mining areas to the various stockpiles and the WRD located on the project area. The haul roads will be constructed to cater for continuous two-way traffic of fully loaded articulated dump trucks. The position of the new haul roads is depicted in Figure 14.

No provincial or local roads within Pilgrims Rest will be used during the operational phase, except for personnel travelling to work. The main tarred road in the study area that is expected to be used is the R533 between Lydenburg, Pilgrim's Rest, Sabie and Graskop. No additional mining vehicles are expected on the provincial roads since gold output will be airlifted to Germiston.

13.2.15. Rehabilitation and Closure Action Plan

Landform design

A landform design for the WRD and final voids, i.e. the terraced cuts and pits, should be done prior to its construction in order to facilitate in-situ placing, contouring and grading with closure in mind. Traditional waste material design (i.e. terraced cuts and overburden dumps), proposes a geometric topography with linear gradients, separated with benches, which results in an angular, terraced appearance. Such rectilinear landforms often require long-term maintenance to manage erosion and surface stability due to its unnatural configuration. Surface instability is one of the direct causes of poor vegetation establishment.

Therefore, it is recommended that the design of the WRD and final voids should adhere to a three-dimensional shape that imitates a mature landform which has been subjected to geomorphic processes under existing environmental conditions. Analogues from the surrounding landscape should inform the final design of the new landform and feed into the following actions:

- Reconfiguration of the high wall, embankments and floor with stability as primary goal, but also to generate achievable visual harmony with the natural topography, for example avoiding sharp corners;
- Reconstruction of surface hydrology by allocating collection areas and flow paths to manage a degree of periodic flooding;
- Developing terrestrial and aquatic habitats by providing a diversity of microhabitat networks and features. This may include, for example, seasonal wetlands, boulder piles, etc., and should be considered along with planting schemes.
- Landscape evolution can be predicted with software that models sheet, rill and gully erosion, and can be confirmed via trials. It is recommended to run such assessments prior to the final design of the WRD and terraced cuts and pits to limit potential failure.

Progressive rehabilitation

Progressive rehabilitation is recommended as a management strategy for environmental liability. The mine plan should be cognisant of the rehabilitation objectives and integrate as much of the rehabilitation into its processes as possible. This will include profiling and grading of disturbed sites as part of the operations and thereby preparing it for closure. A designed cover system should be installed immediately, along with temporary erosion control measures, after which it should be vegetated to limit erosion of the exposed surfaces.

Areas that are left exposed for extended periods should have surface water management structures in place to contain sedimentation until such time that it can be vegetated.

Overburden management

Large quantities of overburden will be removed to access the orebody that is located deeper under the surface. Depending on the depth, different overburden types, each with unique characteristics, will be brought to the surface and dumped on a WRD or used as backfilling in selected areas. Overburden management, based on its characteristics, is recommended as some material types may have potential impacts on the environment, whereas others may have a useful application in construction or rehabilitation, for example. Overburden management may include the following steps:

- Being specific as to what material is placed where in the waste rock dump;
- Selecting suitable material for usage in the cover system design and stockpiling it in an appropriate location;
- Maintaining a high-intensity monitoring program to test water quality and the efficiency of water treatment.

Cover system reconstruction

A very thin layer (Average 450-750mm) of soil, classified as oxidic soils, is present on the Iota, Browns and Theta Terrace cut areas, which can be considered as “topsoil”, i.e. the O and A horizon. This should be salvaged prior to mining, but initial calculations suggest that the volume will not be enough to reintroduce as a sufficient cover system during rehabilitation.

Darmody (2009) suggests that sedimentary overburden can be converted into a suitable cover system as a substitute for topsoil. Shales and dolomites make up some of the overburden layers that will be removed during the mining process. A material classification is required to determine its suitability as a component of the cover system. In addition to this, an organic component should be added to increase the carbon content of the cover system. Organic material can be sourced from a composting program in which alien and invasive plants are used as part of an alien and invasive eradication program.

The design of a suitable cover system should consider the following:

- A barrier layer between the waste material and the rhizosphere if Potential Acid Forming (PAF) material is contained within the WRD. Geochemical test to suggest the thickness and composition of such a layer, if required;
- A reconstructed B-horizon that acts as a subsoil layer which contains a rooting media for deep penetrating root systems and functions as a moisture “store-and-release” layer to sustain plant growth during dry spells;
- An A-horizon layer which consists of a growth medium that has the necessary composition of air, minerals, sand-silt-clay medium and organic matter. It should be well draining, but with a sufficient moisture holding capacity. It should be able to support soil biota and a cover of vegetation that fulfils biodiversity targets;
- An erosion protection layer consisting of a combination of organic-, inorganic material or bio-engineering elements.

Re-vegetation

The re-vegetation approach should find its basis in re-establishing a functioning ecosystem that is regenerative, and which can follow an ecological trajectory to a fully or partially restored system within a reasonable timeframe. The selection of the preferred vegetation composition should be informed through a comprehensive understanding of the vegetation communities that occur in the local area and comparing that with the type of vegetation communities that can be re-established on the disturbed landscape. Two distinct approaches are suggested:

- Reconstructed landform rehabilitation: The WRD and terrace cut/pits will transform the topography and result in a new landform that is different in many ways to the original landscape's biophysical elements. Differences include altered slope gradients, aspects, geology and soil structures. To rehabilitate these landforms, the altered or new characteristics should be understood, and translated into a rehabilitation strategy that suggests appropriate plant species that can fulfil the intended application.
- Restoration of disturbed areas: This approach should aim to reinstate the original functionality of the disturbed areas by rehabilitating the topography, growth medium, hydrology and reintroducing original vegetation species in order to blend the rehabilitated area seamlessly into the surrounding landscape by as much as possible.
- Successful rehabilitation of other terrace mining in the region may have provided valuable techniques on the reintroduction of biodiversity. No such rehabilitation analogues are known for direct comparison and therefore revegetation trials are recommended to formulate practical strategies through applied research. Methods of reaching biodiversity targets could potentially include:

    - Re-introducing plant species and soil biota on disturbed sites through the careful handling of stripped topsoil as a growth medium. Where the topsoil is not considered enough or suitable, an alternative medium should be imported as a foundation for healthy plant growth;
    - Direct seeding of locally sourced seeds or commercially available seed mixtures, suitable to the climatic region;
    - Growing seedlings and cuttings for transplanting to the rehabilitated areas;
    - Direct transplanting from salvaged plants;
    - Through the creation of irregularities in the surface topography which will result in sub- or micro-habitats for faunal re-colonisation, thereby stimulating natural succession processes.

The following basic procedure for re-vegetation should be implemented, unless research from the trials suggests otherwise:

- Remove all contaminants, foreign material or material that may impede healthy growth from the disturbed site and discard in an appropriate manner;
- If disturbed area is heavily compacted, consider deep ripping, parallel to the contour before covering with a cover system;
- Ensure that the cover system is placed correctly on the disturbed surface, i.e. in the correct layering and depth as suggested by empirical research or industry best practice;
- Take soil tests to inform additional ameliorations if required;
- Plant a recommended seed mixture of endemic seeds harvested from the area, or a commercial seed mix, by exercising an appropriate cultivation and planting method (i.e. hand seeding, fine-seed planter or seed spreader). Alternatively, the hydroseeding method may be applied. Whichever method is implemented, ensure even distribution of the seeds at the correct concentration as recommended by a specialist;
- Planting of trees, shrubs and plugs by hand, should be managed and supervised in order to ensure the best planting method is implemented to increase success rates;
- Ensure that the species composition range from early successional species to climax species in order to increase the diversity and thereby achieving biodiversity targets;

- Install additional erosion control measures where necessary (typically on slopes steeper than 1:3). Erosion control measure may include a range of products or designs, but should be implemented according to the manufacturer's specifications;
- Seeding or planting should be done preferably during the rainy season when soil moisture content is optimal for seed germination and plant growth. If irrigation is provided, selective seeding and planting can occur in other seasons;
- Commence with an alien and invader eradication program soon after planting;
- Protect the rehabilitated site from fires in the early stages of development. Acquire the knowledge of a veld management expert to advise on management strategies to reach a healthy and diverse vegetation community;
- Continue with monitoring until re-vegetation and biodiversity targets are reached
- Continuous alien and invader eradication program
- A continuous alien and invader eradication program should be followed on all rehabilitated areas. Alien species must be identified and treated using one, or a combination of the following methods:
- Mechanical removal by uprooting, slashing, cutting off at ground level, or ringbarking (most preferred technique);
- Chemical treatment by foliar spray or stump treatment of a registered herbicide (recommended only if mechanical removal is considered unpractical or unsuccessful);
- Biological treatment by introducing natural enemy agents that target specific species only.

Continuous alien and invader eradication program

- A continuous alien and invader eradication program should be followed on all rehabilitated areas. Alien species must be identified and treated using one, or a combination of the following methods:
- Mechanical removal by uprooting, slashing, cutting off at ground level, or ringbarking (most preferred technique);
- Chemical treatment by foliar spray or stump treatment of a registered herbicide (recommended only if mechanical removal is considered unpractical or unsuccessful); and
- Biological treatment by introducing natural enemy agents that target specific species only.

13.3. Decommissioning, Closure and Post-Closure Phase

During the Decommissioning, Closure and Post-Closure Phase, the following main activities will take place:

- Continuation of rehabilitation of opencast pits and waste rock dumps
- Decommissioning and dismantling of infrastructure and buildings;
- Earth moving, shaping and ripping of ground;
- Waste Management;
- Revegetation of disturbed areas.

The impact assessment for the Decommissioning, Closure and Post-Closure Phase can be found in Appendix 18. The following impacts are envisaged during the decommissioning and closure phase.

13.3.1. Socio-Economic Impact

From a socio-economic perspective it is anticipated that the benefits of the rehabilitation plan can be prolonged should the rehabilitation process consider sub-projects that would involve unskilled and semi-skilled local labourers e.g. a nursery where local labourers could be employed.

Even after mitigation and post closure there could be a number of potential residual impacts in the local area. These include:

- Jobless migrants staying behind in the local area after closure placing pressure on already challenged social infrastructure and posing health and safety challenges, increasing the risk for resumed and intensified illegal mining activities;

Continued negative economic impacts due to environmental pollution. Activities that have the potential, if unmitigated, to negatively affect the socio economic include, but are not limited to, the following:

- Job losses due to mine closure;
- Decline in the sustainability of the local economy as a result of the loss of employment, household income and capital investments;
- Reduced economic activities within the area with subsequent negative impacts on smaller businesses;
- Population changes and out-migration of people from the area, especially skilled workers moving out of the area in search of employment elsewhere;
- Decrease in the quality of life of the surrounding communities due to the discontinuation of social development support and local economic development programmes;
- Possible relocation of families;
- Skilled workers moving out of the area in search of employment elsewhere;
- Negative impact on infrastructure development and maintenance;
- A change in community infrastructure;
- Disruptions and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts;
- Increased safety risks associated with the decommissioning of the infrastructure;
- Possible negative impact on the crime levels due to a possibly increased localised unemployment rate;
- Remnants of possible environmental impacts;
- Remaining visual impact as a result of mining.

13.3.2. Biodiversity – Flora

Activities that have the potential, if unmitigated, to negatively affect the floral biodiversity include, but is not limited to, the following:

- Loss of floral species of conservation concern (SCC encountered within the decommissioning footprint areas;
- Ineffective rehabilitation of exposed and impacted areas, particularly the large footprint of the pits and waste rock dumps, leading to permanent loss of floral habitat (Only partial backfilling planned for Browns Hill);
- On-going risk of discharge from mining facilities beyond closure leading to a permanent impact on floral habitat and downstream impacts on Freshwater Habitat;
- Potential failure to initiate a biodiversity offset investigation process to address all residual impacts – leading to permanent loss of SCC and cumulative loss of floral diversity for the region;
- Failure to implement and manage biodiversity action plan, rehabilitation plan, alien and invasive control plan during the decommissioning and closure phase leading to long-term (or permanent) transformation of the landscape and loss of favourable floral habitat, diversity and SCC;

- Ongoing mining development and ineffective rehabilitation leading to a cumulative loss of natural vegetation in the region;
- Failure to monitor rehabilitation efforts, leading to:
    - Reintroduction and proliferation of alien and invasive plant species;
    - Compacted soils limiting the re-establishment of natural vegetation;
    - Increased risk of erosion in areas left disturbed;
- Improper rehabilitation of disturbed areas leading to permanent floral habitat loss Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity;
- Rehabilitation of currently degraded habitat and AIP clearance of already proliferated areas. Some ecological functioning will be restored that has been lost due to AIP proliferation and habitat transformation.

An integrated, holistic approach towards rehabilitation and closure is recommended. This is defined as an approach that is closure-orientated and should have its commencement in the pre-feasibility phase of the mine. It should influence all aspects of the mine's design, construction, operational and decommissioning phases, and ensure that it is aligned with the closure vision and objectives. Such an approach generates pre-emptive solutions that can result in a positive, pro-active action plan implementation for sustainable rehabilitation and closure.

13.3.3. Biodiversity – Fauna

Activities that have the potential, if unmitigated, to negatively affect the faunal biodiversity include, but are not limited to, the following:

- Ineffective rehabilitation of exposed and impacted areas leading to permanent losses of sensitive species;
- Ongoing risk of contamination from mining facilities beyond closure leading to permanent impact on amphibian life and fauna dependent on the Blyde River for sustenance;
- On-going seepage and runoff may affect the groundwater regime beyond closure;
- Failure to implement a biodiversity action plan, rehabilitation plan and alien floral control plan during the decommissioning and closure phase;

13.3.4. Groundwater Impacts

Activities that have the potential, if unmitigated, to negatively affect the ground water impacts include, but are not limited to, the following:

Summary Opencast Mining:

- Water flow into the mine resulting in the draining of the aquifer and potential lowering of the regional groundwater level: The proposed mining will take place above the groundwater table and no impact is expected;
- Groundwater contamination from waste bodies: Assessment of the waste material which indicated low potential risk.

Summary Waste Rock Dumps:

- Assessment of the waste material which indicated low potential risk
- Geochemical modelling that showed sufficient neutralising and adsorption capacity to prevent contaminants from reaching the groundwater table
- Management measures such as compaction and the installation of a drain system at the base of the waste pile

- Rehabilitation including shaping, capping and vegetation

Due to the low risk posed by the waste material and the mining in general there are currently no additional management requirements, other than groundwater monitoring. The planned rehabilitation of the WRDs will further protect the underlying groundwater resource. The proposed rehabilitation includes shaping to prevent water ponding on the WRDs, capping and vegetation that will reduce infiltration into the waste material.

13.3.5. Hydrology Impacts

Activities that have the potential, if unmitigated, to negatively affect the surface water impacts include, but are not limited to, the following:

- At closure, the WRDs will be capped and vegetated. The pits will mostly be backfilled; however, one void will remain, which may fill with water from rainfall.
- The plant will no longer require water for processing, and therefore, no abstractions will take place from the Iota and Wishbone PCDs. Due to the high rainfall of the area, over time, it is likely that the remaining pit voids and PCDs will fill and spill. The quality of water in the voids and PCDs in the long-term is likely to be similar to that described in the geochemical assessment in the Geohydrological Study for Scenario 2. The water quality will be alkaline, with moderate to fairly high levels of salinity, with an unlikely risk of AMD. However, elevated metals namely arsenic, chromium, mercury and nickel are likely to occur.
- The climate change study indicated that there will be a general decrease in rainfall, but that extreme rainfall events will increase.

During the post mine closure phase, erosion of the rehabilitated area, as well as the filling up and overflowing of the remaining pit voids and PCDs, were considered high risks. Post mine closure, rehabilitation must ensure that erosion prevention is adequate for the long-term.

Cumulative Impacts:

- The mine proposes to abstract approximately 20,000 m^3/month during the dry season while in operation. This was calculated to be a small portion of quaternary catchment B60As mean monthly runoff over the dry months. The loss of runoff due to the containment of dirty areas was also calculated to be small. The mine has a life of mine of approximately 5 years, however, assuming that the plant will be used in the future, as well as other potential projects in the catchment, the cumulative impact on water quantity could potentially become significant. However, any future projects requiring abstractions from the Blyde River catchment, would need to be licensed with the DWS, and it is not expected that the DWS would unsustainably over-allocate water within a known strategic water source catchment.
- The water quality within the Blyde River has been shown to be of a high standard. The impact of this project alone will, to a large degree, be buffered by the relatively high flow volumes and dilution capacity of the Blyde River. However, it should be noted that sensitive aquatic species do occur in the vicinity of the project. Should further projects and developments be established within the Blyde catchment, and mitigation measures not adhered to, then the cumulative impact on water quality has the potential to become significant.

13.3.6. Aquatic Freshwater Systems

Activities that have the potential, if unmitigated, to negatively affect the aquatic impacts include, but is not limited to, the following:

- Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soils and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems (watercourses);
- Proliferation of alien vegetation due to disturbances, which will impact natural flow regimes;
- Potential visual scars, affecting aesthetic features and faunal habitat.

Based on the results of the ecological and impact assessments, it is clear that certain aspects of the proposed TGME mining project have the potential to have significantly high impacts on the receiving environment. Strict monitoring throughout the life of the mine and post-closure is required in order to ensure the ecological integrity and functioning of the freshwater resources is retained in this sensitive drainage area, and monitoring data must be utilised to proactively manage any identified emerging issues.

13.3.7. Air Quality Impacts

The potential air quality impacts associated with demolition activities are similar to the anticipated air quality impacts to occur during the construction phase. The impacts and mitigation measures have been dealt with during the discussions of the construction activities, please see section 13.1.9.

13.3.8. Visual Impacts

Activities that have the potential, if unmitigated, to negatively affect the visual impacts include, but are not limited to, the following:

- Demolition removal of infrastructure and partial backfilling of opencast pits leading to further dust generation, erosion and changes in the visual character of the project area;
- Ineffective rehabilitation leading to poor vegetation cover with bare areas remaining present, opencast pit areas not being completely backfilled and surface infrastructure remaining;
- Ongoing proliferation of alien vegetation;
- Stationery and vehicle-mounted lights during the decommissioning and rehabilitation phase;
- Partial backfilling resulting in voids remaining within the opencast pits leading to altered contours and mountainous terrain. The remainder of pit areas (not backfilled) should be rehabilitated: this is included in the rehabilitation plan.

13.3.9. Noise Impacts

Activities that have the potential, if unmitigated, to negatively affect the noise impacts include, but is not limited to, the following:

- Removal of all Infrastructure;
- Rehabilitation of pit areas;
- Planting of grass.

The potential environmental impact at the abutting residential areas will be insignificant during the decommissioning phases, provided that the noise mitigatory measures will be in place.

13.3.10. Soils, land use and land capability

Activities that have the potential, if unmitigated, to negatively affect the Soils, land use and land capability include, but is not limited to, the following:

- Disturbance of soils as part of demolition activities as well as backfilling, which may lead to further loosening of soil in undisturbed areas and the formation of Witbank soils (Anthrosols) which reduce long term land capability;
- Decommissioning activities may lead to habitat transformation and increased alien plant species proliferation, and potential changing the nutrient status of the soils;
- Ineffective rehabilitation may lead to further habitat transformation and increased alien vegetation encroachment, which will lead to further loosening of the soil and subsequent erosion;
- Shortage of adequate volumes of topsoil is anticipated to be a challenge during the rehabilitation phase as a result of shallow soils dominating the study Area.

13.3.11. Heritage Impacts

During the survey, the following sites, features or objects of cultural significance were identified, only some of which are deemed to be conservation/documentation worthy:

Currently, the Theta Pit boundary approaches the fort to within about 22m. It is recommended that a buffer zone of at least 15m is created around the outer edges of the fort and that this is formalised with a suitable, permanent fence (with an access gate).

Cocopan track and bridge: A section of the remaining cocopan track will be impacted on due to the proposed construction of a pollution control dam (PCD). "Built" adits (situated outside the development footprint, and avoid if possible). However, the Cocopan track is located on old mining waste and old mining depositions. TGME would like to use the Iota PCD, and would need to apply for a permit to temporarily remove the track.

Various Burial sites and Cemetery (situated outside the development footprint, and avoid if possible)

If any of the identified structures is to be demolished, it must be fully documented – mapped, photographed and described – beforehand. A section of the track will be impacted on by a proposed new haul road.

Should archaeologically important sites or graves be exposed in other areas during decommissioning phase, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

Provided that the recommendations had been followed during construction and mining, and the final EIA mining layout plan followed, there should be no negative impact on any of these sites during the decommissioning phase.

13.3.12. Climate Change

The potential air quality impacts associated with demolition activities are similar to the anticipated air quality impacts to occur during the construction phase. The impacts and mitigation measures have been dealt with during the discussions of the construction activities, please see section 13.1.13.

13.3.13. Rehabilitation and Closure Action Plan

Infrastructure removal and or transfer of ownership

All signage, fencing, concrete plinths, buildings, pipelines, pumps, electrical infrastructure and roads to be removed and rehabilitated, unless relinquishment requires the transfer or return of ownership and maintenance to other parties that can demonstrate that they take full responsibility and liability associated with the transfer. Those areas that should be rehabilitated at decommissioning should follow these actions:

- Dismantle and remove all foreign or contaminated material by disposing it in the appropriate fashion;
- Asses the compaction of the surface and implement the necessary decompaction actions;
- Profile and shape the area to blend with the natural topography. Adhere to slope gradients less than 1:3 where possible;
- Reinstate a functional hydrological pattern that is suited to the volume of surface water by sizing and profiling drainage channels correctly;
- Provide and maintain erosion protection for a minimum of 3 years, or until vegetation establishment is sufficient to maintain surface stability;
- Apply a cover system, suitable to the application;
- Revegetate with suitable plant species, preferably endemic species.

Dams and Surface Water Management Structures

Once residual risks for pollution or sedimentation of watercourses is sufficiently abated, the PCDs and surface water management systems may be removed and rehabilitated. It is recommended that this be done by:

- Removing all liners, stabilisation structures, silt traps etc.;
- Reprofiling the area to blend with the natural topography and form slope gradients that are less than 1:3 where possible;
- Reinstating a functional hydrological pattern that is suited to the volume of surface water by sizing and profiling drainage channels correctly;
- Providing initial erosion protective measures through bio-engineering methods, which manages scouring, erosion and sediment loads;
- Reintegrating the surface hydrology into the natural hydrological pattern to be free draining;
- Reintroducing a cover system that can support deep rooted and shallow rooted vegetation, of various species that is suitable to the micro climatic conditions;
- Revegetate with plant species that resembles the natural environment.

Surface and Geotechnical Stability Assessment

Surface and geotechnical stability is one of the first closure objectives that should be met. Geotechnical surveys and assessments should be done periodically on the WRDs, remaining highwalls and embankments. Surface stability relates to erosion which can be assessed with a visual assessment of all rehabilitated surfaces. Poor vegetation establishment is often a sign of sheet, rill or gully erosion. Precautionary measures should be put in place to prevent surface or geotechnical instability, as proposed by a specialist.

14. The possible mitigation measures that could be applied and the level of risk.

Refer to Section 13 for the positive and negative impacts identified for the proposed Theta Hill Project. It is anticipated that the management measures associated with the activities will be adequate to manage the impacts associated with the project as provided in Section13 of this report.

15. Motivation where no alternative sites were considered

Not applicable. Alternatives relating to site layout, type of activities and operational activities were considered, as discussed in Section 8. The location of the proposed project is constrained to the location of the mineral resource and the proven reserve.

Three location options were identified and considered within the study area, referred to as the Scoping Phase layout (Layout 1) alternative, the first draft EIA Phase layout (Layout

2) alternative and then the final EIA/EMPr layout (Layout 3) alternative. These THREE layouts have been assessed in this EIA/EMPr. The updated final site layout plan is reflected in **Error! Reference source not found.** and is referred to as Layout 3 final EIA phase site layout plan. All the alternatives were thus evaluated by the specialist, and the final EIA site layout was identified. This layout was identified by TGME as the only feasible alternative, which addressed both the environmental sensitivities and the global economic environment.

16.Statement motivating the preferred site

The engineering feasibility study formed the basis for the permitting phase and informed the initial Scoping Phase site layout plan (Layout 1) (Figure 20), which was incorporated and discussed as part of the final Scoping Report. The plan of study proposed in the Scoping Report made provision for various biophysical and social studies which would determine the baseline conditions at the project site as well as make recommendations related to the feasibility of the proposed localities and alternatives as per the initial site layout plan.

Certain biophysical and social baseline studies, namely terrestrial ecology (fauna and flora), soils and land capability, air quality, noise and vibration, visual impact, socio-economic and health impact, water quality, heritage and the rehabilitation objectives, returned substantial environmental and social sensitivities and nuances. As part of the first round EIA/EMPr review period (from Nov 2019 to Jan 2020 and from March to July 2020), the amended site layout plan referred to as Layout 2 (draft EIA/EMPr layout) (Figure 21) was made available for public review.

Following the submission of Layout 2, further detailed design work was completed on the WRD’s and PCD’s as part of the existing water use licence application, to ensure that the structures would be stable and able to maximise successful concurrent rehabilitation outcomes. As part of this process, various stability and geotechnical activities were carried out which informed the designs and the design engineers were asked to adapt their designs to avoid various high biodiversity areas within the WRD footprints.

During the same period, TGME recognised that significant changes in the global market had resulted due to the Corona virus pandemic. These changes have the potential to impact on the Applicant’s project due to, among others, an increase in the gold price and the downgrade of the South African economy to junk status.

To respond to the expected changes in the global economic environment, TGME completed a re-evaluation of the Theta Project (i.e. 83MR) with a view to improving the economic metrics of the project to further enhance the attractiveness to potential funders. This has resulted in a new mine schedule being developed which has changed the sequence of the pits being mined and has also resulted in the pits being made slightly larger to bring in more gold bearing material while still taking cognisance of the environmental conditions in the area.

This EIA/EMPr provides a detailed description of the amended layout plan referred to as Layout 3 (Figure 14). This layout was identified by TGME as the only feasible alternative, which addressed both the environmental sensitivities and the global economic environment.

17. Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site

A quantitative impact assessment process was undertaken as described in Section 12. The results of the impact assessment process are provided in Section 13.

In addition to the above methodologies the following steps were undertaken:

- The stakeholder consultation process was undertaken in a manner to be interactive, providing landowners and identified stakeholders with the opportunity to provide input into the project. This is a key focus, as the local residents are able to provide site specific information which may not be available in desktop research material. Stakeholders are requested (as part of the BID) to provide their views on the project and any potential concerns which they may have. All comments and concerns received to date have been assessed by the specialist and have been captured and formulated into the impact assessment table.
- Previous Environmental Studies have been undertaken for a number of projects for TGME within the study area. These include the MPRDA EMP, EMP Alignment and various Basic Assessment Processes on the portions of land applicable to this project. The baseline studies and impact findings were incorporated into the mining works program which led to the application for an amendment to the existing environmental authorisation due to new NEMA-listed activities being triggered.
- Additional site-specific specialist studies were conducted to determine the risk of the proposed project on the environment, which included:
    - Terrestrial Ecology Assessment;
    - Freshwater and Aquatic Assessment;
    - Ground Water Assessment;
    - Surface Water Assessment;
    - Noise Assessment;
    - Air Quality Assessment;
    - Climate Change Impact Assessment;
    - Soil and land use assessment;
    - Rehabilitation and Closure Assessment;
    - Heritage Assessment;
    - Visual Assessment and;
    - Social Economic Assessment.
- A detailed desktop investigation was undertaken to determine the environmental setting in which the project is located. Based on the desktop investigations various resources were used to determine the significance and sensitivity of the various environmental considerations. The desktop investigation involved the use of, amongst others:
    - South African National Biodiversity Institute (SANBI Biodiversity Geographic Database LUDS system including the Mpumalanga Biodiversity Sector Plan (MBSP, 2014), to gain background information on the physical habitat and potential floral diversity associated with the focus area;
    - Geographic Information System base maps;
    - Department of Water and Sanitation (previously the Department of Water Affairs) information documents such as the (ISP and Groundwater Vulnerability Reports);
    - AGIS;
    - Municipal Integrated Development Plan.

- Site Visits were undertaken in March, April, September 2019, January 2020 and April 2020. These site visits were utilized to ensure that the information gathered as part of the desktop investigation reflect the current status of the land.
- The rating of the identified impacts was undertaken in a quantitative manner as provided in Section 12 (Impact Ratings). The ratings are undertaken in a manner to calculate the significance of each of the impacts. The EAP also assessed the outcomes of the calculation to determine whether the outcome reflects the perceived and actual views.

The identification of management measures is done based on the significance of the impacts and measures that have been considered appropriate and successful, specifically as Best Practical and Economical Options.

17.1. Assessment of each identified potentially significant impact and risk

A summary of potentially significant impact and risks is provided in Table 61. A detailed assessment of all the identified potential impacts is provided in Section 13.

Table 53. Impact Assessment of potentially significant impact and risk

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Pre-construction Phase / Construction Phase					
Iota Pit Theta Pits Iota WRDs Wishbone WRD Wishbone PCD	Loss of favourable floral habitat, floral diversity and SCC through construction related activities: *Proliferation of alien and invasive plant species resulting from increased disturbances; *Movement of construction vehicles and access road construction through sensitive floral habitat; *Waste from construction material, e.g. bricks, concrete and/or wood damaged or unused for various reasons during construction, leading to disturbance of natural vegetation; *Destruction of vegetation due to unplanned construction related fires	Flora	High (-)	All floral SCC within the construction footprint should have been rescued and relocated, or removed, where permits were obtained, before construction commences. Site clearance should be limited to the project footprint areas only, with disturbance limited as far as possible.	High (-)
Iota Pit Theta Pits Browns Pits Iota WRDs Wishbone WRD Wishbone PCD	Soil compaction and erosion as a result of development activities and storm water runoff, reducing the efficiency of floral re-establishment and leading to a loss of favourable floral habitat and consequently a further loss of diversity	Flora	High (-)	Based on the findings of the Freshwater report (SAS 219038), it is considered imperative that during the planning phase, very careful consideration be given to the locality and layouts of surface infrastructure, to ensure that watercourses and their associated zones of regulation (in terms of both GN704 and GN509 as they relate to the NWA) are avoided as much as possible; It is recommended that all stockpiles and WRDs be designed in such a manner that runoff is contained, especially where slopes are steep so that sedimentation of the Blyde River is prevented.	Medium (-)

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Iota / Browns Pit / Theta Wishbone WRD	Clearing activities of the riparian areas associated with the haul roads are likely to result in the displacement of amphibian and avifaunal species which inhabit and utilise these areas. Site clearing and the removal of vegetation leading to a loss of sensitive species and habitat. Collision of vehicles with faunal species and potential SCC as well as potential increased risk of poaching and trapping of species	Faunal	High (-)	Limit placement of infrastructure within habitat of increased sensitivity. All pits and WRD should, as far as possible, be kept to a minimum within the areas of high sensitivity, with key management in place to ensure footprint creep does not occur and that edge effects do not impact on additional areas outside of the proposed footprint. It is recommended that all stockpiles and WRDs be designed in such a manner that runoff is contained; - A Biodiversity Action Plan, Alien Invasive Management and rehabilitation Plan is recommended; It is recommended that current prospecting areas falling outside of the proposed mining footprint that have been disturbed are rehabilitated as soon as practically and feasibly possible in order to limit further habitat disturbance.	High (-)
The location of infrastructure (most significantly the Wishbone WRD, the Iota South WRD and the PCDs, as well as various road crossings, powerline crossings and pump columns etc) occur directly within watercourses (especially in the case of linear infrastructure which traverse several drainage systems) and within the 32m or 100m zones of regulation according to the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Government	Increased risk of transportation of sediment from exposed soils in stormwater runoff, leading to increased turbidity of surface water, sedimentation of watercourses and changing the characteristics of the stream beds, smothering of vegetation and/or altered vegetation composition, smothering of benthic taxa and/or destruction of suitable macro-invertebrate and fish habitats;	Aquatic System	Medium	Prior to bulk earthworks it is recommended that the entire clean and dirty water management system be developed to ensure that all “dirty water” areas be managed as they are created.	Medium

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Notice (GN) 704 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).					
Iota, Browns and Theta Pits	Construction of general surface infrastructure and transportation of materials and stockpiling. Altering the topography of the area through the creation of stockpiles and WRD higher than the proposed heights.	Visual	High	It is recommended that the height of the structures be as low as possible, where this can be achieved without increasing the infrastructure footprint. The height of the stockpiles and WRDs should not exceed the proposed heights, to ensure that the skyline of the landscape is not affected, beyond what is anticipated.	High
Removal of vegetation and the exposure of soils during construction. Excavation of channels and trenches and the construction of berms. Stripping and stockpiling of topsoils. Widening of roads	Erosion of exposed soils leading to increased siltation and sedimentation of downslope watercourses impacting on water quality.	Surface Water	High	Temporary erosion measures such as sediment nets can be used during construction at the roads, pits, WRDs, channels, berms and Topsoil Stockpile areas. Runoff from temporarily exposed areas can be managed appropriately through the implementation of measures such as berms which should guide runoff towards silt traps. The clean diversion channels and berms can be vegetated immediately after construction. Energy dissipation measures such as rock riprap can be implemented along steep sections and exists of the channels in order to prevent erosion. Monitoring of the Blyde River upstream and downstream of the operation, as per the recommended monitoring plan provided in this report	Medium
Construction of the Blyde River bridge crossing.	Increased erosion, suspended solids, turbidity and sedimentation.	Surface Water	High	It is recommended that the river be appropriately diverted around working areas as per an approved method statement	Medium

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Alteration of the natural river flows			The bridge can be designed to alter the natural river flows in the least possible way, taking into consideration the high and low flows.	
Theta Mine Project	Employment and income generation	Socio-Economic	Medium (-)		
Operational Phase					
Iota Pit / Iota WRD / Wishbone WRD	Further loss of floral habitat beyond the project footprint as a result of: *vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps; *on-going disturbance of soils due to operational activities; *edge effects associated with mining activities	Flora	High (-)	Monitoring of relocation success of rescued and relocated floral SCC can take place during the operational phase; - Harvesting of protected floral species by mining and operational personnel should be strictly prohibited; - As part of a Biodiversity Action Plan (BAP), floral monitoring is recommended to be done annually during operational activities, including the monitoring of the mine nursery.	High (-)
Iota Pit Theta Pits Browns Pits Iota WRDs Wishbone WRD Wishbone PCD	Additional surface water runoff and sedimentation of the freshwater habitat is likely to result in amphibian habitat degradation. Risk of contamination from operational facilities may pollute receiving environment leading to a loss of faunal SCC	Faunal	High (-)	It is recommended that the focus areas of all surface infrastructure be minimised to what is essential to ensure safe mining and optimal utilisation of the ore resources. As part of a Biodiversity Action Plan (BAP), faunal monitoring is recommended to be done annually during operational activities. No additional habitat is to be disturbed during the operational phase of the development. Stockpiles, WRDs and Dams, and their expansion as the material is deposited, this may be restricted to the footprint area that is authorised. Weekly monitoring and recording of the footprint areas are recommended.	Medium (-)
Deposition of tailings, waste rock, general operations of the mine, with special mention of the	Possible contamination of surface and ground water, leading to impaired water quality and salination of soils	Aquatic System	High	It is recommended that any dirty water runoff containment facilities remain outside of the defined riparian areas and their	Medium

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Wishbone WRD, Wishbone PCD, Iota WRD South and Iota PCD	within riparian areas; * Sedimentation of watercourses could lead to altered water quality, altered channel integrity and altered vegetation community structures; * Changes to vegetation growth due to increased nutrients as a result of altered groundwater property			buffers (setback zones / zones of regulation) as a measure to minimise the impact on the receiving environment; Strict control of sewage water treatment needs to take place and the sewage system can form part of the mine's closed process water system; All dirty water containment structures recommended to be designed to contain a minimum storm event of a 24 hour 1 in 50 year flood event	
Iota, Browns and Theta Pits Iota WRD North and South Theta Wishbone WRD	Project will have a high visual impact on the receiving environment due to it situated within such close proximity to the town of Pilgrim's Rest. The Wishbone WRD will be visible from certain vantage points within the town of Pilgrim's Rest, along the R355 and the Lost City Hiking Trail within the Mount Sheba Private NR, however the visual intrusion thereof is less significant than the Iota WRDs, due to it being situated further away from Pilgrim's Rest.	Visual	High	It is recommended that stockpiles and berms be vegetated with indigenous grasses in order to blend more easily into the existing landscape and for screening purposes of the open pits and infrastructure. The design and height increase of stockpiles and WRDs can be monitored to ensure that these components relate to acceptable environmental standards in terms of slope and elevation. Concurrent rehabilitation throughout the construction and operational phases, consideration of vegetating berms and stockpiles to reduce soil contrast in the landscape as well as effective management of dust generation.	High
Waste Rock Dumps Waste rock material used for stormwater berms Waste rock dump	Groundwater Quality Groundwater contamination from waste bodies	Groundwater	Medium	Assessment of the waste material which indicated low potential risk Geochemical modelling that showed sufficient neutralising and adsorption capacity to prevent contaminants from reaching the groundwater table	Low

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
				Management measures such as compaction and the installation of a drain system at the base of the waste pile Monitoring to assess the impact	
Open pit mining through non-perennial drainage lines as well as the deposition of waste rock in drainage lines.	Loss of hydrological connection and function (note that the non-perennial drainage lines in the project area are not fed by wetlands or groundwater). Loss of water quantity reporting to the Blyde River. Alteration of surface water drainage patterns. Damming/ponding of water upslope of the WRDs	Surface Water	High	Diversion of upslope clean runoff around the pits and WRDs as per the SWMP. Concurrent backfilling and rehabilitation of the pits as per the rehabilitation plan, which will return some of the previously lost contributing catchment area. Restoration of the drainage lines where possible. Diversion of upslope water around the WRDs as the footprints of the WRDs expand.	Medium
Open pit mining, development of the WRDs and stockpiles, and operation and management of the PCDs and other dirty water dams.	Runoff and spills from the mine infrastructure impacting on the water quality of the Blyde River. Parameters of concern include elevated suspended solids, turbidity, dissolved salts (TDS), heavy metals and pH (it must be noted that the geochemical assessment indicated an unlikely potential for AMD).	Surface Water	High	Regular inspections and careful management of the water levels within the PCDs and other dirty dams, to ensure that sufficient freeboard is available in accordance GN704. Frequent desilting of the proposed channels and silt traps, as per the monitoring plan Monitoring of the Blyde River at upstream and downstream positions, as per the proposed monitoring plan.	Medium
Operation of the Theta mine	Rating of negative impacts on other economic sectors in the local economy	Socio-Economic	High	Effective management of the mining activities to avoid any environmental pollution focusing on water, and dust pollution, and limiting any increase in noise levels as per the respective environmental management plans.	Medium

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
				Consider a Strategic Environmental Assessment, which falls outside the ambit of this project. Such an assessment could be beneficial to provide a scientific baseline to be used for future auditing and monitoring. TGME could become part of a regional planning forum, to address such a strategic assessment. Such an initiative could be undertaken in collaboration with the DWS, as the custodian of the water sources in South Africa.	
Operation of the Theta mine	Project Induced in-migration. Formal/structured in-migration (workers associated with project moving into the local area): If outside workers would comprise the majority of the workforce during the operational phase it could result in an additional maximum increase of some 670 individuals causing another dramatic increase in the small population of about 2 000 people living in Pilgrim's Rest	Socio-Economic	High	Employment of locals (within the low to semi-skilled positions) already residing in Pilgrim's rest can receive priority as this would limit the negative impacts (e.g. Infrastructure requirements) associated with a sudden population increase and to avoid possible conflict arising between locals and the outside workforce The local labour procurement strategy as well as proof of residence required is recommended and to be clearly communicated in the local community and broader regional media well in advance of the operational phase.	High
Decommissioning and closure Phase					
Iota Pit / Theta Pit/ Wishbone WRD / Iota WRD	Failure to implement and manage biodiversity action plan, rehabilitation plan, alien and invasive control plan during the decommissioning and closure phase leading to long-term (or permanent) transformation of the landscape and loss of	Flora	High (-)	Floral SCC, if encountered within the decommissioning footprint areas, are to be handled with care and the relocation of sensitive plant species to suitable similar habitat is to be overseen by a suitably qualified botanist/horticulturist in association with a; - Monitoring of relocation success of rescued and relocated floral SCC may continue for up to 2 years after closure or until a suitably qualified botanist/horticulturist determines the relocation activities to be successful.	Medium (-)

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	favourable floral habitat, diversity and SCC				
Iota / Browns Pit / Theta Wishbone WRD	Ongoing risk of contamination from mining facilities beyond closure leading to permanent impact on amphibian life and fauna dependent on the Blyde River for sustenance.	Faunal	High (-)	Continue monitoring of rehabilitation activities for a period specified in the approved rehabilitation plan in such a way as to ensure that natural processes and veld succession can lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area. A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure. Where areas are disturbed during decommissioning activities, proliferation of alien invasive species within these areas should be continually monitored and controlled.; and - Follow-up with alien and invasive plant control measures for a period of at least 5 years post-closure.	Medium (-)
Decommissioning / removal of surface infrastructure	Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soils and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems (watercourses);* Proliferation of alien vegetation due to disturbances, which will impact natural flow regimes;* Potential visual scars, affecting aesthetic features and faunal habitat.	Aquatic System	Medium	It is recommended that soils are replaced in the correct layers, ripped and re-reprofiled post-closure, and that vegetation is restored to a point where succession will lead to the same conditions as the pre-mining state as a minimum; Rehabilitation measures may be implemented. It is recommended that the Implementation be overseen by a suitably qualified Environmental Site Officer (ESO) with freshwater experience and the ESO is recommended to sign off the rehabilitation before the relevant contractors leave site; It is recommended that monitoring be undertaken as per the approved rehabilitation plan.	Medium
Closure and rehabilitation of the pits and WRDs and	The plant will no longer require water for processing, and therefore, no abstractions will take place	Surface Water	High	It is recommended to use water from the voids and PCDs for irrigation of vegetation established on the WRDs as part of the rehabilitation plan.	Medium

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
long-term impacts on water quality	from the Iota and Wishbone PCDs. Due to the high rainfall of the area, over time, it is likely that the remaining pit voids and PCDs will fill and spill.			Should the plant be used for further future projects, then water can be sourced from the PCDs and voids. Monitoring of the Blyde River post-mine closure, as per the approved monitoring plan.	
All activities related to the Theta mine	Job losses due to scaling down of mining activities and mine closure Decrease/Termination of community investment funds and support to local community	Socio-Economic	High	It is recommended that the mine develops additional resources and increase its LoM in order to maintain and promote job security. As per the requirements of the SLP, aim to develop mechanisms to assist employees, prior to the retrenchment date in the transition phase and after closure of the operations. This could include providing portable skilled development programmes during the operational phase of the mine, providing assistance in accessing available and suitable jobs with other local mines or companies etc. If feasible, focus can be placed on supporting non-core local supply links in procurement strategies as well as potential local enterprise development programmes during the operational phases of the mine to facilitate easier transitioning of local suppliers to other customers.	Medium
All activities related to the Theta mine	Sense of Place Impact after closure	Socio-Economic	High	Mining areas may be rehabilitated as soon as the practically possible. The end land-use can be determined in consultation with the local community and relevant government departments to determine what is required from an environmental perspective but to also address localised community needs	Medium

18.Summary of specialist reports.

For the purposes of the environmental authorisation application, numerous detailed specialist studies were undertaken. Please refer to Appendix 4-17 for these reports. The table below presents a concise snapshot of the outcomes of these studies.

Table 54. Summary of findings from specialist studies undertaken

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Socio Economic Impact Assessment Undertaken by: Batho Earth and SED, Appendix 4	In terms of the potential high negative downstream impact on other economic sectors, the risk relates to the potential surface water pollution that could have detrimental impacts on the downstream regional economy. The local tourism industry could also suffer negative consequences as a result of negative impacts on sense of place. The risk of downstream water pollution by the mine is rated low by the specialist studies that formed part of the larger EIA. The increased illegal mining activities furthermore already have a significant existing impact on the water quality and quantity of the Blyde River. The flow of the river is being changed by their activities and the risks of sedimentation have increased. At this stage, the illegal mining activities cannot be controlled. Should the project not proceed, the illegal mining activities are anticipated to significantly increase, with dire consequences for the local and downstream environment. If the project is authorised, it is anticipated that TGME could assist in controlling and possibly eradicating the illegal mining activities through their safety and security measures to be put in place. Adherence to environmental regulations and guidelines can then be managed and audited through the formal processes. In light of the possible impacts on the tourism industry, it should also be noted that there are examples elsewhere in South Africa where mining and tourism co-exist and where the heritage conservation value are considered. The following recommendations are highlighted to address the potential negative impact of the project: • Mitigation measures, responses to risks identified and the Social Management Plan must be adhered to. • A Resettlement Action Plan needs to be developed for the Brown's Hill Community (approximately 10 permanent residents) and the proposed process and possible implications should be discussed with the residents of the Brown's Hill Community. • A serious effort is required in the development of a sustainable post-mining economy through the social investment programme of the project, covering social investment in sustainable non-mining	x	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	related activities as well as through a portable skills programme. These programmes need to be developed and implemented at an early phase of the project. • The contribution that other potential sources of pollution (e.g. agriculture, waste water treatments, illegal mining activities and settlements) already have on the river's downstream water quality would be part of a Strategic Environmental Assessment (to be done under the auspices of the DWS) which falls outside the ambit of this project. Such an assessment remains a high priority to provide a scientific baseline to be used for future auditing and monitoring. • A Biodiversity Offset Agreement (if finalised) must aim to create additional employment opportunities and must focus on capacity building among local community members. In conclusion, it needs to be mentioned that the negative economic impacts of the COVID-19 pandemic are expected to be experienced for at least another two years. South Africa's economy is forecasted to decline by between 3 and 5% in 2020 and only partially making for the loss in 2020 (IMF, 2020). In this context, the proposed project will make a significant positive contribution in providing much needed jobs and tax income, not only for the local, but also for the larger regional and national economy. Based on the findings of the socio-economic impact assessment for the project it is therefore recommended that the proposed Theta Project be approved.		
Floral Ecological Assessment Undertaken by: Scientific Terrestrial Services (STS). Appendix 6	The perceived impact significance of the proposed mining activities prior to mitigation affecting floral habitat, diversity and SCC are mostly high significance impacts, with some considered to be medium significance impacts. Even with effective mitigation taking place, most of the impacts will retain a high significance rating, with only a few reduced to a medium significance rating. Low significance ratings were only obtained for areas that are currently degraded and already suffered a loss of floral diversity with few (if any) floral SCC present. Positive impacts are deemed possible for the decommissioning phase if current degraded habitat is rehabilitated to restore some ecological functioning and habitat connectivity that have been lost due to AIP proliferation and habitat transformation. Thus, for several proposed development activities, particularly activities associated with Iota Hill (Iota Pit, and all WRDs) and to a somewhat lesser extent activities associated with Theta Hill (Theta Pits, and Theta Wishbone WRD), impact mitigation is expected to be limited in its ability to minimise the impacts on the receiving floral environment. If the proposed Theta Project is to proceed, it is deemed essential that a cogently developed, documented and managed biodiversity management plan be implemented and maintained throughout the life of the proposed mine It is recommended that biodiversity offset options be investigated.	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Rehabilitation potential: Due to the presence of sensitive floral habitat of high conservation value, it is recommended that project areas be rehabilitated in accordance with the approved rehabilitation plan. If after rehabilitation there are tangible residual impacts, it is recommended that offsetting could be considered for Optimal CBAs. Biodiversity offsetting, on the other hand, is not feasible for Irreplaceable CBAs (MBSP Handbook, 2014); however, were the proposed Theta Mine application approved after consideration of the principles of Integrated Environmental Management (IEM), it is recommended that it be on the bases that there will be compensation for lost habitat in accordance with National and Provincial Offset Guidelines (preferably as a like for like offset). The initial Scoping Phase layout was associated with higher significance impacts on floral diversity, habitat and SCC due to the overall extent being much bigger than the current EIA Phase Layout, as well as the placement of the previous layouts within more sensitive and diverse floral habitat. Despite the footprint of the EIA Phase layout being smaller and more considerate of sensitive floral communities and habitat, it is the opinion of the specialist that this project will still have negative impacts on the floral ecology within the focus area and potentially on a local to regional scale. The impacts are perceived to be relatively irreversible. If the project is to be approved for overriding socio-economic reasons, Irreplaceable CBAs will be impacted, hence mitigation must comprise both offset (for non-irreplaceable biodiversity) and compensation (for irreplaceable components), including appropriate funding of this initiative. The recommendations listed above, is a summary of the key elements associated with the floral habitat, please also refer to Table 58, 59 and 60; Section 13 for the detailed mitigation measures provided by Scientific Aquatic Services as part of their Freshwater resource and aquatic ecological assessment		
Faunal Ecological Assessment Undertaken by: Scientific Terrestrial Services (STS). Appendix 7	The Five habitat units were defined within the Focus Area from a faunal perspective included the Mountain Outcrops, Montane Grassland, Forest Remnants (Divided into AIP Dominated Forest Remnants and Indigenous Forest areas), Riparian Habitat and Degraded Habitat Unit. There is a high likelihood that some may occur within the focus area permanently whilst others are likely to use the area for foraging purposes. In addition to the observed SCC, it is likely that the focus area will be utilised by several other SCC, both on a temporary and permanent basis. The focus area is considered sensitivity and important for faunal communities, thus from a biodiversity perspective the focus area is of high conservation value. Based on the results of the faunal assessment, it is the opinion of the specialist that this project will have negative impacts on the faunal ecology within the focus area and potentially on a local to regional scale. • A summer assessment to describe the faunal communities accurately is highly recommended. It is of the utmost importance that if approval is granted that the proposed mining footprints and infrastructure locations be inspected by a suitably qualified and experienced ecologist to conduct	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	thorough walkdowns prior to ground/vegetation clearing of the proposed areas to minimize the possible impact to SCC, as far as possible. The following are key recommendations: • Due to the time of year this assessment was undertaken and the limitations this posed on migratory species, it is recommended that a summer assessment be undertaken during the months of January and February to more accurately document the faunal communities; • Upon approval a thorough walk through of the rocky habitat unit and grassland habitat units should be undertaken by a registered specialist for signs of Harpactira hamiltoni (Highveld Baboon Spider, NE) prior to construction, if present the necessary permits should be applied for and appropriate relocation plans drafted; • It is further recommended that a formal avifaunal monitoring programme be established upon approval where: o Absolute counts and density estimates or abundance indices for large terrestrial birds and raptors are applied, o Passage rates of birds flying through the proposed mining areas are recorded, o Occupancy/numbers/breeding success at sensitive habitat units of avifaunal SCC, o Full details of any incidental sightings of priority species; • Vegetation outside of the footprints is not to be cleared unnecessarily; • Where overhead cables or powerlines are located near the Woody Ravine or Freshwater habitats bird flappers are to be used in order to minimise the risk of bird strikes, notably as the mining area is located in an IBA; • As far as possible proposed mining areas should be accessed through the existing road network; • Vegetation clearance and commencement of construction activities either be scheduled to coincide with low rainfall conditions when erosive stormwater is anticipated to be limited or alternatively stormwater controls must be established at the start of construction and dust suppression implemented; • It is recommended to clearly define the boundaries of footprint areas (e.g. through the use of wooden stakes and danger tape) and demarcate routes to mining sites, ensuring that all activities remain within defined footprint areas so as to avoid additional disturbance as a result of footprint creep; • Excavated topsoil can be stored with associated native vegetation debris for subsequent use in rehabilitation;		

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• A suitable rescue and relocation plan is recommended to be developed and overseen by a suitably qualified specialist or nominated mine personnel in order to ensure that species loss during construction activities is kept to a minimum; • Montane Grassland, Mountain Outcrops and the Freshwater Habitat unit recommended to be avoided so as to minimise disturbance to faunal species; • Recommended that no mining activities or associated infrastructure be located within any freshwater systems or their associated buffer zones, this will ensure the continued protection of these systems and the species they support through habitat and resource provision; • Removal/ cutting down of large trees (>4m) recommended to be avoided, notably in the riparian areas, valleys between mountain slopes and along the mountain sides, as these are considered important for large raptors, and cannot be readily replaced through rehabilitation; • Spills and/or leaks from mining equipment required to be immediately remedied and cleaned up so as to ensure that these chemicals do not enter into the freshwater resources; • Prior to vegetation clearing activities in the Mountainous areas, it is recommended to be inspected for the presence of baboon spider burrows. If located, these species required to be carefully excavated ensuring no harm to the spider, and relocated to similar surrounding habitat outside of the footprint area; • Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official be contacted to affect the relocation of the species, should it not move off on its own; • No hunting/trapping or collecting of faunal species is allowed; • No informal fires by construction personnel are allowed; • Initiate an alien and invasive plant control plant; • Initiate a biodiversity action plan. • Several old mine shafts and caves are located within the focus area which may be utilised by bat species, however the constant movement of illegal miners through these adits is likely to limit the		

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	use of these more active adits by bats. Consideration needs to be given that the construction of additional surface infrastructure and operational lights will have an increased probability of altering movement patterns and bat foraging areas due to the attraction of insects to these areas. • Downlighting and as few external lights as needed are to be used for all lighting requirements at night. Additionally, red lights of lower frequencies are to be used in order to limit insect attraction and subsequently the attraction of bats		
Geohydrological Study. Prepared by: MvB Consulting, Appendix 11	*Lowering of the groundwater table:* The groundwater level is deep (50m – 380m) below surface. None of the exploration boreholes drilled at the pit localities intersected any water, and no water levels could be measured in any of these holes several weeks after they were drilled. Mining will therefore take place at a minimum of 50m above the groundwater table. This largely reduces the potential risks of impact from the mining operation and dewatering of the aquifer is unlikely to occur. *Groundwater contamination:* The potential impact to the groundwater quality is largely driven by the waste material and the possibility of contaminant leachate from the exposed rock. The waste classification concluded the following: • The static geochemical testing indicated that only one sample (shale) has the potential to generate acidic leachate. It is expected that if acid generation occur it will be for a short duration due to low sulfur content, and there is enough neutralizing potential in the other material (dolomite) to mitigate this risk. • There are no elements in the Browns and Theta Hill samples that exceed the leachable concentration threshold LCT0. Several elements do however exceed the total concentration threshold TCT0. According to the GNR 635, the waste must be classified as a Type 3 waste based on the TC values of Barium, Manganese, Copper, Boron and Nickel exceeding their respective TCT0 values. • Several parameters exceeded the LCT0 for the leach test on the Iota samples. Chromium and Nickel are two parameters of concern. Mercury was present in the majority of the samples. The XRF and XRD analyses, however, did not indicate high levels of Mercury in the rock material and its presence could be attributed to contamination from drilling. Barium, Copper and Arsenic showed elevated concentrations that exceeded the TCT0 for the majority of the samples. The waste classification indicated that there are some elements that exceed the total concentration threshold and as a result the waste is not totally inert. What is important though is the leachability of these elements and the characteristics of the barrier between the waste body and the groundwater. A geochemical model was	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	developed to assess the risk of leachate from the waste material developing and reaching the groundwater. The geochemical modelling concluded the following: • In terms of geochemical risk, the main source term in the waste rock material in general are sulphide minerals. These minerals contain trace elements and other components which are released upon dissolution. • The geochemical assessment, modelling results and interpretation identified metal(loid)s, specifically arsenic, mercury, chromium and nickel as potential contaminants, however due to adsorptive processes provided by clay and iron oxide minerals these constituents may be reduced in concentration or completely immobilized. • The geochemical modelling indicated that the risk of the development of acid mine drainage conditions are highly unlikely as enough neutralisation capacity is available within the WRD facility and pit backfill material to buffer the pH of the systems. • Contamination of the shallow soil below any on-surface WRD facilities is likely, although the contaminants will be immobilized through adsorptive processes and will therefore not reach the groundwater table. • This impact will be restricted to the footprint of the WRD. Numerical groundwater modelling was undertaken to assess the possibility of contaminated groundwater, should that occur, reaching down-gradient receptors. The aquifer systems are not only a potential transport medium for potential contaminants but should also be viewed as a sensitive receptor from a groundwater use perspective. The Blyde River should also be considered as a sensitive receptor to mine waste drainage as mine waste leachate may have adverse effects on especially the low-flow quality of the receiving stream. • The numerical groundwater model indicated that if contamination enters the groundwater it will not reach the Blyde River in the next 100 years. Due to the low risk posed by the waste material and the mining in general there are currently no additional management requirements, other than groundwater monitoring. The planned rehabilitation of the WRD will further protect the underlying groundwater resource. The proposed rehabilitation includes shaping to prevent water ponding on the WRD, capping and vegetation that will reduce infiltration into the waste material.		
Surface Water Hydrological Study Undertaken by: Hydrospatial (Pty) Ltd,	The project is located in a Strategic Water Source Area (SWSA), meaning that the catchment produces a large quantity of surface water runoff in relation to its size. Furthermore, in the classes and Resource Quality Objective (RQOs) of water resources for the Olifants River (DWS, 2016), it is stated that the sediment situation in the catchment must be improved to support the protected status of the river.	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Appendix 10	The impact assessment indicated that during the construction phase, the exposure of soils due to vegetation clearance and the construction of the Blyde River bridge crossing, will pose high risks if mitigation measures are not adhered to. During the operational phase, open pit mining through, and the deposition of waste rock within non-perennial drainage lines, recommended to be mitigated as far as possible, to reduce high impacts from occurring. Furthermore, runoff from these facilities recommended to be captured and contained in a closed system, to prevent negative impacts on water quality. During the post mine closure phase, erosion of the rehabilitated area, as well as the filling up and overflowing of the remaining pit voids and PCDs, were considered high risks. The following are key recommendations: • Vegetation clearance and the exposure of soils must be kept to an absolute minimum; • Temporary erosion control measures (e.g. sediment nets, berms, etc.) must be employed around working areas; • The recommended water quality monitoring programme is implemented at least a year prior to construction, to obtain a suitable baseline for the wet and dry seasons; • The proposed SWMP is implemented. Erosion and sediment control, as well as the containment and management of dirty water runoff, are the most important aspects to prevent negative impacts on the Blyde River; • Energy dissipation measures are implemented at steep sections as well as at the exits of the proposed channels; • The construction of the bridge over the Blyde River must take place during the low flow months. The river must be appropriately diverted around working areas, and the generation of sediment must be controlled through suitable measures. The river flows, geomorphology and aquatic fauna and flora must be considered in the design, construction and operation of the bridge; • Sufficient freeboard in the PCDs and other dirty water dams must be ensured at all times. The dams must be strictly managed in accordance with GN704 regulations; • Dirty water must not be discharged to the environment. Excess water within the mine water circuit, must be appropriately dealt with, in agreement with the DWS; • Abstractions from the Blyde River during the dry season months should be avoided as far possible. The use of water from flooded surrounding historical adits, or the construction of suitably sized PCDs should be investigated; • Stormwater management and erosion control along the proposed mine roads must be ensured. It is recommended that runoff is diverted off the roads through suitably spaced berms;		

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• The Iota PCD is at risk of flooding as it is located within the 100 year floodline. It is proposed that a flood diversion berm is constructed at a height above 1 252 mamsl; • Exemption from GN704 is obtained for infrastructure that falls within the floodlines or 100 m buffer; • Suitably sized culverts are placed where linear infrastructure crosses the minor non-perennial drainage lines; • Post mine closure, rehabilitation must ensure that erosion prevention is adequate for the long-term; • Water levels within the remaining pit voids and PCDs must be managed post closure. The use of water from these facilities for irrigation of vegetation used for rehabilitation, should be investigated. Furthermore, should the process plant be used for future projects, then water can be sourced from these facilities; and • The recommended mitigation measures and monitoring plans are implemented.		
Freshwater resource and aquatic ecological assessment Undertaken by: Scientific Aquatic Services (SAS),. Appendix 9	Numerous freshwater and aquatic resources (all classified as watercourses as defined in the NWA) were identified within the study areas and within 500m thereof. No naturally occurring wetlands were identified in the study areas. These watercourses (Blyde River and associated tributaries) with associated riparian habitat were assessed and largely found to be of increased ecological integrity, importance and sensitivity. The results of the Risk Assessment are summarised in Table 58, 59 and 60 (Section 13), and indicate that, assuming a high level of mitigation is implemented throughout all infrastructure areas, impacts relating to the construction phase are likely to be of low to medium significance. Without mitigation, impacts of some activities may potentially be of medium to high significance. The following recommendations were made: • All activities including prospecting (if applicable) should adhere to the requirement of GN704 of the National Water Act, 1998 (Act No 36 of 1998) (NWA); • During the planning phase, the location of access roads should take into consideration the sensitivity maps provided, and wherever possible, access roads should not be planned adjacent to, or traversing, any watercourse. Should it be essential that access roads cross over any watercourse, this should be planned at existing crossing points or points of existing disturbance within the river and/or riparian zone; • It should be ensured that no development of any geographically variable infrastructure takes place within 100m of the Blyde River, its tributaries, or any other delineated freshwater resource in line with regulation GN704 of the National Water Act as far as possible, while ensuring that mining is	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	done safely and to optimise resource abstraction as far as possible without causing irreversible harm to the watercourses of the region; • All road crossings over watercourses must be kept to the bare minimum and are adequately designed to prevent impacts on habitat, instream flow, pattern and timing of water and water quality. • All mining infrastructure must remain out of the riparian zones and associated zones of regulation in line with the requirements of GN704 and GN509 of the NWA. Any mining infrastructure within the applicable zones of regulation in terms of GN704 and GN509 must be appropriately authorised; • Limit the footprint area of the construction activity to what is absolutely essential in order to minimise the loss of clean water runoff areas and catchment yield and the concomitant recharge of streams in the area; • Design of infrastructure should be environmentally and structurally sound and all possible precautions taken to prevent contamination of surface and resources present; • No dirty water runoff must be permitted to reach the watercourses, in line with GN704 as it relates to the NWA and appropriate clean and dirty water separation and stormwater management controls must be developed as the first part of the construction activities of each project/mining unit; • It is deemed essential that the mine be designed in such a way as to ensure that decant is prevented for the life of the proposed mining activities and beyond closure unless measures to treat decant to background water qualities can be ensured until the quality of the decant naturally returns to these background levels; • . Appropriate measures to manage Acid Mine Drainage (AMD) must be implemented as part of the mine design and management; • Water quality, with special mention of pH, dissolved salts and specific problematic geochemical processes like AMD need to be managed, and monitored in order to ensure that reasonable water quality occurs downstream of the mined areas to allow for the on-going survival of a riparian and aquatic community in line with the REC and RMO, and in support of Resource Quality Objectives for the major watercourses of the region and most notably the Blyde River; • Mine design and planning must ensure that connectivity of the freshwater resources is maintained; • All proposed haul and access roads, fences and any additional linear infrastructure (e.g. PCD pump columns and Eskom power supply) must cross the watercourses at the narrowest point and at a 90-degree angles. As much as possible, existing access roads and river crossings must be utilised (if necessary, upgraded) to minimise further disturbances to the watercourses;		

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• The substrate characteristics of the watercourse and instream connectivity must be maintained; • Obstruction of flow should not take place or should only occur for very short periods, if absolutely essential; • Restrict construction of clean and dirty water systems and within watercourses (e.g. Wishbone WRD and bridge crossings) to the drier winter months to avoid sedimentation of the watercourses in the vicinity of the proposed mining project; • Vehicles to be serviced at the contractor laydown area and all refueling is to take place outside of the watercourses and applicable setback zones; and • Sanitation services must be provided for construction personnel, whereby at least one portable toilet will be provided per ten personnel and will be emptied regularly. The recommendations listed above, is a summary of the key elements associated with the freshwater habitat, please also refer to Table 58. 59 and 60; Section 13 for the detailed mitigation measures provided by Scientific Aquatic Services as part of their Freshwater resource and aquatic ecological assessment.		
Air Quality Impact Assessment (AQIA) Undertaken by: WSP Environmental (Pty) Ltd (WSP),. Appendix 12	The resultant environmental air quality risks for sensitive receptors were ranked “low” during the construction and operational phases, with mitigation in place. Impacts associated with the proposed project were assessed through the application of a risk matrix. Based on these calculations, the impacts associated with both the construction and operation phases on the neighbouring receptors are calculated to be low, recognising these impacts are calculated assuming the various mitigation measures applied in the emissions inventory will be implemented onsite. Should this mitigation not be implemented accordingly, impacts on the receiving environment will be substantial. Based on the findings of the assessment the following mitigation measures would serve to reduce air quality impacts to the receiving environment and sensitive receptors: • Implementation of a dust fallout monitoring program comprising a minimum of eight dust fallout samplers, with monitoring, and sampler design, undertaken in-line with latest ASTM methodologies. • These samplers should be located along the fenceline of Theta Hill providing insight into dust fallout levels potentially impacting the receiving environment. • Installation of a meteorological station at Theta capable of monitoring, at a minimum, wind speed, • wind direction and rainfall. As stipulated in the National Dust Control Regulations, Theta will be • required to include site specific meteorological data into their monthly monitoring reports.	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• Information regarding construction activities recommended to be provided to all local communities. Such information includes: • Grievance mechanism though a complaint registers at the mining offices if complaints arise to reduce emissions in a timely manner. • Complaints register recommended to be kept to record all events. • Avoid dust generating works during the windiest conditions (especially winds potentially transporting dust towards receptors) if practically possible; • When working near (within 100 m) a potential sensitive receptor, limit the number of simultaneous activities to a minimum as far as possible; • Wet suppression and wind speed reduction are common methods used to control open dust sources at construction sites as a source of water and material for wind barriers tend to be readily available • Where re-vegetation is not feasible, areas of concern can be mitigated with the use of water sprays (control efficiency of 50%). • Windbreaks in the form of shade cloth screens may be erected at exposed areas • Rehabilitation/re-vegetation procedure recommended to be implemented in accordance with the approved rehabilitation plan. • Wet suppression techniques be implemented for emissions control where applicable. Before beginning topsoil removal, the relevant area recommended to be wet for up to 50% control efficiency • Modifying or ceasing loading activities during dry and windy conditions where possible; • Avoid double handling of material where possible; • Minimising the drop height of the material from truck loads where possible; • Using bund walls to shelter the tipping process and protect particulates from resultant stockpiles from being further entrained by wind erosion where possible; • Using water carts with boom sprayers or wet suppression systems when loading and unloading activities occur where possible; • It is recommended that all unpaved haul roads and those roads that experience high traffic volumes continue to receive wet suppression, dust-a-side or another form of chemical suppressant (preferably an emulsion type which bonds the soil together). Water can also be applied as a dust suppressant to the unpaved roads		

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• In order to decrease the erosion potential of stockpiles, the following mitigation techniques are suggested: Permanent stockpiles be enclosed with concrete berms; The height of existing berms at stockpiles be increased, reducing the impact of winds on the stockpile; Temporary stockpiles be enclosed by porous walls; Small, temporary stockpiles can be covered with a porous sheet (preferably hessian).		
Visual Impact Assessment Undertaken by: Scientific Aquatic Services, Appendix 15	Several potential risks to the receiving aesthetic and visual environment as a result of the proposed mining operation have been identified, relating to impacts on visual character and sense of place, visual intrusion and visibility of mining infrastructure. Based on the impact assessment, it was found that the various potential visual impacts identified will be most significant during the operational phase of the project. Based on the findings of this study, it was determined that the TGME Theta Hill Project will have a high visual impact on the receiving environment due to it situated within such close proximity to the town of Pilgrim's Rest which is declared a National Monument and heritage site. With the revised layout (June 2020) of the TGME Theta Hill Project, the visual impact on the town of Pilgrim's Rest have been increased. The main contributing factor for the increased negative visual impact is the increase in extent of the pits and WRDs as well as the increased heights of the WRDs. This has led to the proposed TGME Theta Hill Project being visible from more vantage points within the surrounding area. It is recommended that stockpiles and berms be vegetated with indigenous grasses in order to blend more easily into the existing landscape and for screening purposes of the open pits and infrastructure. • The design and height increase of stockpiles and WRDs recommended to be monitored to ensure that these components relate to acceptable environmental standards in terms of slope and elevation. • In the town of Pilgrim's Rest where the residents are directly affected by the proposed mining activities, it is recommended that the landowners are to be contacted to discuss possible mitigation measures such as berms, screen planting or walls. Roadside vegetation, in the form of tall trees to considered along the R533 road, so as to minimise the effect on tourists and motorists utilising the road; • Erosion, which may lead to high levels of visual contrast and further detract from the visual environment, to be prevented throughout the lifetime of the project by means of putting soil stabilisation measures in place where required and through concurrent rehabilitation;	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• Concurrent/ progressive rehabilitation be implemented and disturbed areas must be rehabilitated as soon as possible and as soon as areas become available by replacing topsoil and revegetating disturbed areas. • A lighting engineer may be consulted to assist in the planning and placement of light fixtures for the mining infrastructures in order to reduce visual impacts associated with glare and light trespass; • Security flood lighting and operational lighting recommended to be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas, i.e. away from settlements, villages, towns, and the main roads It must be noted that even with mitigation the visual impact of the proposed mine will be high and limited mitigatory measures are available, especially in the operational phase of the proposed mine to significantly reduce the visual impact. Post decommissioning and closure phase impacts are likely to be permanent should rehabilitation efforts fail to create a hillside slope similar to the surrounding mountainous landscape.		
Environmental Noise Impact Assessment Undertaken by: dBAcoustics, Appendix 13	The proposed terrace mining project will take place in a mountainous area west and south of Pilgrim's Rest in the vicinity of mining activities and existing infrastructure which have been moth balled since early 1900's. There is a continuous flow of traffic along the access routes and the people in the town is exposed to traffic noise and tourist type noises. The potential environmental impact will be insignificant during the construction and decommissioning phases (provided that the noise mitigatory measures will be in place) and moderate during the operational phase at the abutting residential areas. The following recommendations were made: • Equipment and/or machinery which radiate noise levels between 85.0dBA and 90.0dBA to be acoustically screened off. • Emergency generators to be placed in such a manner that it is away from any residential area. • An earthberm to be constructed along the section of the open cast pit which will face the residential areas. • Environmental noise and monitoring to be carried out along the footprint boundaries of the pit and at the abutting residential areas (to be determined once the pit boundaries have been identified). • Environmental noise monitoring at the residential areas and the mine boundaries to be done on a monthly basis for a year after which the frequency can change to a quarterly basis. • All acoustic screening measures must be in place before commissioning the proposed open cast pit mining;	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• Environmental noise and ground vibration monitoring to be carried out during the different phases of the project; • All noise sources at the different mining areas to be identified and registered; • The Noise Control Regulations, 1994 to be adhered to at all times. The environmental noise management plan recommended during all the phases of the open cast pit activities so as to identify any noise intrusion and/or ground vibration increase on a pro-active basis and to address the problem accordingly		
Soil, land use and land capability Assessment Scientific Aquatic Services, Appendix 5	The proposed mining project is not anticipated to cause significant cumulative loss of herbaceous material for grazing after mitigation measures have been put in place. In addition, since the majority of proposed activities are to occur on shallow soils. It should be noted that cumulative loss of wilderness soils is likely to occur particularly on sloping areas during opencast mining activities, some of which will be unavoidable even when mitigation measures have been implemented. The project could cause soil erosion and the associated sedimentation of downgradient areas, soil compaction, soil contamination and loss of land for potential forestry and grazing. However, if mitigation measures are carefully implemented during all phases of development, the project is not seen as fatally flawed from an agricultural potential, land use and land capability point of view and the cumulative impact on agricultural resources is limited, although the conservation value of the area must be considered. • A site-specific soil rehabilitation plan recommended prior to commencement of mining and related activities to ensure that the natural topography and wildlife/wilderness land capability is reinstated post closure and residual impacts minimised. Key Recommendations include: • The footprint of the proposed mining operation and related infrastructure areas recommended to be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible; • Laydown areas to be located within disturbed soils (Anthrosols) to avoid compaction of natural soils as far as practically possible; • An emergency response contingency plan recommended to address clean-up measures should a spill and/or a leak occur; • Stockpile areas to be demarcated as "No Go Areas" to ensure that the disturbance of topsoil is minimal;	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• Stockpiles recommended not exceed three (3) meters in height and should be treated with temporary soil stabilization measures. Should a topsoil stockpile height of three (3) meters be exceeded, erosion control measures to be implemented; During the decommissioning phase the footprint be thoroughly cleaned, and all construction material removed to a suitable disposal facility.		
Phase 1 Cultural Heritage Assessment Prepared by: J A van Schalkwyk,. Appendix 8	For the proposed Theta project, the assessment has determined that, whilst there are a number of historical sites, features or objects of heritage significance in the area around Pilgrim's Rest, occur in the study area. If heritage features are identified during construction, as stated in the management recommendation, these finds would have to be assessed by a specialist, after which a decision will be made regarding the application for relevant permits. • During the survey, the following sites, features or objects of cultural significance were identified, only some of which are deemed to be conservation/documentation worthy: • Currently, the Theta Pit boundary approaches the fort to within about 22m. It is recommended that a buffer zone of at least 15m is created around the outer edges of the fort and that this is formalised with a suitable, permanent fence (with an access gate). • Cocopan track and bridge: A section of the remaining cocopan track will be impacted on due to the proposed construction of a pollution control dam (PCD). "Built" adits (situated outside the development footprint, and avoid if possible) • Various Burial sites and Cemetery (situated outside the development footprint, and avoid if possible) • If any of the identified structures is to be demolished, it must be fully documented – mapped, photographed and described – beforehand. A section of the track will be impacted on by a proposed new haul road. As an off-set to this, it is proposed that the section of the track extending from the road towards TGME (at the old pump station) westwards to the metal bridge across the Blyde River be declared a no-go section and that it is protected and retained as a sample of this type of technology. The site of historic significance closest to Theta Hill Pit, namely the old fort, can easily be avoided as it falls outside the mining area – please just note the buffer area needed. Should archaeologically importantly sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38
Climate Change Impact Assessment.	This study considered two perspectives in terms of climate change and the Theta Mining project. The first was the impact of the project on climate change. The second was the impacts of climate change on the project. In	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Prepared by: Promethium Carbon, Appendix 14	both perspectives, the physical and transitional risks were considered. The following are key aspects that emerged from this climate change impact assessment: • In terms of the proposed Theta Mining project's impact on climate change, the mine will generate emissions both through its direct operations, and there will be emissions associated with the mine's value chain. • In terms of the impacts of climate change on the project, there are key vulnerabilities related to the core operations and the value chain of the proposed project. The core operations are exposed, and highly sensitive to, increased temperatures, severe storms and variable rainfall patterns. These climatic changes will result in risks to the labour force, potential infrastructure damage as well as logistical disruptions. Due to the location of the project and the surrounding environmental context, these risks also pose environmental impact risks. • With respect to the social and natural environment in which the mine would operate there are two key aspects to consider: the first is that the community surrounding the mining site is very vulnerable to climate change impacts. Secondly, land rehabilitation will play a critical role in supporting the facilitation of secondary economic development options and he restoration of natural environment to support ecosystem services. This will play an important role in addressing legacy mining issues which pose a number of risks to the local community. To maintain its social license to operate we recommend that the impact of climate change on the mine's social environment be addressed in the mine's Social and Labour Plan. Recommended that The Social and Labour Plan include appropriate climate change adaptation actions focusing on health and social resilience building. Linked to the above is land rehabilitation. Land plays a critical role in post mine life sustainability. Pro-active planning for land restoration and rehabilitation, within the context of climate change, is critical to ensure the future integration of land into the existing spatial context and supporting sustainable development trajectories. Changing climatic parameters such as droughts and flash floods could constrain the land rehabilitation process. As such we recommend that the rehabilitation and mine closure plans clearly address climate change risks and mitigation measures to optimise land for a variety of potentially viable post-mine life land uses.		
Theta Project Biodiversity Offset and Compensation Recommendations. Undertaken by: Conservation Strategy Tactics & Insight and	As part of the EIA application the following suggested mitigation measures are suggested: *Biodiversity offset:* • As an offset for the biodiversity footprint impacts of the project, the applicant must secure an area of not less than 3336ha of NE Dolomite Grassland, within the Malmani Karstland listed ecosystem and containing as great a proportion of CBAs (set out in the MBSP 2014) as possible.	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Scientific Terrestrial Services CC	• The applicant must procure the necessary consents, permissions and other administrative and management authority agreements for the offset area for declaration to the relevant authority as a Nature Reserve (or a part of an existing Nature Reserve) under Section 23 of the NEMPA. The required consents (land owners, beneficial occupiers, management authority and other rights holders inter alia) and other administrative measures to secure this declaration must be submitted to the relevant MEC (or failing that the Minister of Environment, Forestry and Fisheries) for consideration for the declaration, before the activities may commence. • The requisite Protected Area Management Plan for the Offset property(ies) must be drawn up, in consultation with MTPA (and/or DEFF if applicable), within 1 year of the submission of the documents noted above, and submitted to the MEC for consideration. • The applicant must be responsible for all costs of declaration, establishment and the procurement of and implementation of the management plan for the offset site protected area for a minimum of 30 years or until 10 years post the issue of a closure certificate for the mining operations covered by 83 MR, whichever is the later. • The applicant must procure an independent auditing of management performance of the offset site PA every 5 years, with the audit report being submitted to MTPA, DARDLEA, DEFF and the DMRE. The applicant is required to comply with the independent audit recommendations, failing which the specified portion of the guarantee or performance bond required below will become due and payable to the institution established to safeguard the offset and compensation. *Biodiversity-related compensation for potential water and sedimentation impacts:* • To compensate for existing licenced abstraction of water in this Strategic Water Source Area, as well as for potential impacts on water ecosystems and associated biodiversity through sedimentation and altered flows, the applicant must develop two rehabilitation plans, and implement those components of the plans outlined below, to achieve the requisite outcomes. • The applicant must develop, in conjunction with MTPA, DARDLEA, the Thaba Chweu Municipality, large landowners (>1000ha), the FPA, DWS and DEFF an integrated conservation, forestry and agriculture land use and rehabilitation plan for the Quaternary Catchment B60B with 2 years of the issue of the EA (The Rehabilitation Plan for B60B). • This plan must set out priority areas for rehabilitation, deployment of biocontrol and other effective means of long-term control of invasive species, existing lawful agricultural (ploughing) use, and be able to inform future land use planning instruments (IDP, SDF and LUS) of the municipality;		

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• The plan must provide for alignment of all investments in natural resource management, including but not limited to, Invasive Alien Tree control and biocontrol, wetland and riparian restoration, erosion and sedimentation control, and forest and grassland rehabilitation. It may provide for alignment with fire management plans produced by the relevant FPA, if appropriate; • The plan must be signed off by MTPA before finalization, and lodged with the operational divisions of all applicable resource management entities (DEFF NRM, FPA, Thaba Chweu LM, DARDLEA); and • The plan must be revised every five years after initial lodging, and again after every major fire or other significant disturbance. • The applicant must develop, in conjunction with MTPA, the Thaba Chweu Municipality, large landowners, DARDLEA, DWS and DEFF an integrated Conservation and Forestry land use and rehabilitation plan for the Quaternary Catchment B60A with 2 years of the issue of the EA (The Rehabilitation Plan for B60A). • The plan for B60A must include, where relevant, similar components and requirements to that for B60B. • The applicant must fund the Coordination, Management and Reporting Structures for the implementation of both the rehabilitation plans for a period of not less than 12 years from the submission of the plan (5-year Life of Mine + 7 years follow up). • The applicant must at least be responsible for reaching the rehabilitation targets of the Rehabilitation Plans for its mining rights area (83MR) and for the portion of land in the Rehabilitation Plans within the Stanley Bush Kop section managed as part of the Blyderivierspoort Nature Reserve (BNR) ; and • The rehabilitation target of the B60B Rehabilitation Plan for the 'Stanley Bush Kop' section of the Blyderivierspoort Nature Reserve shall not be less than the maintenance, for a minimum of 5 years, of the Reserve at: * an invasive alien tree density of <1%; * with no mature, seed-bearing trees; * a basal cover measured on a 10 square metre plot of at least of 30% indigenous vegetation; and * sedimentation runoff reduced by at least 25% compared to a baseline prior to the activities' commencement. • All land owned by the applicant within quaternary catchments B60B and B60A outside the mine works areas shall comply with the stipulations set out in the rehabilitation plans and related regulations for natural resource management (viz. Maintain natural vegetation for 5 years at <1% Invasive Alien tree cover, with indigenous basal cover >30%, and measured sedimentation runoff at least <25% of pre-commencement levels).		

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Safeguards for offset and biodiversity compensation: • As a suspensive condition of this Environmental Authorisation, an implementation agreement must be concluded with the MTPA describing the specifics of the offset site(s), the steps for compiling the quaternary catchment Rehabilitation Plans, the institutional and financial arrangements for achieving the requisite outcomes of the full scope of required offset and compensation, and other relevant matters. • This agreement is to be concluded with MTPA and submitted to the relevant DMRE office and the DEFF before commencement can begin. • The applicant is expressly prevented from applying for any new Environmental Authorisations (except those under Section 24G for rectification of impacts prior to the issuance of this Authorisation) until such time as the offset declaration is complete and management plan approved by the responsible authority, the Rehabilitation Plans are developed and submitted to MTPA and DARDLEA, and the financial guarantees to the implementing party are in place to the satisfaction of the MTPA. Institutional and Financial Arrangements to cover Offset and Compensation Measures: • It is recommended that the applicant establish a trust or similar structure, with majority representation from MTPA, a suitable Public Benefit Organisation and Independent biodiversity professionals, and minority from the applicant, and that is independently chaired. • The Trust objectives must include, inter alia, the requisite outcomes of the Offset and Compensation measures outlined in this authorisation and in the Offset & Compensation Study submitted for the project. • Given the scope of potential impacts in the receiving environment, the applicant is required to provide a bank guarantee or performance bond lodged in an escrow account of an entity mutually agreed with the MTPA (or an alternative financial mechanism to the satisfaction of the MTPA and the Trust) of an amount sufficient to cover the applicant's offset and compensation obligations for 30 years. The guarantee is to be in the name of the Trust and must be used exclusively to achieve the outcomes of the offset and compensation, and if they have already been reached, then to further the objectives of the offset and compensation measures set out herein. • If the applicant fails to comply with the Offset Condition, then 30% of the guarantee becomes immediately payable to Trust		

List of studies undertaken	Key Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• If the applicant fails to reach the targets set out in the rehabilitation plans then 60% becomes immediately payable to the trust to pursue reaching these targets. • Notwithstanding the bank guarantees being made available to the Trust, the applicant is still liable for complying with all conditions pertaining to the offset and compensation set out herein.		
Closure and Rehabilitation Undertaken by: Globesight, Appendix 16	Recommendations that could form part of an aftercare and maintenance program are described below: • Surface erosion on all rehabilitated areas: Assess type of erosion, source of erosion and take corrective measures to repair; • Geotechnical stability on all WRDs, highwalls and embankments: Identify areas of instability, determine the cause and take corrective and preventative measures; • Cover system performance in terms of ability to facilitate successional development of an ecosystem, resist excessive erosion, management of surface water run-off and ability to support nutrient cycles; • Siltation of water courses: Identify source of sediment and take corrective and preventative measures; • Surface and ground water quality: Ensure monitoring points are regularly maintained and data is collected and stored; • Air quality; • Alien and invader species: Implement a continuous alien and invader eradication program by using mechanical, chemical or biological methods; • Vegetation establishment on rehabilitated surface: Assess; species diversity, its performance towards the reference ecosystem, successional stage, root development, basal growth and leaf cover; • Visual integration into the natural landscape to minimise eyesores and visual impacts.	Yes	Sections 13, 17, 19, 22, 23, 24, 34, 36 and 38

19. Environmental impact statement

19.1. Summary of the key findings

The impacts evident from the detailed impact assessment (Section 13) of the proposed project are both positive and negative in nature. The key positive and negative findings are outlined below.

19.1.1. Key Positive Impacts After Mitigation

The main positive impacts identified for the project relate to socio-economic impacts that the construction and operation of Theta Hill Project will have. These aspects were determined to have a positive impact, either directly or through potential spinoffs generated by the development and operation of the proposed Theta Hill Project and associated infrastructure. These positive impacts occur throughout all phases of the project.

In terms of local economy, there is the potential for multiple significant benefits to both local and regional businesses, as well as local employment opportunities. This would be highest during the construction phase, due to the requirement for significant contractor numbers (for services and materials). The project is expected to create between 400 and 450 direct jobs and an unknown number of indirect jobs during its lifetime.

The assessment of the current economic state in Thaba Chweu LM and Ehlanzeni DM, the profile of the zone of influence, and the project itself revealed that the proposed mining activity will create numerous positive impacts and will likely stimulate the local economy. The stimulation of the national economy will occur as a result of the investment into the mine and proceeds from production.

The total gross value added (GVA) of the town is currently estimated in the region of R20m. Direct spending on construction activities alone could be 3 times the current size of the Pilgrim's Rest economy. The direct income from construction activities is also expected to have some distributive impact as low-income households are expected to earn a slightly higher portion (25%) of total income compared to the provincial and national averages of 11% and 16% respectively.

The TGME mining project holds very high potential in terms of short-term job and income creation for the local community; potential for up-skilling of the local workforce: public revenues in the form of taxes, royalties as well as local development funds over the six and a half year Life of Mine (LoM).

It should be noted that the mine's involvement in the local economy through their social funding, SLP and local procurement programmes could result in a number of positive opportunities for economic diversification.

The rehabilitation process is expected to address some of the environmental damage done by mining activities over the past 146 years. This would be made possible as a result of the revenue generated from the proposed mining activities.

In terms of the short time span of the project there is a high likelihood that this project will unlock future mining investment in the area which will extend the window of opportunity for the project to contribute positively to the local economy of Pilgrim's Rest. T

his could result in the development of alternative sustainable industries in the local area through the mine's social investment programme, skills programmes and contribution to tax revenues. The potential high informal influx of people anticipated into the area is a typical result of large mining projects in general, especially in societies or regions that experience high unemployment levels. The mine is expected to also benefit the larger regional economy through supply links with the mine and induced spending. It could also be said that if mine management maintains a well-publicised tight control of illegal mining activities in the area it might even deter some of the in-migration related to illegal mining activities into the project areas, as well as the subsequent environmental pollution as a result of the illegal mining activities.

A reduction in the activities of illegal miners is foreseen, due to formal mining activities in the area and the mine's stated intention of employing a specialist team to deal with illegal miners.

It should be noted that, if this project is to proceed, profits from the project would unlock further mining opportunities for the project developer in the area in future. This implies that similar positive as well as negative impacts related to mining operations as described in this section could potentially be sustained in the local area for another 20 years or more.

During the decommissioning phase positive impacts will occur from rehabilitation activities including the restoration of land capability to its pre-mining state or agreed upon alternative, the restoration of vegetation and habitat types as well as the rehabilitation of infrastructure footprint areas.

The groundwater study showed that mining will take place above the groundwater level and as a result no impact on the groundwater levels will occur. The geochemical composition of the waste material does not contain hazardous contaminants and the potential for Acid Rock Drainage (ARD) is low. It is evident from the 1:20 leach tests that the quality of the leachate does not pose a risk to the groundwater. None of the parameters exceed the guideline limits.

It should, however, also be noted that the increased illegal mining activities have a significant existing impact on the water quality and quantity of the Blyde River. Should the project not proceed, the illegal mining activities are anticipated to significantly increase, with dire consequences for the local and downstream environment. If the project is authorised, it is anticipated that TGME could assist in controlling and possibly eradicating the illegal mining activities through their safety and security measures to be put in place. Adherence to environmental regulations and guidelines can then be managed and audited through the formal processes.

19.1.2. Key Negative Impacts After Mitigation

The assessment found that potential negative impacts can be expected as a result of the Theta Hill Project. The most significant impacts identified were on the biodiversity (both fauna and flora) habitat units, socio-economic impacts on the area, visual intrusion, and impact on the watercourses situated within the study area and their associated functions.

- *Biodiversity (fauna / flora)*

The results of the floral report indicate that the focus area is of increased sensitivity due to the proposed mine layout encroaching onto areas of intact, and largely undisturbed, vegetation that is representative of the vegetation types for the area; these include endangered vegetation types and an endangered ecosystem. Moreover, the focus area is floristically diverse, and a broad range of floral SCC are present, including some threatened species but mostly consisting of provincially protected flora. Based on these results the mine has made changes to their proposed layout to minimise, as far as is economically feasible, the impact on the sensitive floral communities and habitat within the Theta Hill site. Although the revised EIA Phase Layout has managed to reduce the overall perceived impact on floral ecology on Theta Hill, there will still be a loss of favourable floral habitat that will impact on floral communities and SCC not only within the direct footprint but on adjacent habitat as well. This will result mainly from edge effects associated with habitat fragmentation, ongoing AIP proliferation and an increased risk of SCC harvesting.

The findings of the field assessment indicate that the focus area is characterised by four broad habitat units, i.e. Mountain Outcrops, Montane Grasslands, Riparian Habitat and Forest Remnants as well as Degraded Habitat. Although all habitat units have been affected by anthropogenic activities to some degree, the severity of the impacts differ. Apart from the Degraded Habitat unit, all other habitat units remain largely intact and their habitat integrity is only slightly compromised due to existing roads (i.e. habitat fragmentation) and some AIPs encroaching into natural areas. The potential for the various habitat units to support floral SCC also differ with the Mountain Outcrops harbouring the highest abundance and diversity of floral SCC, followed by the Montane Grasslands. Consequently, the ecological sensitivity of the identified habitat units varies between high to moderately high (Mountain Outcrops and Montane Grasslands), moderately high to intermediate (Riparian Habitat and Forest Remnants) and moderately low (Degraded Habitat).

The perceived impact significance of the proposed mining activities prior to mitigation affecting floral habitat, diversity and SCC are mostly high significance impacts, with some considered to be medium significance impacts. Even with effective mitigation taking place, most of the impacts will retain a high significance rating, with only a few reduced to a medium significance rating. Low significance ratings were only obtained for areas that are currently degraded and already suffered a loss of floral diversity with few (if any) floral SCC present. Positive impacts are deemed possible for the decommissioning phase if current degraded habitat is rehabilitated to restore some ecological functioning and habitat connectivity that have been lost due to AIP proliferation and habitat transformation. Thus, for several proposed development activities, particularly activities associated with Iota Hill (Iota Pit, and all WRDs) and to a somewhat lesser extent activities associated with Theta Hill (Theta Pits, and Theta Wishbone WRD), impact mitigation is expected to be limited in its ability to minimise the impacts on the receiving floral environment.

Based on the results of the faunal assessment, it is the opinion of the specialist that this project will have negative impacts on the faunal ecology within the focus area and potentially on a local to regional scale. Of further importance it is expected that the impacts stemming from this project will be relatively irreversible. The impact of the proposed project must however be contrasted with the risk that uncontrolled artisanal mining poses.

An appropriate biodiversity offset and compensation plan, as well as appropriate funding of this initiative is considered essential. TGME is currently undertaking an offset investigation to investigate the suitability of a biodiversity offset, including the calculation of potential biodiversity losses and required offset quantum, for the proposed Theta Hill Project. Once finalized a follow-up meeting will be arranged with Mpumalanga Tourism and Parks Agency (MTPA on the approach and way forward of the investigation. Please refer to Appendix 18 for the phase 1 offset investigation report.

- *Freshwater Ecology*

Numerous freshwater and aquatic resources (all classified as watercourses as defined in the NWA) were identified within the study areas and within 500m thereof. The aquatic specialist indicated that no naturally occurring wetlands were identified in the study areas. These watercourses (Blyde River and associated tributaries) with associated riparian habitat were assessed and largely found to be of increased ecological integrity, importance and sensitivity, particularly in the upper reaches where anthropogenic disturbances are limited. Even in the lower reaches where historical mining and agricultural activities have occurred, the systems are considered to have been exposed to limited levels of modification with impacts occurring within a limited extent.

Based on the findings of this study, it was determined that the various project components pose varying degrees of risk based on the distance of each operation from the watercourses in the region. Numerous watercourses (Blyde River and associated tributaries) are situated downgradient of the various study areas, and therefore there is significant potential for the systems to be impacted on by the proposed mining activities, particularly in terms of sedimentation and impacts on water quality post mitigation.

Implementation of the identified mitigation measures along with general ecologically sensitive mining and construction methods are deemed essential to ensure that the ecological integrity of the highly important and sensitive freshwater resources in the vicinity of mining activities are not compromised to such a degree that the RQOs for these drainage systems cannot be met, there is a change in EcoStatus and that long term and/or irreversible impacts on the watercourses of the area occur.

- *Socio-Economic environment*

The majority of negative socio-economic impacts are rated medium and are typical of the socio-economic impacts that could be expected in mining projects. These impacts could largely be mitigated through proper management measures.

There are however, a number of potential socio-economic impacts on the local community that needs to be flagged as medium to high risks. These risks can be mitigated as summarised below:

Job Creation and project timeframe: The short operational period, combined with the large scale of the project could result in real challenges for the community in terms of job losses and the decline in local economic development funds after mine closure (rated as high risks). It is however noted that this project could unlock further underground mining opportunities in the area in future.

Project Induced formal and informal influx into Pilgrim's Rest: High levels of formal and informal population influx into Pilgrim's Rest (rated a medium to high risk) is highly probable and is rates a high risk. It is also a difficult risk to mitigate. Pilgrim's Rest face additional challenges in terms of local governance issues and uncertainty over the distribution of responsibilities between different government departments as well as the lack of available/safe land for further development of Newtown/Schoonplaas as its largest settlement. TGME would be able to manage the formal/structured in-migration through their employment and procurement strategies. Formally appointed employees from outside the area will typically stay in the local housing facilities provided by TGME as part of the proposed upgraded Caravan Park. Such formal and structured in-migration can, if associated with economic opportunity, result in downstream benefits for the local businesses with additional spin-offs in terms of employment, as well as the overall improvement in infrastructure and service in the Pilgrim's Rest area. TGME could continue, and possibly expand, their existing financial and socio-economic support to the local Pilgrim's Rest Primary School to assist the children affected by the socio-economic impacts of the in-migration of outsiders. It is recommended that TGME support TCLM and coordinate with the municipality to anticipate, manage and mitigate the impacts of in-migration. In this regard it is recommended that TGME assist in undertaking the necessary studies to enable the TCLM to implement the proposed townplanning process with regards to the expansion/development of residential units as part of Newtown/Schoonplaas. TGME can consider entering into partnerships with the TCLM to raise awareness and education on social issues and safe social behaviours, especially now in the light of the Covid-19

Pandemic. It could also be said that if mine management maintains a well-publicised tight control of illegal mining activities in the area it could assist in controlling the inflow of outsiders to the area.

Sense of place: The mining activities could have a negative sense of place on the predominantly rural and historic character of Pilgrim's Rest due to visual scarring of the landscape as well as a potential increase in noise and activity levels. The mine will be operational 6 days per week (excluding Sundays) and work will be done in two shifts 6am to 4pm and 4pm to 2am. This risk is rated medium. The recommendations of the Visual Impact Assessment would be implemented. A detailed Rehabilitation Plan would be developed and rehabilitation would occur concurrently with the mining activities. Such a Rehabilitation Plan would include the removal of Alien Invasive Species and would aim to develop a low-risk sustainable end-use.

Brown's Hill Settlement: The proposed mining activities would be in very close proximity to Brown's Hill. Although the impacts on the Brown's Hill Community are rated as medium, the location of the settlement requires resettlement. The impacts on the Brown's Hill Community (consisting of mainly two 2 families), are rated as medium. A Resettlement Action Plan (RAP) would have to be developed and implemented. Should resettlement be successful this negative impact can be reversed to a positive socio-economic impact.

Resource Use: There are real concerns over ground and water contamination resulting from the project that could have dire consequences not only for Pilgrim's Rest but also for the downstream regional economy. The probability of this impact materialising and the risk were rated as low, based on the findings of the geohydrology report. The increased illegal mining activities, however, have a significant existing impact on the water quality and quantity of the Blyde River. The flow of the river is being changed by their activities and the risks of sedimentation have increased. At this stage, the illegal mining activities cannot be controlled. Should the project not proceed, the illegal mining activities are anticipated to significantly increase, with dire consequences for the local and downstream environment. If the project is authorised, it is anticipated that TGME could assist in controlling and possibly eradicating the illegal mining activities through their safety and security measures to be put in place. Adherence to environmental regulations and guidelines can then be managed and audited through the formal processes.

Tourism: In terms of the mine's potential impact on Pilgrim's Rest's tourism industry, there is conflicting views on the actual nature of the impact. While nature-based tourist activities in Pilgrim's rest, like Mount Sheba Resort are at a high risk to experience negative economic impacts from the mining project, other businesses (including the general dealer, petrol station and some tourist businesses in the historic town) could experience positive impacts. The risk however remains that the net impact of the mining project on the tourist sector could be some out-crowding of eco-based long-term tourism jobs while offering only short-term benefits to the town. The risk is rated medium.

Response to Risk: Considering the possible negative impacts of the Covid-19 Pandemic on the local Pilgrim's Rest tourism industry, it is noted that TGME proposes various tourism related ventures in the area with subsequent positive economic spin-offs. These include, inter alia, the following: The establishment of a tourism forum for the area; The launch of additional tourism related ventures focusing on the historical and existing mining activities within the Pilgrim's Rest area; annual gold panning events and so on. .

- *Visual Intrusion*

Based on the findings of the visual impact assessment study, it was determined that the Theta Hill Project will have a high visual impact post mitigation on the receiving environment due to the proposed project being situated within such close proximity to the town of Pilgrim's Rest. With the revised layout of the Theta Hill Project, the visual impact on the town of Pilgrim's Rest has been reduced, particularly for the WRD associated with the Theta and Browns Pits (Wishbone WRD).

Should the project be authorised to proceed, it is imperative that all mitigation measures as stipulated in this report be adhered to. Said mitigation measures would need to comprise concurrent rehabilitation throughout the construction and operational phases, consideration of vegetating berms and stockpiles to reduce soil contrast in the landscape as well as effective management of dust generation.

Whilst the Wishbone WRD will be visible from certain vantage points within the town of Pilgrim's Rest, along the R355 and the Lost City Hiking Trail within the Mount Sheba Private NR, the visibility and visual intrusion of the Iota WRD 1 and 2 on these areas is more significant.

It must be noted that even with mitigation the visual impact of the proposed Theta Hill Project will be high and limited mitigatory measures are available, especially in the operational phase of the proposed mine. Post decommissioning and closure phase impacts are likely to be permanent should rehabilitation efforts fail to create a hillside slope similar in visual character to the surrounding mountainous landscape.

- *Lowering of the groundwater table*

The groundwater level is deep (50m – 380m) below surface. None of the exploration boreholes drilled at the pit localities intersected any water, and no water levels could be measured in any of these holes several weeks after they were drilled. Mining will therefore take place a minimum of 50m above the groundwater table. **This largely reduces the potential risks of impact from the mining operation and dewatering of the aquifer is unlikely to occur.**

- *Groundwater contamination*

The potential impact to the groundwater quality is largely driven by the waste material and the possibility of contaminant leachate from the exposed rock. The waste classification concluded the following:

- The static geochemical testing indicated that only one sample (shale) has the potential to generate acidic leachate. It is expected that if acid generation occur it will be for a short duration due to low sulfur content, and there is enough neutralizing potential in the other material (dolomite) to mitigate this risk.
- There are no elements in the Browns and Theta Hill samples that exceed the leachable concentration threshold LCT0. Several elements do however exceed the total concentration threshold TCT0. According to the GNR 635, the waste must be classified as a Type 3 waste based on the TC values of Barium, Manganese, Copper, Boron and Nickel exceeding their respective TCT0 values.
- Several parameters exceeded the LCT0 for the leach test on the Iota samples. Chromium and Nickel are two parameters of concern. Mercury was present in the majority of the samples. The XRF and XRD analyses, however, did not indicate high levels of Mercury in the rock material and its presence could be attributed to contamination from drilling. Barium, Copper and Arsenic showed elevated concentrations that exceeded the TCT0 for the majority of the samples.

- *Surface Water*

The impact assessment on surface water quality indicated that during the construction phase, the exposure of soils due to vegetation clearance and the construction of the Blyde River bridge crossing, will pose high risks if mitigation measures are not adhered to. Implementation of the recommended mitagory measures reduces this risk to medium.

During the operational phase, open pit mining through, and the deposition of waste rock within non-perennial drainage lines, will need to be mitigated as far as possible, to reduce high impacts from occurring. Furthermore, runoff from these facilities must be captured and contained in a closed system, to prevent negative impacts on water quality. During the post mine closure phase, erosion of the rehabilitated area, as well as the filling up and overflowing of the remaining pit voids and PCDs, were considered high risks before mitigation measures are implemented and rated as medium after mitigation measures were implemented. However, these items can be sufficiently addressed via the TGME aftercare and maintenance programme. Successful mitigation would reduce this risk from High to Medium.

It will be crucial that erosion and sediment control, as well as dirty water containment and management, are top priority during the construction and operational phases of the project. Post mine closure, rehabilitation must ensure that erosion prevention is adequate for the long-term.

- *Soil, land use and land capability*

The proposed mining and related infrastructure is not anticipated to result in a significant loss of agricultural land capability since the majority of the soils where mining and associated infrastructure is to occur are shallow and disturbed in most instances.

Heavy equipment traffic during construction and mining operation activities is anticipated to cause soil compaction. The severity of this impact is expected to be low due to the low clay content of the soils and the resistance offered by the underlying, relatively shallow, bedrock.

All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is considered to be medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern. Therefore, strict contamination (i.e. accidental spill and leakages) and waste management protocols and activity-specific Environmental Management Programme (EMP guidelines should be adhered to during all phases of the project.

- *Air Quality*

The resultant environmental air quality risks for sensitive receptors were ranked Low during the construction and operational phases, with mitigation in place.

It is expected that the alternative of using the EIA phase mining layout will have an improved outcome, on air quality impacts as, the pit shells were reduced in size creating a reduction of dust, PM10 and PM2.5 generation compared to the proposed Scoping Phase mining layout plan. Noise

- *Noise*

The environmental noise impact during the construction and decommissioning phases will be insignificant provided that the mitigatory measures will be adhered to at all times. The noise intrusion levels during the construction phase at the Iota, Brown's and Theta Hill pits will be different depending on the distance between the activities and the abutting residential properties.

The noise impact will change during the operational phase where the noise intrusion could be moderate to high when open cast mining will be done. This is based on the threshold values of 3.05mm/s to 6.10mm/s for ground vibration at historical properties (British Standards BS 738525) which will be exceeded. The potential environmental noise intrusion levels can however be controlled by means of approved acoustic screening measures, state of the art equipment, proper noise management principles and compliance to the Noise Control Regulations, 1994. The environmental noise management plan must be in place during all the phases of the open cast pit activities so as to identify any noise intrusion and/or ground vibration increase on a pro-active basis and to address the problem accordingly.

- *Climate change*

The proposed Theta Mining project will produce greenhouse gas emissions that will contribute to anthropogenic climate change and its ensuing impacts. The extent, duration and probability of the mine's greenhouse gas emissions impacts on climate change will be low-medium in the context of South Africa's available carbon budget. Furthermore, the overall significance from the mine's single-source impact during construction and operational phases on global emissions and thus climate change, is rated as low to medium. This is however subject to the consideration of community vulnerability and long-term rehabilitation within the context of further mine planning.

- *Closure and Decommissioning*

The residual risk associated with the proposed project will largely relate to water management and rehabilitation following the operational phase.

The rehabilitation of the mining area will need to be managed to prevent any residual impact in the years following decommissioning. These monitoring requirements have been addressed in the EMPr.

The main impacts that will result from the closure phase will relate to possible ineffectiveness of the construction and operational phases to eradicate alien vegetation, which will ultimately result in the loss of indigenous fauna and flora. This can very easily be managed with a dedicated alien and invasive species management plan

The decommissioning activities may further impact on the established vegetation in the area, resulting in the loss of biodiversity species, habitats and ecological structure. All the impacts that may result from the decommissioning activities of the proposed project have been effectively addressed in the impact assessment in Section13 (Appendix 18), as well as in the EMPr.

In addition, a detailed rehabilitation plan (attached as Appendix 16) was developed for the Theta Mine study area, in order to ensure that the end-land use of the area is acceptable.

19.2. Final Site Map

The site layouts changed during the course of this study from the Engineering Scoping Phase (Layout 1) to an EIA Phase (Layout 2) and then to the final EIA Phase (Layout 3). The Layout Alternative section details the progression from an initial to the most feasible site layout related to the Theta Project. The progression has been significantly influenced by engineering, economic, environmental and social considerations.

Scoping Phase Layout (Layout 1) Alterative

The engineering feasibility study formed the basis for the permitting phase, and informed the initial site layout plan which was incorporated in the final scoping report as submitted to the DMRE. The plan of study proposed in the Scoping Report made provision for various biophysical and social studies which would determine the baseline conditions at the project site as well as make recommendations related to the feasibility of the proposed localities and alternatives as per the initial site layout plan (Figure 20).

On the scoping phase layout plan a few design or layout alternatives were considered for initially for the various Waste Rock Dumps (WRD). As part of the operational activities two potential options were proposed for the locations of the associated Waste Rock Dumps (WRD) at both Theta and Iota Hills. As part of the terms of reference for the specialist they had to identify the preferred alternatives for the location of the various waste rock dumps identified.

First round EIA Phase Layout (Layout 2)

The outcome of the specialist studies resulted in substantial environmental and social sensitivities, with specific reference to the ecology of the study area. These biophysical and social studies was used to inform the final EIA phase mining layout.

However, the process of EIA, within which the above-mentioned studies were undertaken, is inhibited in its ability to assess year-round baseline conditions due to the legislated timeframes imposed by South African law and regulation. In these instances, which is typical of EIA processes, the Environmental Assessment Practitioner (EAP) imposes the precautionary approach by informing the site layout plan from an environmental and social perspective to assist the applicant to achieve the most feasible site layout plan.

In the case of the Theta Project, the application of the precautionary approach resulted in an alteration of the site layout plan as initially presented in the Scoping Report.

The alteration reflects revised pit layouts (with the Theta Hill Pit being largely affected), new waste rock dump (WRD) locations as well as optimisation of the overall project footprint to achieve the best IEM scenario considering the extent of baseline information available at the time. Please refer to Figure 21

Final EIA Phase Layout (Layout 3)

During quarter one of 2020, TGME continued to complete various detailed engineering designs as part of the renewal process for the water use license. During this design process, additional geotechnical work was completed to inform the final designs of the waste rock dumps and pollution control dams in order to ensure that the structures are designed and constructed in a stable and safe manner. These detailed designs have resulted in changes to the footprint of the mining area. The revised site layout plan is reflected in Figure 14

Summary of Layout 3:

The layout has changed and has been informed by various engineering studies. The most significant changes made to the layout include the following:

- Enlarged pit layouts, with the Iota and Theta Pit being affected the most (Figure 65)
- Positioning of the strategic ore stockpiles, within the three pits, as mining progress per phase, each pit will be used as strategic ore stockpile areas;
- Increased size of the Wishbone PCD, informed by detailed engineering designs (geotechnical and stability) to ensure stable structures (Figure 65)

- Inclusion of a Balancing Dam, based on the detailed Water Balance (Figure 65)
- Increased capacity of the Iota North and South WRD informed by detailed engineering design (geotechnical and stability) to ensure stable structures (Figure 64)
- Detailed Storm Water Management Plan and Infrastructure Designs
- Footprints adjusted to further reduce impacts on significant biodiversity areas at a micro level
- Changes in mine schedule and pit sequences to improve funding attractiveness of the project

The final EIA phase mining layouts (Layout 3) for each of the pits are provided in Figure 63 and Figure 64.

To respond to the expected changes in the global economic environment, TGME completed a re-evaluation of the Theta Project (i.e. 83MR) with a view to improving the economic metrics of the project to further enhance the attractiveness to potential funders. This has resulted in a new mine schedule being developed which has changed the sequence of the pits being mined and has also resulted in the pits being made slightly larger to bring in more gold bearing material while still taking cognisance of the environmental conditions in the area.

This EIA/EMPr provides a detailed description of the amended layout plan referred to as Layout 3 (Figure 14). This layout was identified by TGME as the only feasible alternative, which addressed both the environmental sensitivities and the global economic environment. The assessment also included the "no-go" option. All the identified alternatives were assessed in detail in the specialist studies and impact assessment phase.

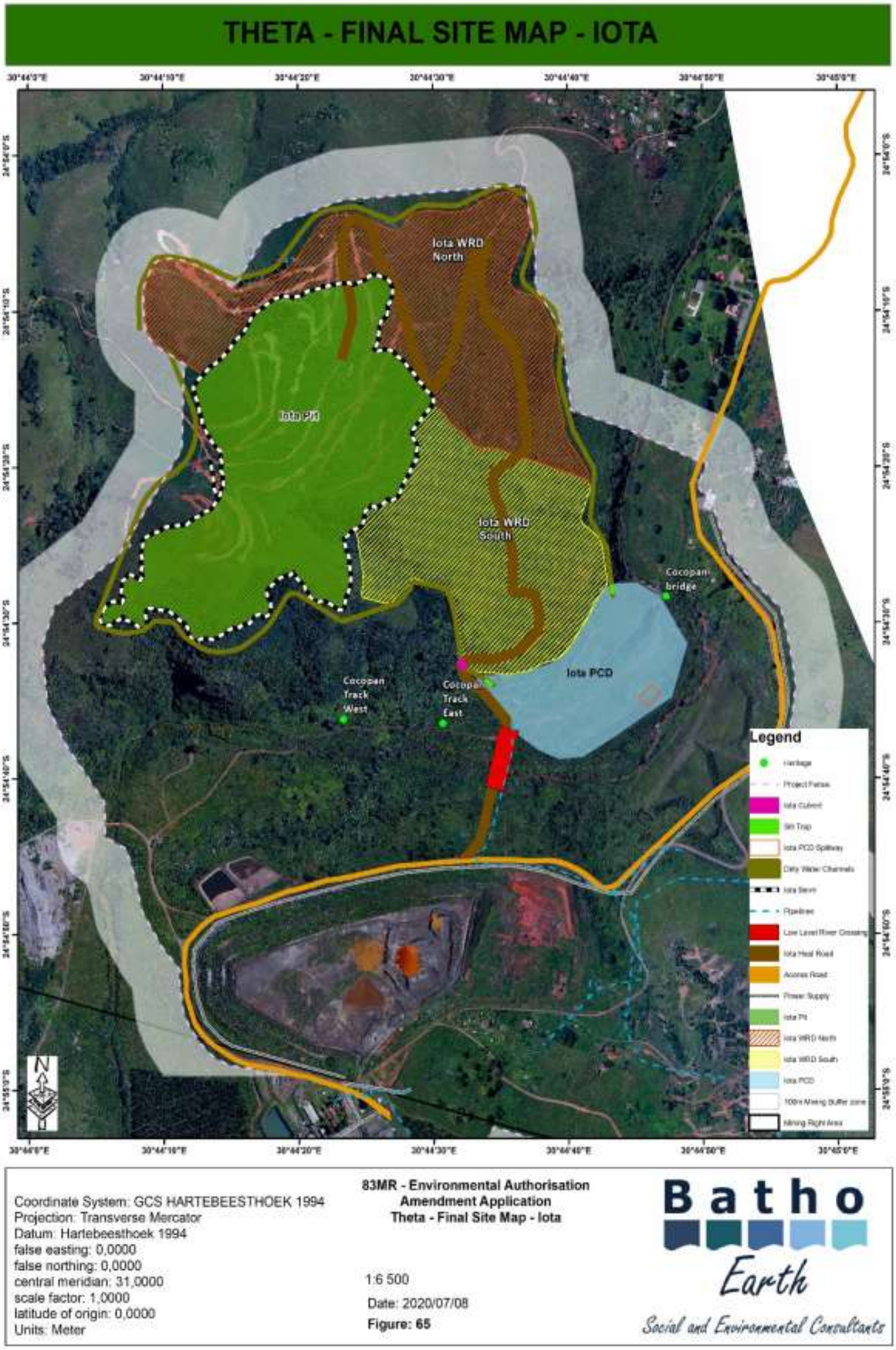


Figure 64. Final Site Map Iota

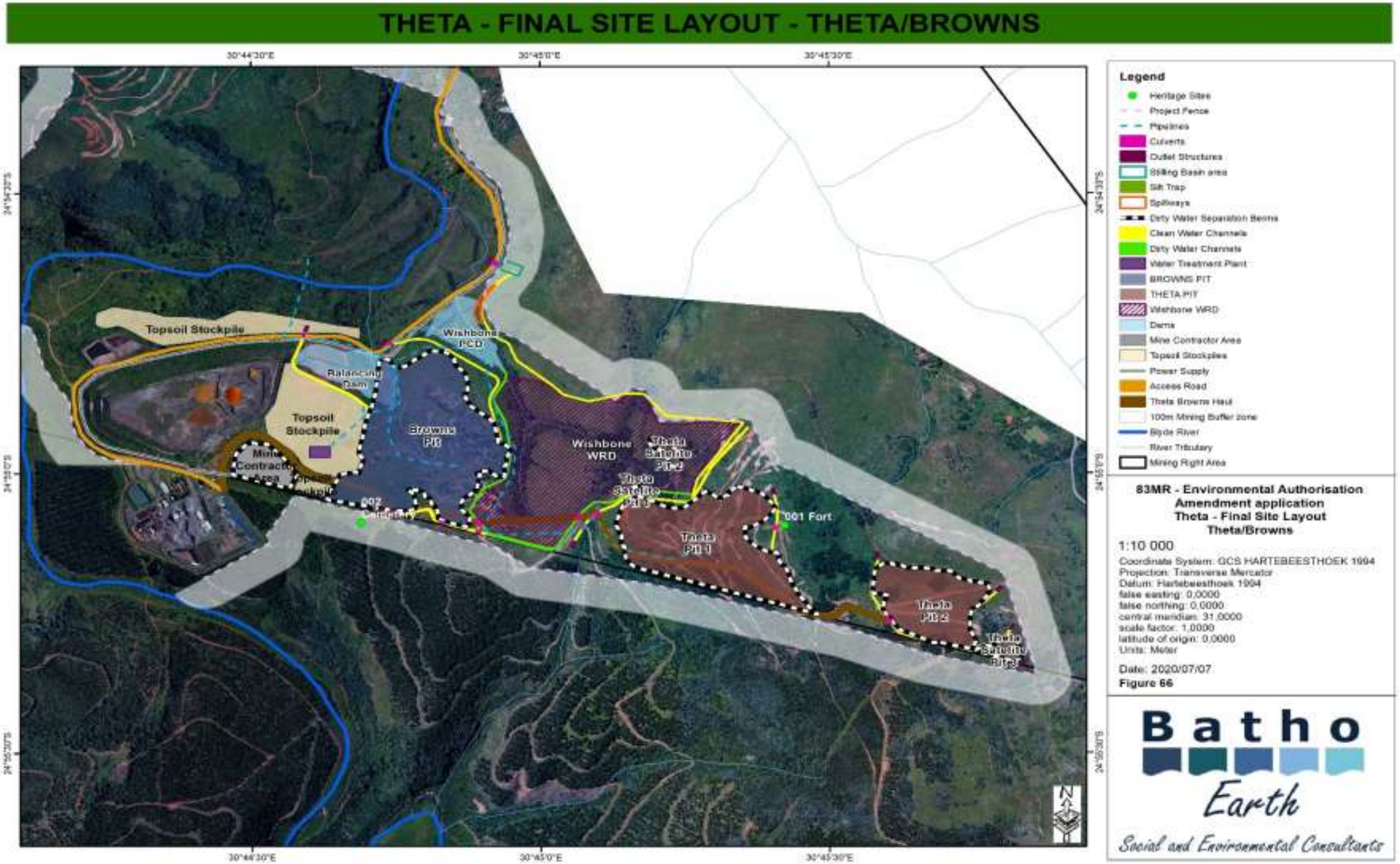


Figure 65. Final Site Map Theta / Browns

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

The positive and negative implications were assessed for the construction, operational and decommissioning phases of the proposed project. A detailed description of the main impacts is provided in Section 13 and Appendix 18. A short summary is provided below for each phase of the project.

19.3.1. Construction Phase

From a socio-economic perspective the development of the mine will have a positive impact on employment creation, economic and social upliftment and community development. An increase in employment opportunities, household income and skills development will contribute to a positive growth in the local and regional economy.

Most of the potential negative impacts are associated with site clearance and vegetation removal activities. The focus area is considered ecologically sensitive and important for floral communities, thus from a biodiversity perspective the focus area is of high conservation value. The Mpumalanga Biodiversity Sector Plan (MTPA, 2014) also recognises this and categorised the area as an Optimal and Irreplaceable Critical Biodiversity Area (CBA).

The mitigation measures presented within the biodiversity report are deemed to be implementable, financially practical and essential to reduce impacts on the receiving environment. However, even after implementation of the proposed mitigation measures, several of the perceived impacts may only be reduced to a medium significance level.

Some impacts are deemed unavoidable. It is essential that the pre-construction phase focuses on ensuring that activities associated with all phases of the project have the lowest possible impact on the receiving environment. This includes the preparation of a Rehabilitation Plan, a Biodiversity Action Plan, an Alien and Invasive Plant Management and Control Plan, as well as initiating an investigation into a biodiversity offset.

Numerous watercourses (Blyde River and associated tributaries) are situated downgradient of the project area, and therefore these systems could potentially be impacted on by the proposed mining activities. Clearing of vegetation prior to construction and ongoing disturbances to vegetation during operational activities will result in exposed soils. This, combined with the steep slopes, will increase the risk of erosion and potentially the risk of sedimentation of downgradient watercourses.

Impacts on the watercourses could potentially lead to a loss of migratory routes for faunal species, impacts on water quality, and loss of recharge to downstream reaches. These activities, if not effectively mitigated, may result in long term to permanent impacts on portions of watercourses which are directly affected, and could potentially extend to one or more of the numerous watercourses downgradient of the project area, and in particular on the Blyde River and Peach Tree Stream.

The surface water impact assessment indicated that during the construction phase, the exposure of soils due to vegetation clearance and the construction of the Blyde River bridge crossing, could pose high risks if mitigation measures are not adhered to.

Potential negative social impacts could occur due to the impacts a population influx into Pilgrim's Rest will have on already impacted infrastructure in the area.

19.3.2. Operational Phase

Employment creation during operation as well as stimulation and growth of the local, regional and national economies will have a continued and positive social impact during the operational phase. Additionally, local SMME will indirectly benefit from the operational phase of the mine. The community will also benefit from community projects which should improve the well-being of the community. The aim of the SLP will be to establish projects which can provide longer-term benefits to the local community.

As with the construction phase, major negative social impacts are expected due to the impacts n increase in informal population influx into Pilgrim's Rest will have on already impacted infrastructure.

The majority of the impacts identified for the operational phase are associated with the open pit mining and concurrent rehabilitation. Mining activities could result in the change of the topography, and overall sense of place.

Several potential risks to the receiving aesthetic and visual environment as a result of the proposed mining operation have been identified, relating to impacts on visual character and sense of place, visual intrusion and visibility of mining infrastructure. The impact assessment indicates that the various potential visual impacts identified will be most significant during the operational phase of the project. Mitigation measures would need to include concurrent rehabilitation throughout the construction and operational phases, consideration of vegetating berms and stockpiles to reduce soil contrast in the landscape as well as effective management of dust generation.

The perceived significance of the proposed mining activities prior to mitigation affecting floral habitat, diversity and SCC is mostly high. significance impacts, with some considered to be medium significance impacts. Even with effective mitigation taking place, most of these impacts will retain a high significance rating, with only a few reduced to a medium significance rating. Hence there is a need for biodiversity offset development for residual impacts.

It is recommended that sufficient stormwater management measures be put in place to ensure clean and dirty water is kept separate. It is recommended that runoff emanating from surface infrastructure be contained in appropriately-sized PCD's. Activities around drainage lines, such as mining and depositing of waste rock, will require mitigation as far as possible to prevent high impacts from occurring. Furthermore, it is recommended that runoff from these facilities be captured and contained in a closed system, to prevent negative impacts on water resources.

Operational activities may result in the contamination of soils and groundwater by, for example, increased salt loads and CPCs. Such contamination may, in turn, lead to the alteration or loss of habitat for floral and faunal species associated with the freshwater areas.

Topsoil loss has been identified as a potential impact of moderate significance during the operational phase as a result of rainwater runoff and wind erosion from roads and soil stockpiles. In addition, alien vegetation may establish on the topsoil. This can be prevented by planting indigenous grass mixtures, which will also assist in erosion reduction.

Ineffective rehabilitation of construction areas could lead to proliferation of alien invasive plant species. An active program to combat these species is recommended.

As would be the case during the construction phase, nuisance noise, and dust impacts of moderate negative significance could occur from general operation activities such as loading, hauling and stockpiling overburden and ROM. All of these impacts can however be mitigated.

The groundwater study showed that mining will take place above the groundwater level and as a result no impact on the groundwater levels will occur. The geochemical composition of the waste material does not contain hazardous contaminants and the potential for Acid Rock Drainage (ARD) is low. It is evident from the 1:20 leach tests that the quality of the leachate does not pose a risk to the groundwater. None of the parameters exceed the guideline limits.

The geochemical modelling has shown that the attenuation capabilities of the barrier (soils and rock material between the waste dump and the groundwater) is enough to prevent any of the elevated concentrations to reach the groundwater level. The impact from the waste rock on the groundwater quality is therefore considered negligible. In the operational phase and closure phase, biannual monitoring of groundwater quality and groundwater levels is recommended.

The final EIA mine layout plan, as well as, amongst others, the design of clean and dirty water channels, roads and berms, take into account the recommendation made by the various specialist investigations. These will form the basis for mitigation of a number of the potential impacts.

19.3.3. Decommissioning Phase

During the decommissioning phase positive impacts will occur from rehabilitation activities including the restoration of land capability to its pre-mining state or agreed-upon alternative, the restoration of vegetation and habitat types as well as the rehabilitation of infrastructure footprint areas.

Moderate negative social impacts could occur when mining operations cease as a dependency on the mine for sustaining local economy would have been established.

During the post mine closure phase, erosion of the rehabilitated areas, as well as the filling up and overflowing of the remaining pit voids and PCDs, if unchecked, could lead to additional risks.

Post-closure monitoring, aftercare and maintenance would be essential to ensure that rehabilitation efforts are successful and sustainable.

Positive impacts are deemed possible for the decommissioning phase if current degraded habitat is rehabilitated to restore some ecological functioning and habitat connectivity that have been lost due to Alien Invasive Plant proliferation and habitat transformation.

20. Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr

The EMPr seeks to achieve a required end state and describes how activities that have, or could have, an adverse impact on the environment and surrounding communities will be mitigated, controlled and monitored.

The EMPr will address the environmental impacts and possible unplanned events during each phase of the Project (construction, operational, decommissioning and post-closure). Due regard must be given to environmental protection during the entire project life cycle. In this regard a number of environmental recommendations are made to provide guidance to achieve environmental and social management objectives.

The objectives of impact mitigation and management are to:

- Primarily pre-empt impacts, assess their significance and implement appropriate mitigation and management measures to avoid, minimise and/or remediate the associated impacts where they cannot completely be avoided.
- Implement an adequate monitoring programme to:

- Ensure that mitigation and management measure are effective.
- Allow quick detection of potential impacts, which in turn will allow for quick response to issue/impacts.
- Reduce duration of any potential negative impacts.

21. Final proposed alternatives

21.1. Preferred Option

In terms of the preferred layout option, the (Layout 3) final EIA layout option was identified as the preferred layout. This layout was identified by TGME as the only feasible alternative, which addressed both the environmental sensitivities and the global economic environment. This layout takes into account the required engineering designs which are the corners stones of a well planned mine.

The layout was informed by various engineering studies:

- Designs of Waste Rock Dumps and Pollution Control Dams informed by detailed engineering (geotechnical and stability) to ensure stable structures
- Footprints adjusted to further reduce impacts on significant biodiversity areas at a micro level
- Changes in mine schedule and pit sequences to improve funding attractiveness of the project

The planned project will include (Figure 64 and Figure 65):

- Iota Opencast Pit;
- Theta Opencast Pit (includes 5 pits);
- Browns Opencast Pit;
- Iota Waste Rock North and South
- Wishbone (Theta/Browns) Waste Rock Dump
- Iota Pollution Control Dam
- Wishbone Pollution Control Dam
- Balancing Dam
- Haul roads;
- Low level river crossing;
- Topsoil Stockpiles;
- Strategic Ore Stockpiles (Located within the Pits);
- Buildings including workshops, fuel bay, offices, stores, a contractors' laydown area and ablution and parking areas;
- Stormwater management infrastructure;
- Power supply infrastructure and electrical powerlines;
- A package Wastewater Treatment Plant;
- Sewage Package Plant

The pits will be mined using modified terrace mining methods over a period of 5years.

21.1.1. Alternative Option

The alternative option for the project entails locating the majority of the required infrastructure on the Scoping Phase layout option. This alternative was based on the initial engineering feasibility study which formed the basis for the permitting phase, and informed the initial site layout plan.

In terms of the placement of the related infrastructure, a few design or layout alternatives were considered initially for the various Waste Rock Dumps (WRD). As part of the operational activities two potential options were proposed for the locations of the associated WRD at both Theta and Iota Hills. These are detailed as follows:

- Theta/Browns Waste Rock Dump Option 1: This option is situated between both Browns and Theta Pit;
- Theta/Browns Waste Rock Dump Option 2: Located to the north eastern side of Theta Pit, incorporates two smaller pockets separated by a tributary;
- Iota Waste Rock Dump Option 1: Located to the north eastern corner of the Iota Pit;
- Iota Waste Rock Dump Option 2: Located to the north western boundary of the Iota Pit.

22. Aspects for inclusion as conditions of Authorisation.

The studies and impact assessment have been based on the proposed mine layout and mine works programme and other available information from the applicant. The management of the impacts identified for the construction, operation and closure phase is through a comprehensive range of programmes and plans contained in the EMPr. Implementation of these plans and programmes together with mitigation measures stipulate in the EMPr will be institutionalized through regular monitoring and auditing.

In order to achieve relative environmental management standards and ensure that the findings of the environmental assessment are implemented through practical measures, the recommendations and management measures from this EIA study are included within an EMPr.
The document also refers to the <u>Biodiversity Offset and Compensation</u>. As part of the EIA application the following suggested mitigation measures are suggested:

Biodiversity offset:

- As an offset for the biodiversity footprint impacts of the project, the applicant must secure an area of not less than 3336ha of NE Dolomite Grassland, within the Malmani Karstland listed ecosystem and containing as great a proportion of CBAs (set out in the MBSP 2014) as possible.
- The applicant must procure the necessary consents, permissions and other administrative and management authority agreements for the offset area for declaration to the relevant authority as a Nature Reserve (or a part of an existing Nature Reserve) under Section 23 of the NEMPA. The required consents (land owners, beneficial occupiers, management authority and other rights holders inter alia) and other administrative measures to secure this declaration must be submitted to the relevant MEC (or failing that the Minister of Environment, Forestry and Fisheries) for consideration for the declaration, before the activities may commence.
    - The requisite Protected Area Management Plan for the Offset property(ies) must be drawn up, in consultation with MTPA (and/or DEFF if applicable), within 1 year of the submission of the documents noted above, and submitted to the MEC for consideration.
    - The applicant must be responsible for all costs of declaration, establishment and the procurement of and implementation of the management plan for the offset site protected area for a minimum of 30 years or until 10 years post the issue of a closure certificate for the mining operations covered by 83 MR, whichever is the later.
    - The applicant must procure an independent auditing of management performance of the offset site PA every 5 years, with the audit report being submitted to MTPA, DARDLEA, DEFF and the DMRE. The applicant is required to comply with the independent audit recommendations, failing which the specified portion of the guarantee or performance bond required below will

become due and payable to the institution established to safeguard the offset and compensation.

Biodiversity-related compensation for potential water and sedimentation impacts:

- To compensate for existing licenced abstraction of water in this Strategic Water Source Area, as well as for potential impacts on water ecosystems and associated biodiversity through sedimentation and altered flows, the applicant must develop two rehabilitation plans, and implement those components of the plans outlined below, to achieve the requisite outcomes.
- The applicant must develop, in conjunction with MTPA, DARDLEA, the Thaba Chweu Municipality, large landowners (>1000ha), the FPA, DWS and DEFF an integrated conservation, forestry and agriculture land use and rehabilitation plan for the Quaternary Catchment B60B with 2 years of the issue of the EA (The Rehabilitation Plan for B60B).
    - This plan must set out priority areas for rehabilitation, deployment of biocontrol and other effective means of long-term control of invasive species, existing lawful agricultural (ploughing) use, and be able to inform future land use planning instruments (IDP, SDF and LUS) of the municipality;
    - The plan must provide for alignment of all investments in natural resource management, including but not limited to, Invasive Alien Tree control and biocontrol, wetland and riparian restoration, erosion and sedimentation control, and forest and grassland rehabilitation. It may provide for alignment with fire management plans produced by the relevant FPA, if appropriate;
    - The plan must be signed off by MTPA before finalization, and lodged with the operational divisions of all applicable resource management entities (DEFF NRM, FPA, Thaba Chweu LM, DARDLEA); and
    - The plan must be revised every five years after initial lodging, and again after every major fire or other significant disturbance.

- The applicant must develop, in conjunction with MTPA, the Thaba Chweu Municipality, large landowners, DARDLEA, DWS and DEFF an integrated Conservation and Forestry land use and rehabilitation plan for the Quaternary Catchment B60A with 2 years of the issue of the EA (The Rehabilitation Plan for B60A).
    - The plan for B60A must include, where relevant, similar components and requirements to that for B60B.
- The applicant must fund the Coordination, Management and Reporting Structures for the implementation of both the rehabilitation plans for a period of not less than 12 years from the submission of the plan (5-year Life of Mine + 7 years follow up).
    - The applicant must at least be responsible for reaching the rehabilitation targets of the Rehabilitation Plans for its mining rights area (83MR) and for the portion of land in the Rehabilitation Plans within the Stanley Bush Kop section managed as part of the Blyderivierspoort Nature Reserve (BNR) ; and
    - The rehabilitation target of the B60B Rehabilitation Plan for the 'Stanley Bush Kop' section of the Blyderivierspoort Nature Reserve shall not be less than the maintenance, for a minimum of 5 years, of the Reserve at:
      * an invasive alien tree density of <1%;
      * with no mature, seed-bearing trees;
      * a basal cover measured on a 10 square metre plot of at least of 30% indigenous vegetation; and
      * sedimentation runoff reduced by at least 25% compared to a baseline prior to the activities' commencement.
- All land owned by the applicant within quaternary catchments B60B and B60A outside the mine works areas shall comply with the stipulations set out in the

rehabilitation plans and related regulations for natural resource management (viz. Maintain natural vegetation for 5 years at <1% Invasive Alien tree cover, with indigenous basal cover >30%, and measured sedimentation runoff at least <25% of pre-commencement levels).

Safeguards for offset and biodiversity compensation:

- As a suspensive condition of this Environmental Authorisation, an implementation agreement must be concluded with the MTPA describing the specifics of the offset site(s), the steps for compiling the quaternary catchment Rehabilitation Plans, the institutional and financial arrangements for achieving the requisite outcomes of the full scope of required offset and compensation, and other relevant matters.
- This agreement is to be concluded with MTPA and submitted to the relevant DMRE office and the DEFF before commencement can begin.
- The applicant is expressly prevented from applying for any new Environmental Authorisations (except those under Section 24G for rectification of impacts prior to the issuance of this Authorisation) until such time as the offset declaration is complete and management plan approved by the responsible authority, the Rehabilitation Plans are developed and submitted to MTPA and DARDLEA, and the financial guarantees to the implementing party are in place to the satisfaction of the MTPA.

The EMPr must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for the life cycle phases of the project is considered to be vital in achieving the appropriate environmental management objectives as detailed for this project.

23.Assumptions, uncertainties and gaps in knowledge.

Batho Earth has exercised due care in reviewing the information supplied by TGME. Whilst Batho Earth has compared key data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the data supplied by TGME.

Opinions presented in this report apply to the information about the project site and the proposed project as it existed at the time of Batho Earth’s investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which Batho Earth had no prior knowledge nor had the opportunity to evaluate.

All the data and information supplied to Batho Earth is assumed to be accurate and reflective of the current condition of the focus area. It is assumed that the baseline information was scrutinised and used to explain the environmental profile is accurate.

It is recommended that TGME comply with relevant legislation pertaining to the activities of this proposed project and that necessary permits and licenses that may be required will be identified and applied for prior to commencement of construction activities.

The public involvement process has been sufficiently effective in identifying perceived stakeholder issues and has been addressed in the EIA / EMP by the EAP. The public involvement process has sought to involve key stakeholders and individual landowners.

The information requested and the comments raised by I&APs during the initial Scoping Report phase has, wherever possible, been sufficiently addressed and incorporated into the EIA and EMPr that will be submitted to the DMRE.

Batho Earth recommends that TGME should implement the measures contained in the EMPr and should adhere to monitoring procedures. A monitoring and evaluation system, including auditing, is recommended to be established and operationalized to track the implementation of the EMPr ensuring that management measures are effective to avoid, minimize and mitigate impacts and that corrective action is being undertaken to address shortcomings and / or non-conformances.

The following assumptions and limitations apply to the respective biophysical and socio-economic studies that were conducted for the proposed project.

23.1. Terrestrial Ecology

23.1.1. Flora

The following assumptions and limitations are applicable to this report:

- Zone of influence around the proposed activities: The floral assessment is confined to the focus area and does not include the neighbouring and adjacent properties beyond a reasonable zone of influence; these were however considered as part of the desktop assessment (Section A). In this instance the floral assessment focused on the proposed areas of activity as well as the immediate areas surrounding the proposed activities (50m zone of influence);
- Season of assessment: With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. To account for seasonal turnover several assessments took place, including assessments in autumn, spring and summer. These assessments also occurred following various successional changes in the landscape e.g. the summer assessment occurred after good rains and the spring assessment after veldfires, thus providing a chance to detect pioneer species during post-fire secondary succession as well as the more permanent species once the veld has recovered. This floral study thus assumes that the data gathered and supplemented with the additional, available background databases, adequately describes the various floral communities associated with the focus area to an acceptable level to allow for informed decision making;
- Sampling design: Sampling by its nature means that not all individuals are assessed and identified. Some species and taxa within the focus area may, therefore, have been missed during the assessment. Due to the extent of the focus area, detailed field assessments were restricted to the proposed infrastructure areas as provided by the applicant. Information for vegetation within the focus area where no infrastructure is planned, and which was thus not meticulously assessed during the site visit, were inferred from the results of the field assessment and mapped using desktop methods. Therefore, if any changes are made to the proposed layout within areas that are still natural and undisturbed, more field assessments will be required for those areas. The sampling design was thus a targeted approach and is assumed to have resulted in a representative floral species list for the focus area;
- Access constraints: Due to safety concerns posed by illegal miners, there were certain sections of Iota Hill and the drainage line within the proposed wishbone WRD that could not be accessed for assessment on foot. However, where there were roads, the security team was able to accompany the specialists. Thus, approximately one quarter of the Iota WRD (north-eastern section) was only assessed from the vehicle and several sections of the drainage line (within the wishbone WRD) could not be adequately assessed; and
- Timing and frequency of botanical surveys: An initial field assessment was undertaken from the 26th to the 29th of March 2019 (autumn season), to determine the floral ecological status of the focus area, and to "ground-truth" the results of the desktop assessment (Section A). A follow up assessment took place from the 2nd to the 4th of September 2019 (spring season) to assess changes made to the proposed layout. During the spring assessment the veld was recently

burned, and a suitable assessment of floral communities was not possible; however, species were observed during the spring assessment that were not recorded during the March assessment (typical pioneer species). Due to the nature of the layout changes, a follow-up summer assessment was required and took place from the 28th of January 2020 to the 31st of January 2020, thus allowing for a more saturated species list. At the request of the Department of Environment, Forestry and Fisheries (DEFF), an assessment of the forest areas and drainage lines on Iota Hill and within the Wishbone WRD was undertaken from the 29th to the 30th of April 2020. During this assessment, areas were visited where smaller changes to the proposed layout was made. A more meticulous approach was further taken to mark all encountered protected floral species

- A more accurate assessment would require that assessments take place in all seasons of the year – winter assessments can e.g. allow detection of Aloe species that only flower in winter and are otherwise difficult to detect or adequately identify. However, on-site data was significantly augmented with all available data from desktop sources, together with project experience in the area, and the findings of this assessment are considered to be an adequate reflection of the ecological characteristics of the focus area to allow for informed decision making.

23.1.2. Fauna

The following assumptions and limitations are applicable to this report:

- Unfavourable weather conditions were encountered during the March 2019 survey (overcast, mist and strong winds), limiting faunal species observations. Two further follow-up assessments took place thereafter to assess changes made to the proposed layout: o Due to additional layout changes a follow-up summer assessment was required which took place from the 28th of January 2020 to the 31st of January 2020, thus allowing for a more saturated species list; and
- At the request of the Department of Environment, Forestry and Fisheries (DEFF), an assessment of the forest areas and drainage lines on Iota Hill and within the Wishbone WRD was undertaken from the 29th to the 30th of April 2020. During this assessment, areas were visited where smaller changes to the proposed layout was made.;
- The faunal assessment is confined to the footprint area and does not include the neighbouring and adjacent properties; these were however considered as part of the desktop assessment;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most faunal communities have been accurately assessed and considered and the information provided is considered sufficient to allow informed decision making to take place and facilitate integrated environmental management;
- Due to the nature and habits of most faunal taxa, the high level of surrounding anthropogenic activities, it is unlikely that all species would have been observed during a field assessment of limited duration. Therefore, site observations were compared with literature studies where necessary;
- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa within the footprint area may therefore have been missed during the assessment;
- Two field assessments were undertaken, the first from the 26th - 29th of March 2019 and the second from the 28th – 31st January 2020, to determine the ecological status of the footprint area, and to “ground-truth” the results of the desktop assessment. A more accurate assessment would require that assessments take place in all seasons of the year. However, on-site data was significantly augmented

with all available desktop data, previous work done in the area and specialist experience in the area. The findings of this assessment are considered to be an acceptably accurate reflection of the ecological characteristics associated with the footprint area.

23.2. Aquatic Ecosystem

The following points serve to indicate the assumptions and limitations with regard to the freshwater and aquatic assessment:

- *Determination of Boundaries*: The determination of the freshwater resource boundaries and the assessment thereof, is confined to the study areas. All freshwater resources identified within 500m of the study areas were delineated in fulfilment of Regulation GN509 of the NWA using various desktop methods including use of topographic maps, historical and current digital satellite imagery and aerial photographs. However, these resources were not assessed except where they are located downgradient of study areas and may therefore be impacted upon by the proposed activities. The general surroundings were, however, considered in the desktop assessment of the study areas;
- *Global Positioning System (GPS) technology*: GPS technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. If more accurate assessments are required, the freshwater resources will need to be surveyed and pegged according to surveying principles and with survey equipment;
- *Transitional Areas*: Wetland, riparian and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the freshwater resource boundary may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results;
- *Reference conditions are unknown*: Considering existing mining activities in the larger catchment, the composition of aquatic biota in the study areas, prior to disturbance associated with approximately a century of mining activity as well as the associated settlement of people in the area, is unknown. The majority of aquatic resources associated with the study areas is subject to plantations, extensively utilised for forestry (Eucalyptus spp. and Pinus spp.). These forestry disturbances have been in place for decades and current plantations are evident on digital satellite imagery. For this reason, reference conditions are hypothetical, and are based on professional judgement and/or inferred from limited data available such as the Department of Water and Sanitation (DWS) Resource Quality Information Services (RQIS) PES/EIS database,
- *Temporal variability*: The data presented in this report is based predominantly on three site visits during early spring (October 2018), early autumn (March 2019), and mid-summer (January 2020), however, where historical data was available, this was used to draw temporal comparisons. The effects of natural seasonal and long-term variation in the ecological conditions and aquatic biota found in the streams are, therefore, unknown at the time of writing this report. Ideally aquatic assessments should be undertaken, as a minimum, in the summer/high flow and winter/low flow seasons, to account for and define seasonal variability. However, consideration was given to local data on the DWS RQIS PES/EIS database as well as a previous study conducted by SAS in 2008 . Said information assists in understanding variability in the system and thus ensures that observations and discussions on impacts are adequately understood to inform this study;
- *Ecological assessment timing*: Aquatic ecosystems are dynamic and complex. It is possible that aspects, some of which may be important, could have been

overlooked. A more reliable assessment of the biota would require seasonal sampling, with sampling being undertaken under both low flow and high flow conditions (also see previous point, "Temporal variability"). Due to the nature of the aquatic systems, the observations made in this study are deemed adequate to: a) provide the information required to define the risk to the aquatic ecosystem, and b) to ensure that sufficient insight into management and mitigation measures is provided, to allow adequate protection and maintain the PES of the system;
- *Accessibility*: Due to access constraints relating to terrain and personal safety concerns, limitations were experienced in site selection as well as the verification of the extent and characteristics of some sections of some watercourses. Due to the limitations, some aspects of the aquatic ecology of the area, some of which may be important, may have been overlooked (also see previous point, "Ecological assessment timing"). However, based on the available desktop assessment reference and assessment results, it is deemed adequate to provide the required level of understanding of the systems for the study. Furthermore, limitations were experienced in accessing the full extent of some freshwater resources within the study areas and 500m thereof during the site visits. In addition, seasonal variations in terms of vegetation as well as recent veld fires in some of the study areas during October 2018, limited the use of vegetation indicators, and therefore some delineations were undertaken utilising historical and current digital satellite imagery and relevant topographic maps. Where field verification was feasible, the desktop delineations proved to be accurate, and the delineations as presented in this report are thus regarded as a best estimate of the temporary or riparian zone boundaries (as applicable) based on the site conditions present at the time of assessment;
- *Risk Assessment Matrix*: The risk assessment was undertaken based on available information pertaining to the proposed terrace mining footprint areas, which indicates that the proposed mining areas will be placed within sensitive areas. Thus, when undertaking the risk assessment, the principles enshrined in the relevant South African legislation and advocated by the DEA et al (2013), the precautionary principle was followed and a "worst case scenario" was considered;

23.3. Heritage Resources

The investigation has been influenced by the following factors:

- The assumption that the description of the proposed project, provided by the client, is accurate.
- The unpredictability of buried archaeological remains.
- No subsurface investigation (i.e. excavations or sampling) were undertaken, since a permit from SAHRA is required for such activities.
- It is assumed that the public consultation process undertaken as part of the EIA is sufficient and that it does not have to be repeated as part of the heritage impact assessment.
- Old maps relating to the previous mining operations were not available, contributing to a lack of causal understanding.

23.4. Groundwater Assessment

The following conditions typically need to be described in a model:

- Geological and geohydrological features;
- Boundary conditions of the study area (based on the geology and geohydrology);
- Initial groundwater levels of the study area;
- The processes governing groundwater flow;

- Assumptions for the selection of the most appropriate numerical code.

Field data is essential in solving the conditions listed above and developing the numerical model into a site-specific groundwater model. Specific assumptions related to the available field data include:

- The top of the aquifer is represented by the generated groundwater heads;
- The available geological / geohydrological information was used to describe the different aquifers. The available information on the geology and field tests is considered as correct;
- Many aquifer parameters have not been determined in the field and therefore have to be estimated.

In order to develop a model of an aquifer system, certain assumptions have to be made. The following assumptions were made:

- The system is initially in equilibrium and therefore in steady state, even though natural conditions have been disturbed;
- No abstraction boreholes were included in the initial model;
- The boundary conditions assigned to the model are considered correct;
- The impacts of other activities (e.g. agriculture) have not been considered.

It is important to note that a numerical groundwater model is a representation of the real system. It is therefore at most an approximation, and the level of accuracy depends on the quality of the data that is available. This implies that there are always errors associated with groundwater models due to uncertainty in the data and the capability of numerical methods to describe natural physical processes.

23.5. Social Economic Assessment

With regards to the SEIA undertaken, the following should be noted:

- The SEIA included consultations with selected stakeholders and potentially affected parties as part of the impact assessment phase. This does not form part of the Public Participation Process (PPP) required for the overall EIA process, except where it was specifically specified as such during the consultation sessions.
- A SEIA aims to identify possible social and economic impacts that could occur in future. These impacts are based on existing baseline information. There is thus always an uncertainty with regards to the anticipated impact actually occurring, as well as the intensity thereof. Impact predictions have been made as accurately as possible based on the information available at the time of the study.
- Sources consulted are not exhaustive and additional information can still come to the fore to influence the contents, findings, ratings and conclusions made.
- Socio-economic baseline information was mainly based on official statistics from StatsSA, as well as municipal documentation. Sub-municipal data was only available for 2011. Recent trends as well as information on a sub-municipal level were also based on quantitative and qualitative information received from local representatives with local knowledge. The lack of more recent official socio-economic data is therefore seen as a limiting factor, although it is not anticipated to influence the outcome of the report.
- The profile of Pilgrim’s Rest’s economy was based on information supplied by the Pilgrim’s Rest business community. No extensive audit was undertaken but rather information of an existing non-official audit of the economy was used as basis of the employment and output estimates of the local economy, cross-checked with other local data sources. Ratios of the national and provincial economy was used

to establish the economic output of the economy and cross-check local employment data to be consistent with output figures.
- Additional information may become known or available during a later stage, which could not have been allowed for at the time of the study.
- Technical and other information provided by the client is assumed to be correct.
- Individuals view possible socio-economic impacts differently due to their association with the anticipated impact. Impacts could therefore be perceived and rated differently than those contained in the SEIA Report.
- The potential external costs associated with the project were based on information supplied by sub-specialists for the Environmental Impact Assessment of the project.
- The economic impact model was based on information supplied by Theta Gold Mines (Pty) Ltd (The Applicant). The employment and income impacts were based on financial information as contained in the Mining Works Programme (MWP) for the proposed project as well as the updated financial model (April 2020) for the project.
- Only the socio-economic impacts of mining operations and the processing plant were investigated in this environmental application. The TSF and processing plant falls outside the scope of this EIA. However since the processing plant forms an integral part of the total economic impact of mining activities it was included in the economic impact of the SEIA.
- Where client information of relevant socio-economic indicators for the mine was not available it was assumed that the operation will adhere to principles as set out by the Mining Charter.
- Economic multipliers, average salaries and wages and value added as a percentage of total income were based on provincial and national averages.
- An overall rating for the possible decommissioning and closure phase impacts was included although it is recommended that the socio-economic impacts be re-assessed at the time of decommissioning as the local dynamics could have changed.

23.6. Noise Assessment

The following limitations forms part of the environmental noise measurements:

- The prevailing ambient noise levels for the study area was created by far and near noise sources associated with traffic, domestic activities and tourist activities with the result that the prevailing ambient noise level may change at times;
- Noise measurements in the presence of winds in excess of 3.0m/s may impact the outcome of the environmental noise results;
- The identification of noise measuring points may create a problem in terms of the prevailing noise levels should it not be done with outmost care and in a scientific manner;
- The existing metallurgic processing plant has stopped during the 2015 and the noise from the processing plant and associated hauling vehicles were not available;
- The influx of traffic into an area (be it mining activities and/or tourist activities) will have an influence on the prevailing ambient noise levels and was considered during the noise impact assessment process;
- Only major noise sources are used in this study, including the Eccentric ripper, crusher, excavators, dozers, loading of ore onto haul trucks and haul truck activities along the haul road to and back from the existing processing plant;
- The maximum noise generated during mining is based on equipment count;
- The facility will operate continuously at the same level on a 24/7 basis;
- All model input noise levels are in sound power level - dBA.

There will be a difference in the prevailing ambient noise levels between the summer and winter periods as the insect activities such as crickets and cicadas raise the prevailing ambient noise levels during the summer period whereas the prevailing ambient noise levels will not be influenced by insects during the winter period.

23.7. Surface Water and Hydrology Assessment

The water balance calculations are based on the following assumptions and limitations:

- The water balance calculations are based on the values, data sources and assumptions provided in the Hydrology Report;
- The water balance only considers the operational phase of the project;
- The average monthly water balance calculations are based on average monthly rainfall and evaporation for the area;
- Mining will take place above the groundwater table and therefore groundwater inflows into the pits have been assumed to be negligible;
- Only the monthly disturbed areas have been considered to contribute runoff to the pit sumps and PCDs. Runoff from the remaining areas will be diverted away;
- 5 % of the monthly pit area would be managed as a pit sump, into which runoff from the pit will report;
- The water balance has been setup so that the TSF/RWD, plant and stockpile runoff, as well as the STP effluent, supply the required monthly plant demand with water first. Any further water required is pumped from the Buffer Dam and Wishbone and Iota PCDs. If there is not enough water for the Process Plant from the above sources, then makeup water is pumped from the Blyde River or Beta shaft;
- The WTP only treats excess water from the Buffer Dam and Wishbone and Iota PCDs;
- The WTP will be operated at the recommended monthly treatment capacities;
- The estimated required mine service water of 397 m3/month will be abstracted in equal portions (132.3 m3/month) from the Process Plant Dam (PPD) and Wishbone and Iota PCDs;
- There will be no catchment runoff into the Buffer Dam as upslope runoff will be diverted away from the dam;
- The Buffer Dam will only receive excess water from the Wishbone and Iota PCDs;
- Excess water at the PPD will be pumped to the TSF;
- The TSF and RWD water balance was obtained from Tailex and calculations were accepted as received;
- The Process PPD, TSF and RWDs are existing and do not form part of the scope of work. It has been assumed that these dams will be upgraded should additional capacity be required; and
- The water balance has been setup on a monthly timestep as data was received on a monthly basis. The water balance is an initial estimate and will be updated by MineLock for the WULA.

23.8. Air Quality

The following assumptions and limitations are applicable to this report:

- Data input into the model is based on the information provided by the Client. It is assumed that the information provided by the Client is accurate and complete at the time of modelling;
- Construction activities were assumed to take place 10 hours per day, seven days per week, as per Client data;

- In order to determine the PM2.5 emission rates for the stockpiles and dumps, a factor of 15% was applied to the PM10 equation and a control efficiency of 50% for watering was applied to the stockpile/dumps (NPI, 2012);
- An average wind speed of 3.4 m/s (Lakes Environmental meteorological data) and a moisture content of 2.5% (USEPA, 2006) was used for material handling. Control efficiencies for water sprays and miscellaneous transfer points was applied to the various material handling activities (NPI, 2012);
- The mean vehicle weight was assumed to be 48.35 tons ((29.85 tons + 66.85 tons)/2), as per Client data. The road surface silt content applied for all unpaved roads was the USEPA default value of 10.2% for western surface gold mining haul roads, in the absence of gold mining specific silt content (USEPA, 2006). Since fugitive emissions along roads will be mitigated, emissions were assumed to be controlled with an efficiency of 90%;
- Operational activities were assumed to occur 20 hours a day, six days week on a conservative basis, as per Client data;
- The impacts in this assessment are limited to incremental impacts as long-term ambient monitoring data was not available for the area to assess future cumulative impacts;
- It must be noted that although AERMOD is equipped with algorithms for modelling dry deposition (dust fallout), inherent inaccuracies are associated with the modelling of this pollutant. This is due to many limitations and uncertainties associated with model predicted deposition, such as:
    - The complexity of the fluid-dynamic processes that influence the deposition flux;
    - The complexity of various deposition surfaces that influence deposition rates;
    - Particle-size distributions, which need to be carefully selected for the pollutant of interest;
    - Settling velocities, which can vary by three orders of magnitude for various particles.
- As such, maximum predicted offsite concentrations have not been presented here due to the inaccuracies of the model.

23.9. Visual Assessment

The following assumptions and limitations are applicable to this report:

- At the time of the field assessment in March 2019 and September 2019, the initial proposed mine layout was assessed, as such the areas where the currently proposed pollution control dams and the eastern most Theta pits are proposed, were not assessed in the field. However during the field assessment, photographs were taken from the entire area where the proposed mine is to be located, as such the pollution control dams and eastern most Theta Pits could be assessed based on the photographs and general knowledge and past experience of the area. Furthermore, based on digital signatures on Google Earth and confirmed with the photographs taken in the field, remnants of historic PCDs are evident in the area where PCD is located directly adjacent to the Iota WRD South;
- No specific national legal requirements for VIAs currently exist in South Africa. The assessment of visual impacts is required by implication when the provisions of relevant legislation governing environmental management are considered and when certain characteristics of either the receiving environment or the proposed project indicate that visibility and aesthetics are likely to be significant issues and that visual input is required (Oberholzer, 2005);

- Due to a lack of visual impact assessment guidelines within the Mpumalanga Province, the "Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process" (Oberholzer, 2005), prepared for the Western Cape Department of Environmental Affairs & Development Planning, was used;
- All information relating to the proposed project as referred to in this report is assumed to be the latest available information. Additionally, best practice guidelines were taken into consideration and utilising the maximum expected heights of the infrastructure and the placement thereof in viewshed calculations as a precautionary approach;
- Abstract or qualitative aspects of the environment and the intangible value of elements of visual and aesthetic significance are difficult to measure or quantify and as such depend to some degree on subjective judgments. It is therefore necessary to differentiate between aspects that involve a degree of subjective opinion and those that are more objective and quantifiable, as outlined in the diagram below (The Landscape Institute and Institute of Environmental Management and Assessment (LI IEMA, 2002).
- The viewsheds resulting from the DEM and as illustrated in this report, indicate the areas from which the proposed project is likely to be visible and does not take local vegetation cover and man-made structures into account. Potential sensitive receptor sites, indicated to fall within the viewsheds have been ground truthed during the field assessment;
- The Impact Assessment used is not specific to visual resource management. Some limitations in the accuracy of the description of impacts thus occur due to the inherent characteristics of the impact assessment supplied by the EAP and it is the opinion of the specialists that in some instances the impacts are over or underestimated.

23.10. Soils, Land Use and Land Capability

For the purpose of this assessment, the following assumptions and limitations are applicable:

- The soil survey conducted as part of the land capability assessment was confined within the Focus Area, which is considered adequate for the purpose of this investigation;
- Sampling by definition means that not all areas are assessed, and therefore some aspects of soil and land capability may have been overlooked in this assessment. However, it is the opinion of the specialist that this assessment was carried out with sufficient sampling and in sufficient detail to enable the proponent, the Environmental Assessment Practitioner (EAP) and the regulating authorities to make an informed decision regarding the proposed mining activities;
- Land Capability was classified according to current soil restrictions, with respect to prevailing climatic conditions on site; however, it is virtually impossible to achieve 100% purity in soil mapping, the delineated soil map units could include other soil type(s) as the boundaries between the mapped soils are not absolute but rather form a continuum and gradually change from one type to another. Soil mapping and the findings of this assessment were therefore inferred from extrapolations from individual observation points;
- Since soils occur in a continuum with infinite variances, it is often problematic to classify any given soils as one form, or another. For this reason, the classifications presented in this report are based on the "best fit" to the soil classification system of South Africa;
- Soil chemical analyses sampling was undertaken from optimal points within the Focus Area to allow for the best utilisable baseline soil chemistry data;

- Soil fertility status was not considered a limitation, seeing as inherent nutrient deficiencies and/or toxicities would be rectified by appropriate liming and/or fertilization during rehabilitation phase.

23.11. Climate Change

The project is a greenfield project and therefore the emissions on Theta Hill Project were based on calculated or estimated values and not actual values.

24. Reasoned opinion as to whether the proposed activity should or should not be authorized.

24.1. Reasons why the activity should be authorized or not.

Various specialist studies were undertaken during the EIA Phase, with the objective of identifying and weighing anticipated impacts and risks associated with the proposed mining activities as well as in accordance to relevant legislative requirements.

The results indicated that the most significant risk is related to the ecological sensitivity of the site, together with the sensitivity of freshwater and aquatic resources (Blyde River) which dissects the proposed project area. The proposed site also borders the historical mining town of Pilgrims Rest.

The specialist studies also recognised the heavily transformed nature of the area due to alien invasive species and the negative impacts of illegal mining on the area and, in particular, on the river system.

A summary of the negative and positive impacts can be seen below:

Negative impacts

Impact	Mitigation
Loss of biodiversity areas	• Biodiversity offset and compensation plan, which has already been developed for the project, and consultation with MTPA on off-set discussion has already commenced; • Stormwater management plan was developed for the project and will be implemented during the implementation of the project. This includes the design of clean and dirty water channels, roads and berms to achieve optimal channelling and separation of clean and dirty water; • Detailed Rehabilitation plan was developed and will be implemented. Rehabilitation will be conducted in tandem with construction and operational phases of the project; • Re-vegetation of the rehabilitated areas with indigenous species; • Develop and implement a biodiversity management plan;
Negative impact on several threatened vegetation types and ecosystems;	• Demarcation and enforcement of no-go areas

	• Biodiversity offset and compensation plan, which has already been developed for the project, and consultation with MTPA on off-set discussion has already commenced; • Stormwater management plan was developed for the project and will be implemented during the implementation of the project. This includes the design of clean and dirty water channels, roads and berms to achieve optimal channelling and separation of clean and dirty water; • Detailed Rehabilitation plan was developed and will be implemented. Rehabilitation will be conducted in tandem with construction and operational phases of the project; • Re-vegetation of the rehabilitated areas with indigenous species; • Develop and implement a biodiversity management plan;
Loss of floral SCC individuals as the success of rescue and relocation is uncertain for many species	• Biodiversity offset and compensation plan, which has already been developed for the project, and consultation with MTPA on off-set discussion has already commenced; • Detailed Rehabilitation plan was developed and will be implemented. Rehabilitation will be conducted in tandem with construction and operational phases of the project; • Re-vegetation of the rehabilitated areas with indigenous species; • Develop and implement a biodiversity management plan;
Loss and fragmentation of habitat of faunal SCC and direct loss of fauna which will be expected to move from the area as a result of increased anthropogenic activities	• Biodiversity offset and compensation plan, which has already been developed for the project, and consultation with MTPA on off-set discussion has already commenced; • Re-vegetation of the rehabilitated areas with indigenous species; • Develop and implement a biodiversity management plan;
Although the revised EIA Phase Layout has managed to reduce the overall perceived	• Biodiversity offset and compensation plan, which has already been developed

impact on floral ecology, there will still be a loss of favourable floral habitat that will impact on floral communities and SCC not only on the direct footprint but on adjacent habitat as well	for the project, and consultation with MTPA on off-set discussion has already commenced; • Re-vegetation of the rehabilitated areas with indigenous species; • Develop and implement a biodiversity management plan;
The following proposed infrastructure falls within the 1:100 year floodlines: o Iota PCD; o Wishbone PCD; o Wishbone WRD; o River crossing bridge; o Browns Pit; o Haul road; o Other linear infrastructure (pipelines, electrical lines, smaller access roads and clean and dirty stormwater measurers).	Detailed engineering designs were undertaken and will be completed as part of the water use licence that will address these concerns
Visual impacts: the visibility and visual intrusion of the Iota WRD 1 and 2 is more significant on the town of Pilgrim's Rest, the R355 and the Lost City Hiking Trail within the Mount Sheba Private NR	For the duration of the operational phase these impacts cannot be fully mitigated. Final rehabilitation of the site will provide improved visual mitigation
Nuisance noise: although expected to be low to inaudible in most areas, some areas close to the mining operations will experience negative impacts which will require mitigation	Mitigation measures will include: • noise barriers • well maintained equipment (especially exhaust systems)
High levels of formal and informal population influx into Pilgrim's Rest (rated a medium to high risk) is highly probable due to the size of the required workforce	For context, mining has been prevalent in the area for the last 146 years and mining activities have been active since the mid 1980's to 2015. The town and area has demonstrated its ability to absorb accommodation requirements for mining activities. Mitigation measures include: • Use of accommodation in neighbouring towns • Possibility to establish accommodation in caravan park that can later be converted to holiday accommodation

Positive impacts

The positive impacts of the project is expected to occur in three broad areas:

- Socio/Economic
- Environmental Control and Rehabilitation
- Contribution to tourism

The largest contributions in this area are

- Flow of money into the local, regional and national economy through expenditure such as salaries, procurement of goods, taxes and royalties
- Job creation in an area that has nearly double the national average unemployment rate
- Reduction of illegal mining in the area and the associated secondary crime that comes with it. This will be achieved by employing specialist illegal mining prevention teams in the area that will initially remove the illegal miners and thereafter prevent the influx of illegal miners into the area.

Due to the overall decrease in tourism revenue and as a result of the mine no longer being operational, the town's is experiencing a generally poor socio-economic environment is generally poor.

Mining companies are governed by:

- Social and Labour Plans (SLP's);
- General Corporate Social Responsibilities (CSR).

The company, as part of their Social and Labour Plans (SLP's) and Corporate Social Responsibilities (CSR), TGME has been supporting sponsoring 3 additional teachers and an assistant at the local schools. In addition, the company provides printing facilities at the school, and is also involved in a feeding scheme for junior school children and has also completed some renovation activities at the local primary school. All of these activities have been supported, despite the fact that the company is not currently operational.

A revenue generating project will allow support for these activities to continue and will also enable TGME to expand its SLP and CSR initiatives, particularly with a view to completing projects that can continue beyond the mine's life. These projects are expected to focus on ultimately supporting the tourism or farming industries.

The general socio-economic landscape is also expected to improve through indirect spending by employees and others associated with the project. Such spending would include, increased requirements for overnight accommodation and meals for visitors to the mine.

Environmental Control and Rehabilitation

The mining activities that have taken place in the area during the past 146 years have caused environmental damage such as excavations and habitat degradation. The company recognises that the advances in environmental management practices, standards and technologies have advanced and that these modern-day practices can now be applied to areas of historical degradation.

However, environmental remediation however requires financial, human and specialist resources to execute and o. Once the project is operational, these resources will become available to address historical environmental degradation in the project area. As a result of addressing these historically degraded areas, the company expects to deliver a nett positive impact on environmental remediation across the whole mining rights package area.

In addition, illegal mining activities are having a significant negative on the Blyde river through the introduction of significant sediment loads as well as the possible introduction of mercury and other chemicals associated with illegal mining activities. While the mine was in operation, a specialist team was contracted to deal with illegal miners. Since the mine's closure and the departure of this team, an estimated 30 illegal smelters have been established in the local communities. The budget for the Theta Hill Project includes the re-engagement of a specialist team to remove the illegal miners in the area, which will contribute significantly to a general reduction in local crime - as it did in the past. This can only be implemented once the project is approved and financed.

Contribution to tourism

Pilgrims rest has suffered from a general reduction of tourism revenues into the area. There is a general lack of suitable accommodation in the area, particularly for larger events such as motorcycle and bicycle rally's, the annual national gold panning championships and others. Revival of the caravan park is expected to contribute to increasing visitor numbers to the town.

The company is currently working towards securing the caravan park that was historically considered to be one of the top caravanning and camping destinations in South Africa. Unfortunately, the caravan park has deteriorated over time and has started to be vandalised. The applicant has placed security on the property in the short term and expects inject significant amounts of capital into the facility to revive a portion of the park for the general public. A section will be used for the mine's purposes however without this synergistic approach with the mine, the capital required in the caravan park is not expected to be found and therefore the park will remain in a poor state.

Where possible, mitigation and management measures, no-go areas, as well as further recommendations have been provided by specialists which will lead to a reduction in the significance of these impacts to medium-high, including:

- Biodiversity offset and compensation plan, which has already been developed for the project, and consultation with MTPA on off-set discussion has already commenced;
- Stormwater management plan was developed for the project and will be implemented during the implementation of the project. This includes the design of clean and dirty water channels, roads and berms to achieve optimal channelling and separation of clean and dirty water;
- Detailed Rehabilitation plan was developed and will be implemented. Rehabilitation will be conducted in tandem with construction and operational phases of the project;
- Re-vegetation of the rehabilitated areas with indigenous species;
- Develop and implement a biodiversity management plan;
- A Resettlement Action Plan needs to be developed for the Brown's Hill Community

Monitoring plans, which should be implemented throughout the life of the mine, have also been provided to ensure that adverse impacts are reduced, and continuous improvements made.

With the correct and effective mitigation and management measures, the project will still have negative impacts on the floral ecology within the focus area and potentially on a local to regional scale. The impacts are perceived to be relatively irreversible.

If the project is to be approved for overriding socio-economic reasons, an appropriate biodiversity offset and compensation plan, including appropriate funding of this initiative, is considered essential.

Rehabilitation potential: Due to the presence of sensitive floral habitat of high conservation value, it is preferred that 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. Due to the location of the focus area in CBAs, rehabilitation should ideally be to a pre-mined condition. If this is not possible, which the findings of this report deem likely, offsetting must be considered for Optimal CBAs.

However, a positive role can be played if current degraded habitat is rehabilitated to restore some ecological functioning and habitat connectivity that have been lost due to historical mining activity, AIP proliferation and habitat transformation.

24.2. Conditions that must be included in the authorisation

24.2.1. Specific conditions to be included into the compilation and approval of EMPr

The following specific conditions are proposed:

- An appropriate biodiversity offset and compensation plan, as well as appropriate funding of this initiative should be developed and approved – (*please refer to Section 22 of the report for the specific conditions linked to offset*);
- All buffer areas indicated for features should be implemented and avoided. Where avoidance is not possible, alternatives such as rehabilitation or offset agreements needs to be reached;
- Environmental monitoring should take place as recommended;
- All flora and fauna Species of Conservation Concern should be relocated by a qualified specialist as part of a relocation and monitoring plan prior to construction activities. Where it is not possible to relocate SCC, required permits must be obtained;
- A thorough walkdown of the footprint area should take place where all floral SCC are marked for rescue and relocation, or removal (where permit application would then apply). This walkdown will ideally need to take place in late November and early February when species identification will be more accurate, and the species lists for these habitats can be fully saturated;
- No faunal SCC may be poached during the construction or operational phase of the project;
- The section of the track extending from the road towards TGME (at the old pump station) westwards across the metal bridge crossing the Blyde River westwards if this is to be temporally removed, a valid permit would be required from SAHRA/PHRA prior to its destruction. Such a permit will only be issued after the site has been fully documented – mapped, photographed and described.
- A buffer zone of at least 15m is created around the outer edges of the fort and that this is formalised with a suitable, permanent fence (with an access gate).
- A Resettlement Action Plan needs to be developed for the Brown's Hill Community and the proposed process and possible implications should be discussed with the residents of the Brown's Hill Community.
- A serious effort is required in the development of a sustainable post-mining economy through the social investment programme of the project, covering social investment in sustainable non-mining related activities as well as through a portable skills programme. These programmes need to be developed and implemented at an early phase of the project.
- The contribution that other potential sources of pollution (e.g. agriculture, waste water treatments and settlements) already have on the river's downstream water quality would be part of a Strategic Environmental Assessment (to be done under the auspices of the DWS) which falls outside the ambit of this project. Such an assessment remains a high priority to provide a scientific baseline to be used for future auditing and monitoring.
- A grievance system or communication platform should be established to create a forum for the public to interact with the mining house;

- Baseline environmental noise and ground vibration levels to be recorded on a monthly basis for the first year after which the frequency can change to a quarterly basis;
- All acoustic screening measures must be in place before commissioning the proposed open cast pit mining;
- Environmental noise and ground vibration monitoring to be carried out during the different phases of the project;
- All noise sources at the different mining areas to be identified and registered;
- • Earth berms to be constructed along the perimeter, which face the abutting residential areas, of the Iota, Brown's and Theta Pits; and
- The Noise Control Regulations, 1994 to be adhered to at all times.
- A Water Use License must be obtained prior to water uses being undertaken;
- Dirty water must not be discharged to the environment;
- The PCD's must be designed and operated in such a way that it will not spill. The dams must be able to contain the water required for operations and a storm event;
- Water levels within the remaining pit voids and PCDs must be managed post closure;
- The generation of sediment must be controlled through suitable measures;
- The stormwater management plan must be revised near mine closure;
- Water quality monitoring programme is implemented at least a year prior to construction;
- The numerical and geochemical model must be updated annually with monitoring data collected during operations.

24.3. Rehabilitation Requirements

The post-mining land-use objective relates to the rehabilitation hierarchy illustrated in the report. Avoidance is not an option; however, a combination of reinstating/restoring the original ecosystem, development of an alternative outcome with a higher or equal economic value and re-vegetation with suitable species, is considered viable post-mining land-use objectives. These objectives may adapt based on the practical implementation and knowledge, or research outcome at the time. For these land-uses to be realised, the four primary closure objectives and the specific objectives for each of the domains as described below should be met:

- Surface infrastructure to be removed, and sites rehabilitated to a restored ecosystem or alternative vegetation cover with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition in order to reach biodiversity targets;
- Transport infrastructure to be rehabilitated to a restored ecosystem or alternative vegetation cover with the main objective to achieve biodiversity targets. Those roads that will remain as access roads as a result of pre-closure negotiations with landowners and stakeholders, shall be sufficiently upgraded to minimise erosion and sedimentation potential. Transfer of maintenance agreements with regards to the road surface and stormwater management infrastructure, should be formalised. Residual impacts and environmental risks should be assessed at that time to have the best basis for decision-making, especially for transport infrastructure that traverses sensitive ecosystems;
- All equipment and electrical infrastructure to be removed, and their footprints rehabilitated to a restored ecosystem or an alternative vegetation cover with the main objective of achieving biodiversity targets. No infrastructure to remain on site unless a beneficial gain is identified and agreed upon with landowners/ stakeholders;

- All waste rock dumps to be rehabilitated with a vegetation cover with the main objective to achieve biodiversity targets. It is paramount that geotechnical, erosional and geochemical stability is achieved, and that no pollution shall emanate from the waste rock dumps;
- Final voids, terrace cuts and/or pits shall be safe for humans and animals, or access should be restricted until such time as it is declared safe and stable. A suitable cover system shall be imported to enable healthy vegetation establishment that supports a pre-defined species diversity to achieve biodiversity targets;
- All dams relating to pollution control shall be removed and rehabilitated only when the risk of pollution or sedimentation is within prescribed standards. The site should be restored to the original ecosystem or alternative vegetation cover to achieve biodiversity targets;
- All product stockpiles to be sold, and the footprints rehabilitated to a restored ecology or to an alternative vegetation cover which can achieve biodiversity targets. All topsoil stockpiles to be used in rehabilitation procedures and the footprints vegetated with a cover that supports a pre-defined species diversity to achieve biodiversity targets.

25. Period for which the Environmental Authorisation is required

The application would not require a validity period.

26. Undertaking

We hereby confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Environmental Impact Assessment Report and the Environmental Management Programme Report.

27. Financial Provision

CALCULATION OF THE QUANTUM

Applicant: **TGME**
Evaluators: **Minelock / Globesight / OMI solutions**

No.	Description	Unit	A Quantity	B Master Rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
1	Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m3	70 000.00	14.71	1	1	1 029 700.00
2 (A)	Demolition of steel buildings and structures	m2	517.24	204.96	1	1	106 013.51
2 (B)	Demolition of reinforced concrete buildings and structures	m2	1 322.76	302.05	1	1	399 539.66
3	Rehabilitation of access roads	m2	119 600.00	36.68	1	1	4 386 928.00
4 (A)	Demolition and rehabilitation of electrified railway lines	m		355.99	1	1	0.00
4 (B)	Demolition and rehabilitation of non-electrified railway lines	m		194.18	1	1	0.00
5	Demolition of housing and/or administration facilities	m2		408.93	1	1	0.00
6	Opencast rehabilitation including final voids and ramps	ha	63.02	214 888.54	1	1	13 542 275.79
7	Sealing of shafts adits and inclines	m3		110.03	1	1	0.00
8 (A)	Rehabilitation of overburden and spoils	ha	84.45	143 259.03	1	1	12 098 225.08
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha		178 426.53	1	1	0.00
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	14.13	518 235.21	1	1	7 322 663.52
9	Rehabilitation of subsided areas	ha		119 957.86	1	1	0.00
10	General surface rehabilitation	ha	12.83	113 485.31	1	1	1 456 016.53
11	River diversions	ha		113 485.31	1	1	0.00
12	Fencing	m	3299	126.45	1	1	417 158.55
13	Water management	ha	13.46	43 150.31	1	1	580 803.17
14	2 to 3 years of maintenance and aftercare	ha	187.89	15 102.61	1	1	2 837 629.39
15 (A)	Specialist study	Sum		0		1	0.00
15 (B)	Specialist study	Sum		0		1	0.00
					Sub Total 1		44 176 953.20
1	Preliminary and General		5301234.38		weighting factor 2 1		5 301 234.38
2	Contingencies			4417695.32			4 417 695.32
					Subtotal 2		53 895 882.91
					VAT (15%)		8 084 382.44
					Grand Total		61 980 265.34

27.1. Explain how the aforesaid amount was derived.

The closure costs were determined by using the Guideline document for the Evaluation of the Quantum of Closure related Financial Provision Provided by a Mine (DME, January 2005).

The approach adopted during this evaluation broadly involved conducting a site investigation during which visual observations were made and interviews were held with key personnel and a comprehensive review and scrutiny of applicable scientific and technical reports including related information. From this a costing strategy and framework was developed in order to ultimately compile a detailed independent rehabilitation and closure cost estimate.

The development of site-specific costs for final rehabilitation, decommissioning and closure necessitated the following sequence of evaluations:

- A determination of a new Bill of Quantities (BoQ). In this particular instance a Bill of Quantities was calculated from new by a civil engineer from information contained on the respective site layout diagrams;

- Identification of the respective closure components;
- Identification of the prescribed post mining land use requirement for each closure component (informed by the relevant biophysical baseline studies);
- Compilation of a list of activities/actions to be implemented in order to achieve the desired post mining land use objective for each closure component;
- Determine the equipment capacity, operator efficiency, fuel requirement, distance of travel, angle of route & height of infrastructure applicable to each activity/action in order to derive unit rates for the purposes of an auditable cost basis.

27.2. Confirm that this amount can be provided for from operating expenditure.

It is confirmed that the amount for outstanding rehabilitation can be provided from operating expenditure.

28. Deviations from the approved scoping report and plan of study

28.1. Deviations from the methodology used in determining the significance of potential environmental impacts and risks.

There are no deviations from the impact assessment methodology that was submitted with the approved Scoping Report.

28.2. Motivation for the deviation

Not applicable – No deviations from the methodology proposed in the Scoping Report.

29. Other Information required by the competent Authority

29.1. Impact on the socio-economic conditions of any directly affected person.

The study area is located directly north and west of Pilgrim’s Rest.

The main and closest sensitive receptors in the area include, inter alia, Brown’s Hill, Darks Gully, Schoonplaas/Newtown, Pilgrim’s Rest Town, TGME Metallurgical Plant and Tailings Storage Facility (TSF), Former Pilgrim’s Rest Caravan Park and Camping Site, Pilgrim’s Rest Hut Guest House, Grootfontein Village, Mount Sheba Forever Lodge, Mount Sheba Private Nature Reserve and grazing areas.

Other nearby property owners include SAFCOL, York Timbers (Pty) Ltd., SAPPI and the Maorabjang Communal Property Association.

Receptors directly affected by the mining activity:

- The mining activities could have a negative sense of place impact on the predominantly rural and historic character of Pilgrim’s Rest due to visual scarring of the landscape as well as a potential increase in noise and activity levels. The mine will be operational 6 days per week (excluding Sundays) and working hours will extend from 6am to 2am. This risk is rated medium.
- The proposed mining activities would be in very close proximity to Brown’s Hill. Although the impacts on the Brown’s Hill Community are rated as medium, the location of the settlement requires resettlement due to the Brown’s Hill Pit and the topsoil stockpile being planned within this area. The community is also in close proximity to the existing plant area.
- Impacts that are rated medium that would have negative intrusion impacts on the residents of Darks Gully relate to the possible noise and dust pollution impacts as

well as proximity of the Iota WRD. Mining activities would also be visible from this community.

- High levels of formal and informal population influx into Pilgrim's Rest (rated a medium to high risk) is highly probable due to the size of the required workforce as well as the attractiveness that such a project will hold in a region with historic high in-migration rates, as well as high and increasing unemployment rates. Through proper communication on the recruitment methods and by the employment of local community members this impact can be mitigated to some extent, however it is anticipated that an influx into the town will remain high. Apart from general service delivery challenges that face many local governments in South Africa, Pilgrim's Rest face additional challenges in terms of local governance issues and uncertainty over the distribution of responsibilities between different government departments as well as the lack of available/safe land for further development of Newtown/Schoonplaas as its largest settlement.
- There are real concerns over ground and water contamination resulting from the project that could have dire consequences not only for Pilgrim's Rest but also for the downstream regional economy. The probability of this impact materialising was rated as low, based on the findings of the geohydrology report. From a socio-economic perspective, it is critical to avoid any possible environmental pollution e.g. sedimentation and erosion surrounding the existing watercourses and the Blyde River. The sensitive biodiversity areas that support the water systems should also be protected.
- In terms of the mine's potential impact on Pilgrim's Rest's tourism industry, there is conflicting views on the actual nature of the impact. While nature-based tourist activities in Pilgrim's rest, like Mount Sheba Resort are at a high risk to experience negative economic impacts from the mining project, other businesses (including the general dealer, petrol station and some tourist businesses in the historic town) could experience positive impacts. The risk however remains that the net impact of the mining project could be some out-crowding of long-term tourism jobs while offering only short term benefits to the town. The risk is rated medium.
- The short operational period combined with the large scale of the project could result in real challenges for the community in terms of job losses and the decline in local economic development funds after mine closure (rated as high risks). While it is noted that this project could unlock further underground mining opportunities in the area in future, this is not a certainty. It would be a real challenge for capacity building and local economic development programmes related to the project to achieve high and lasting benefits over a such a short period - 4 years full time operation and 1 year construction.
- The detailed rehabilitation plan was not available at the time of the study, but from a socio-economic perspective it is anticipated that the benefits of the project can be prolonged should the rehabilitation process consider sub-projects that would involve unskilled and semi-skilled local labourers e.g. a nursery where local labourers could be employed.
- Given the large scale of the project there could be high negative cumulative impacts on nuisance factors and in-migration and related challenges if construction activities run parallel to mining operations
- Even after mitigation and post closure there could be a number of potential residual impacts in the local area. These include:
    - Jobless migrants staying behind in the local area after closure placing pressure on already challenged social infrastructure and posing health and safety challenges, increasing the risk for resumed and intensified illegal mining activities;

- Continued negative economic impacts due to environmental pollution.

29.2. Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

For the proposed Theta project, the Heritage assessment has determined that, whilst there are a number of historical sites, features or objects of heritage significance in the area around Pilgrim's Rest, occur in the study area. If heritage features are identified during construction, as stated in the management recommendation, these finds would have to be assessed by a specialist, after which a decision will be made regarding the application for relevant permits.

During the survey, the following sites, features or objects of cultural significance were identified, only some of which are deemed to be conservation/documentation worthy:

- Currently, the Theta Pit boundary approaches the fort to within about 22m. It is recommended that a buffer zone of at least 15m is created around the outer edges of the fort and that this is formalised with a suitable, permanent fence (with an access gate).
- Cocopan track and bridge: A section of the remaining cocopan track will be impacted on due to the proposed construction of a pollution control dam (PCD). "Built" adits (situated outside the development footprint, and avoid if possible)

Various Burial sites and Cemetery (situated outside the development footprint, and avoid if possible)

If any of the identified structures is to be demolished, it must be fully documented – mapped, photographed and described – beforehand. A section of the track will be impacted on by a proposed new haul road.

As an off-set to this, it is proposed that the section of the track extending from the road towards TGME (at the old pump station) westwards to the metal bridge across the Blyde River be declared a no-go section and that it is protected and retained as a sample of this type of technology.

The site of historic significance closest to Theta Hill Pit, namely the old fort, can easily be avoided as it falls outside the mining area – please just note the buffer area needed.

Should archaeologically important sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. The EIA has therefore included mitigation measures that must be implemented should any heritage resources be encountered during all phases of the project. Please refer to Section 13 of this report and the accompanying EMPr.

30. Other matters required in terms of sections 24(4)(a) and (b) of the Act.

Section 24(4)(b)(i) of the NEMA (as amended), provides that an investigation must be undertaken of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity.

Alternatives relating to site layout, infrastructure and operation activities were considered. The location of the proposed project is constrained to the location of the mineral resource, and proven reserve.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

31. Details of the EAP

31.1. Expertise of the EAP

31.1.1. Qualifications of the EAP

Please refer to Section 3.2.1.

31.1.2. Summary of EAPs past experience

Please refer to Section 3.2.2.

32. Description of the aspect of the activity

Please refer to Section 5 of this report

33. Composite Map

The freshwater composite map is provided in Figure 66 and attached as Appendix 2. The following buffer areas were applied:

- 100m buffer for water courses (GN509);
- 1:100 year floodline

The ecological composite map is provided in Figure 67 and attached as Appendix 2. The following buffer areas were applied:

- National Forest 30 m Department of Agriculture, Fishery and Forestry buffer
- Floral Sensitivity zones

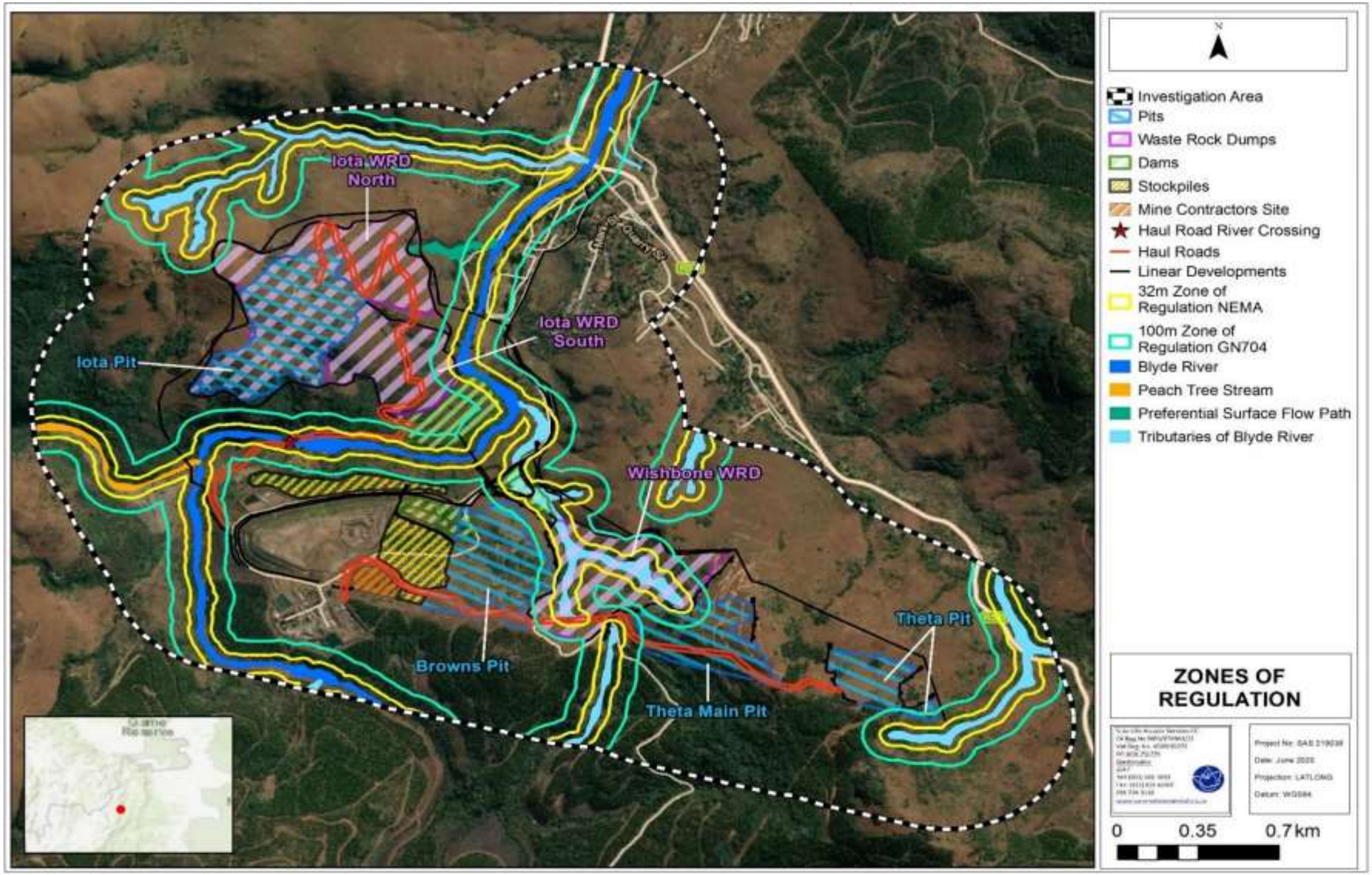


Figure 66. Freshwater composite map

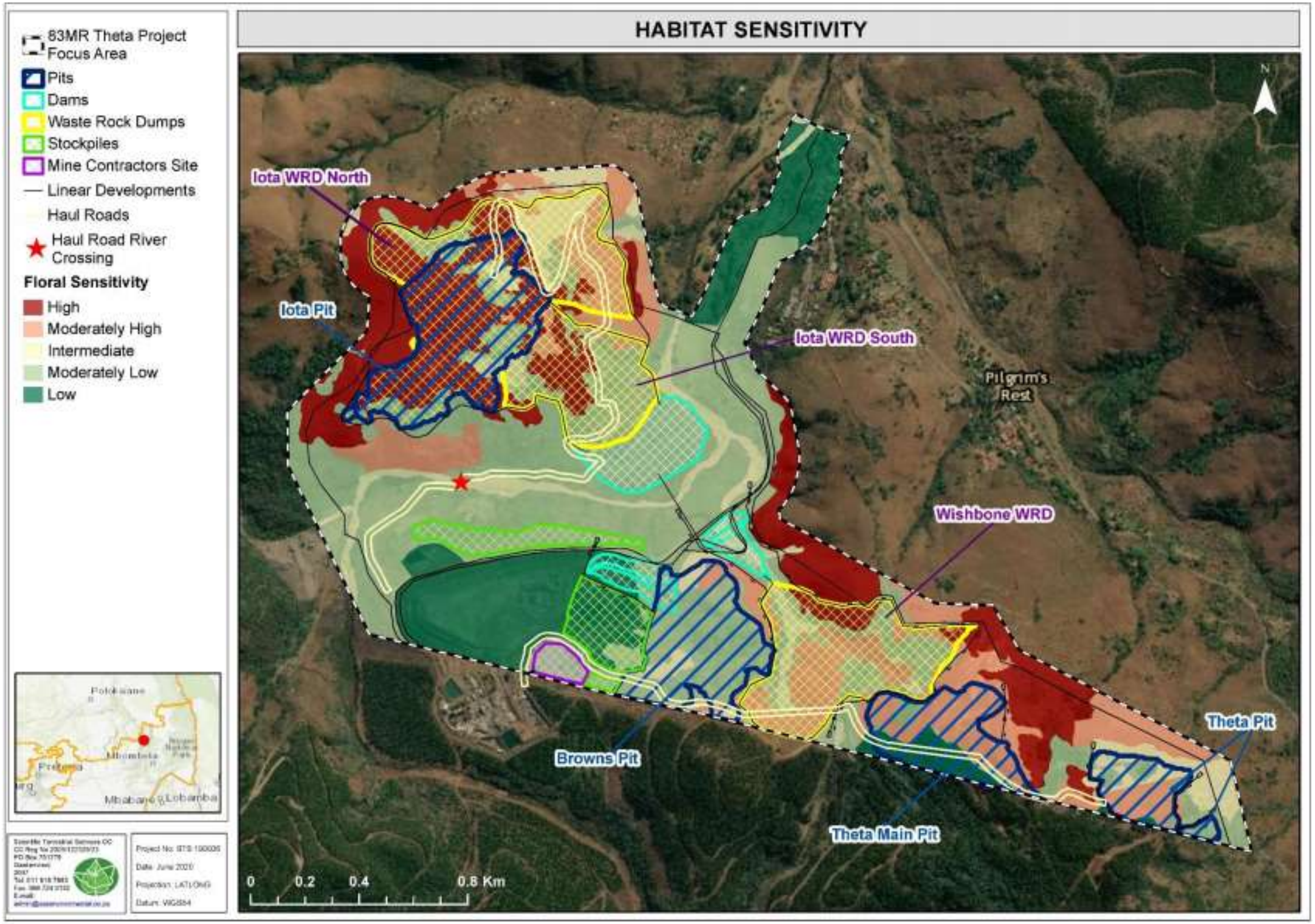


Figure 67. Ecological composite map

34. Description of Impact management objectives including management statements

34.1. Determination of closure objectives.

The overarching closure vision for the TGME Theta mine application is to initiate the recovery of the disturbed areas and accelerate an ecological trajectory/pathway towards a pre-defined reference condition within an achievable timeframe. This requires a reconstructed system that aims to be functional, resilient and regenerative with respect to its species composition (biodiversity), structural integrity (geotechnical, erosional and geochemical stability) and reintegration with the larger context, while creating the potential to promote ecosystems, livelihoods and local industries.

Objectives for mine closure should be suited to its context, practically achievable based on best practices, and fit within the regulatory framework. As a minimum, four general closure objectives should be achieved namely:

- The post mining landscape should be safe for humans and animals over a long term;
- The post mining landscape should be stable (geotechnically, erosional and geochemically) and offer long-term resistance to normal environmental stresses and disturbances;
- Residual impacts, as a result of the mine, should not cause harm or pollute the environment in and around the mining footprint;
- The post mining landscape should be able to sustain an agreed post-closure land use or restore pre-determined land capabilities.

34.1.1. Post Mining Land-use objective

The post mining land-use objective relates to the rehabilitation hierarchy illustrated in the rehab and closer report (Appendix 16). Complete avoidance or full restoration are not considered achievable objectives for the post mining landscape. Rather, a combination of the following can be implemented namely:

- Developing an alternative outcome with a higher or equal land capability;
- Re-vegetation with suitable species and
- Developing a lower value land use or land capability.

These objectives may adapt based on the practical implementation and knowledge, or research outcome at the time. For these land-uses to realise, the four primary closure objectives should be met (refer to Section 6). Specific objectives for each of the categories are described below:

- All surface infrastructures and their footprints shall be rehabilitated to a condition where:
    - All structures and their foundations are dismantled and removed;
    - The infrastructure sites are free of pollutants or sources of residual or latent environmental impacts;
    - Create a surface condition that is suitable for vegetation establishment and establish a vegetation cover with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition; and
    - The rehabilitated sites interact with adjacent ecosystems in terms of organism migration, nutrient cycles and hydrological connections.
    - The perimeter fence and security features (specifications unavailable at the time of reporting) should remain intact and active until all the terrace cuts/pits and WRDs are declared safe for humans and animals and until such time the Applicant does not require the security or

access control. At the point when the above criteria are met, all features of the fence should be removed, and the disturbed surfaces rehabilitated through:

  - Preparation of the soils to form a seed bed; and
  - Create a surface condition that is suitable for vegetation establishment and establish a vegetation cover with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition.
  - Approximately 5.5km haul roads (11.35ha) and an indeterminate length of internal roads will be constructed in the mining area. All rehabilitated roads shall be:
  - Profiled to restore the natural topography and hydrological patterns; and
  - Capped with a suitable growing medium and vegetated with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition.

- Those roads that will remain after closure as a result of pre-closure negotiations with landowners and stakeholders, shall be sufficiently upgraded to minimise the impacts of erosion and sedimentation on local water courses via the implementation of adequate stormwater management systems. Transfer of maintenance agreements with regards to the road surface and stormwater management infrastructure, should be formalised. Residual impacts and environmental risks should be assessed at that time to have the best basis for decision making, especially for those transport infrastructures that traverses sensitive ecosystems;
- The low water bridge over the Blyde River shall be removed and rehabilitated to:

  - Restore the natural flow path of the river;
  - Prevent scouring of the river profile at that particular point and downstream; and
  - The river embankments shall be revegetated with indigenous aquatic and riparian species that is representative of the vegetation in the river system.

- Pre-closure negotiations with landowners/stakeholders may find a beneficial use for the low water bridge. The health and integrity of the aquatic ecology and hydrological system should be considered as the primary stakeholder when making a final decision. This will require scrutiny of all the monitoring information and interpretation of the data by a qualified professional;
- Pumps and pipelines (dewatering and supply pump columns) are some of the equipment that will be installed at PCDs, pits etc., to manage water levels and balances across the site. Pumping equipment that manages potentially polluted water, should remain active after decommissioning until all risk of pollution is abated. Ultimately, when relinquishment criteria with regards to sediment loads, water quality and -balances have been achieved, this equipment shall be removed, and the sites rehabilitated by taking the necessary action to:

  - Demolish structures such as pump mountings etc. and remove foundations;
  - Restore the topography to blend in with the natural surroundings;
  - Capped with a suitable growing medium and vegetated with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition.

- An overhead 6.6kV powerline shall be erected from the existing substation near Pilgrims Rest to the existing processing plant. This section of approximately 2.5

km will typically consist of gum pole structures supporting the power cables (detail design to be completed). Removal of the conductors, poles, foundations and other ancillary components shall be initiated when the powerline becomes redundant in terms of its use.

- The waste rock dumps (WRD) will be permanent landforms and must be designed and constructed with closure in mind. Structural profiling and contouring should occur in-situ as far as practically possible to minimise earthworks at a later stage. This approach should develop a landform that:
    - Blends with the natural topography by avoiding sharp corners, straight lines and unnatural intersections with the landscape;
    - Provides geotechnical, erosional and geochemical stability;
    - Manages surface water in an effective way to facilitate long-term functionality;
    - Is capped with a cover system that consists of a growth medium that can support a healthy vegetation cover;
    - Is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition; and
    - Reduce the necessity for extended aftercare and maintenance actions by ensuring long-term stability and establishing a regenerative and self-sustaining ecology.
- The mine design suggests that partial backfilling will occur in parts of the pits. Some areas may remain as open cuts and pits that should be rehabilitated to achieve the following core objectives:
    - The terrace cut, in specific the high wall, must be made safe and stable as far as practically possible, minimising risks to the health and safety of humans and animals;
    - Where in-filling is suggested, the slopes should be stable and at a gradient that is accessible for equipment to perform rehabilitation;
    - Minimise the scale and height of the high wall through profiling, partial backfilling and by implementing sound stabilisation methods;
    - Profile the landform within reasonable and practical limits to merge with the natural terrain. A landform design should inform the operational phase to minimise actions at the closure phase;
    - Surface water should not accumulate in voids unless it can be demonstrated that it is beneficial to the environment, stakeholders or local industries and that no environmental impact may originate from it for example salinization, unacceptable catchment interference or a safety hazard. Retention of water should be subjected to the approval of the necessary licences;
    - Is capped with a cover system that consists of a growth medium that can support a healthy vegetation cover;
    - Is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition;
    - Reduce the necessity for extended aftercare and maintenance actions by ensuring long-term stability and establishing a regenerative and self-sustaining ecology.
- All pollution control dams, balancing dams and associated surface water management structures (including diversion channels, silt traps etc.) shall remain

actively monitored and maintained during the operational and closure phases and may only be decommissioned once all risk of pollution from the terrace cuts/pits and WRD are effectively dealt with. Once residual and latent risks have been sufficiently managed, the dams, diversion channels etc. shall be decommissioned and rehabilitated by:

  - Removing all structures such as silt traps, foundations, pump mountings, liners, etc., and dam walls;
  - Profiling and restoring the natural topography and hydrological patterns as far as practically possible, thereby reinstating a natural functioning and free-draining system that provides ecologically stable environments;
  - Cap with a suitable growing medium that is resistant to erosion in the early stages of vegetation establishment; and
  - Is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition;

- Three topsoil stockpile areas (12.5 ha in total) and strategic ore stockpiles (location and size unknown at the time of reporting) are proposed. All topsoil stockpiles should be used in rehabilitation by spreading it over disturbed areas and vegetating it. It is assumed that strategic ore stockpiles will be sold or processed, leaving the footprint to be rehabilitated. All stockpile footprints shall be rehabilitated to a condition where:

  - The shaping and profiling are done to blend with the natural topography;
  - The rehabilitated sites are resilient to normal ranges of environmental stresses and or disturbances;
  - The rehabilitated sites can sustain itself structurally and functionally;
  - The surface is capped with a cover system that consists of a growth medium that can support a healthy vegetation cover;
  - The surface is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition; and
  - The rehabilitated sites interact with adjacent ecosystems in terms of organism migration, nutrient cycles and hydrological connections.

It is recommended that the progress of the rehabilitation be monitored to ensure sustainability. This requires an understanding of the basic baseline environment, as well as project management to ensure that the rehabilitation program is a success.

34.2. The process for managing any environmental impacts

All the identified impacts shall be mitigated as provided for in Section 13 of this report.

An Environmental Response Plan (ERP) is a process to respond rapidly and effectively to and manage emergency situations that may arise at the mine. The Emergency Preparedness and Response Code of Practice will be compiled in accordance with the following legislation:

- OHSAS 18001; and
- The MHSA.

In the event of an emergency, the ERP and applicable procedure(s) will be consulted, and the required actions implemented. To facilitate the effective implementation of the procedures, copies of the Emergency Response Plan will be placed in accessible and visible locations around the site, such as the site office and contractors' yards.

TGME shall ensure that employees and contractors are adequately trained regarding the implementation of the EMPr, environmental legal requirements and obligations, and the ERP.

Environmental awareness is applicable to all personnel involved in the project, including part-time personnel who shall be trained so that they are aware of environmental obligations by the time they access the site. An Environmental Control Officer (ECO) will be appointed to conduct training during site establishment and will be responsible for what the site will look like before the commencement of mining activities and what it looks like after rehabilitation. This will be to ensure that the site has been restored to its original state or to an acceptable level, and ensure the ERP is adequately applied in case of an emergency. Accordingly, training programmes and frequent emergency simulations is suggested to ensure that all personnel are aware of safety and emergency procedures.

In addition, a list of emergency contact numbers will be displayed at various locations around the site. If the emergency has the potential to affect surrounding communities, the communities will be alerted via alarm signals or contacted in person.

Personnel that do not comply or ignore training and instruction regarding this, should be fined based on their offenses. First time offenders may get away with only a written warning, depending on the seriousness of the offence. Second time offenders may be suspended or fined depending on the decision made by the site manager, who may consult with the ECO, contractor and SHE Manager/Officer of the mine.

34.3. Potential risk of Acid Mine Drainage

A geochemistry assessment was conducted for the Theta Project as part of the EIA/EMPr and IWWMP.

The geochemical assessment, modelling results and interpretation identified metal(loid)s, specifically arsenic, mercury, chromium and nickel as potential contaminants, however due to adsorptive processes provided by clay and iron oxide minerals these constituents may be reduced in concentration or completely immobilized.

The geochemical modelling indicated that the risk of the development of acid mine drainage conditions are highly unlikely as enough neutralisation capacity is available within the WRD facility and pit backfill material to buffer the pH of the systems. However, contamination of the shallow soil below any on-surface WRD facilities is likely, although the contaminants will be immobilized through adsorptive processes.

The calibrated numerical model was used to assess the potential impacts from the WRD on the geohydrological regime for the various layouts.

The geochemical environmental risks from the waste rock disposal on waste rock dump facilities concluded that:

- The cumulative geochemical environmental risk of the development of acid mine drainage conditions in the operational and post-operational long term are Low. This is due to the overabundant acid neutralisation potential inherent in the site geology.
- The cumulative geochemical environmental risk of the pollution of groundwater by metal(loid)s and sulphate from the waste rock, either in the operational phase or the post-operational phase in the long term (> 100 years) is Low. This is due mostly to the overabundance of adsorption capacity inherent in the site geology as well as

the propensity of the site geology to increase the adsorption capacity over time even under reasonably varying environmental and physico-chemical conditions.

- Due to the Low cumulative environmental geochemical risks during the operational and post operational long-term phases, the post-operational in-pit backfilling is an environmentally acceptable remediation method for the waste rock.
- Therefore, the recommendation is made that the TGME waste rock be classified as Type 4, i.e. inert.

34.4. Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

The geochemical study to determine the potential for AMD formation (section 34.3) was mainly focused on the following aspects:

- The likelihood and rate of leaching of hazardous substances into the post-closure aquifer containing the waste rock material in the short- and long-term (100 years) as a result of the in-pit waste rock disposal;
- The short and long-term (100 years) interaction of aquifer material, waste rock material, groundwater and waste rock pore water to determine the sustainability of the current waste mineral waste management options.

During the study, an iterative modelling approach was followed with constant sensitivity analysis and changes to parameters and rates to achieve systems in which a close as possible natural environment can be modelled to evaluate and understand the processes involved. The main aim of the modelling scenarios was to evaluate the short term (5 years), which roughly corresponds to the operational phase of the mine, and long-term, post-operational (>100 year) behaviour of potential contaminants as a result of sulphide mineral oxidation.

- WRD facility during the operational and post–operational phase. The following scenarios were assessed:
    - Scenario 1: Assessment of reactions and resultant source term fluid chemistries after 5 years. Result: The Theta and Browns Hill, and Iota waste rock pore waters are slightly alkaline with model pH values of 8.20 and 7.82, respectively. Dominant components of magnesium and bicarbonate is evident. The model pore water solutions display elevated chromium concentrations. Mercury is also elevated above the given guidelines in the Iota model pore water solution.
    - Scenario 2: Assessment of reactions and resultant source term fluid chemistries after 100 years. Result: The long-term WRD pore waters also indicate slightly alkaline pH values with a pH between 7.40 and 7.93 simulated for the respective Iota, and Theta and Browns Hill WRDs. The dominant components include magnesium, bicarbonate and sulphate. The Iota model pore water displays higher concentrations of especially sulphate, which may be ascribed to the higher proportion shale (associated with sulphide minerals) calculated to be deposited on this dump. The model pore water solutions have elevated metal(loid) concentrations of specifically arsenic, chromium, mercury and nickel.
    - Scenario 3A: Adsorption model assessing final 5-year source term chemistry with the purpose to determine the importance of adsorption as a potential geochemical process to immobilise leachate contaminants in the site lithologies. Result: The modelled waters display slightly alkaline pH values of 8.20 and 7.82 for the respective

Theta and Browns Hill, and Iota modelled systems, with dominant magnesium, bicarbonate, sulphate (Iota) signatures. All the parameters are within the acceptable guideline ranges. The model results following Scenario 1, which assess the short-term behaviour of the waste rock material, indicate that although WRD pore water is more alkaline, the pore fluid is still likely to contain elevated concentrations of chromium and mercury (Iota). The adsorption model (Scenario 3A) however indicates that chromium and mercury adsorption is high, and it is therefore likely that these constituents will be sorbed to secondary mineral phases as the source term leachate migrates through the underlying lithologies.

  - Scenario 3B: Adsorption model assessing final 100-year source term chemistry with the purpose to determine the importance of adsorption as a potential geochemical process to immobilise post-operational leachate contaminants in the site lithologies. Result: The modelled waters have a near neutral to slightly alkaline pH of 7.39 and 7.77 for the respective Iota and Theta and Browns Hill systems. Dominant magnesium, bicarbonate and sulphate (Iota) components can once again be observed. The long-term model waste material pore water simulations (Scenario 2) indicate that although near neutral to slightly alkaline pH prevails; the pore fluids are very likely to contain elevated metal(loid) concentrations. These metal(loid)s however have the potential to be sorbed out of solution to secondary mineral phases as shown by the adsorption model (Scenario 3B) that indicate high sorbed fractions for specifically arsenic, mercury and nickel. Although chromium adsorption was high, it still occurs at concentrations above the regulatory guidelines. This suggest that adsorption is an important geochemical process in the immobilisation of potential contaminants.

- Pit backfill during post-operational phase. The following scenarios were assessed:

  - Scenario 4: Assessment of the final 5-year source term chemistry (Scenario 1) in pit backfill reactions and resultant fluid chemistries after 100 years under a sliding oxygen fugacity and a 5:1 water to waste rock ratio. This conceptually represents the disposal of the overburden and waste rock material in the pit after life of mine has been reached. Result: The model results of the pit backfill indicate that the modelled pore fluids have slightly alkaline to alkaline pH values. The model pore waters show reduced salinity when compared to the source terms (Scenario 1), however, model arsenic, chromium, and mercury concentrations are above the lowest regulatory thresholds.
  - Scenario 5: Adsorption model assessing the source term chemistry with the purpose to determine possible immobilisation of leachate contaminants. Result: The modelled water qualities indicate slightly alkaline to alkaline pH and are dominated by magnesium, bicarbonate and sulphate ions. The model results following Scenario 4 indicate that metal(loid)s, arsenic, chromium, mercury, and to a lesser extent nickel, are mobile in the alkaline pH and less oxidising conditions. Additionally, cobalt becomes more mobile in the less oxidising conditions. The adsorption model (Scenario 5) suggest that adsorption is an important geochemical process that stabilise metal(loid) concentrations.

34.5. Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

As noted in Section 34.3, it is highly unlikely that AMD would occur at Theta Hill. In order to monitor the situation and thereby avoid AMD, it is recommended that groundwater and geochemical models be updated on a regular basis (every 2years) to verify potential for decant.

34.6. Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

Please refer to the sections above

34.7. Volumes and rate of water use required for the mining, trenching or bulk sampling operation.

Water requirements for use by the mine staff is calculated at 120 litres (l) per person per day. Raw water will be supplied via an existing raw water tank located within the metallurgical plant area and will be fed to water tanks situated at the respective mining areas via pipelines. From there water will be treated to potable standards as and when required.

34.8. Has a water use license has been applied for?

An electronic Water Use Licence Application and Authorisation System (e-WULAAS) application has been submitted to the Department of Water and Sanitation (DWS). The Integrated Water and Waste Management Plan (IWWMP) to be submitted to the DWS during Phase 3 of the application will be made available to the stakeholders for review and comment.

Maleka Environmental Consulting was appointed by TGME to undertake the required Integrated Water Use Licensee Application (IWULA) in terms of Section 40 of the NWA.

34.9. Impacts to be mitigated in their respective phase

The full impact assessment with associated mitigation and management measures are presented in Part A: Section 8 Item 3(g)(v): Impacts and risks identified including the nature, significance, consequence, extent, duration and probability as well as in Section13.

Table 55. Impact Management During the Pre-Construction and Construction Phase Operation and Decommission Phase: Mitigation Type

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Planning of proposed surface infrastructure layout and proposed open pit mining areas. [The location of infrastructure occur directly within watercourses (especially in the case of linear infrastructure which traverse several drainage systems) and within the 32m or 100m zones of regulation according to the NEMA and GNR 704 of the NWA.]	Loss of catchment yield and surface water recharge, potential creation of seepage (from the WRD) within the active drainage systems which can lead to a loss of general loss of aquatic and riparian biodiversity as well as SCCs, impaired water quality, loss of instream habitat integrity and overall EcoStatus as well as impacts to aquatic resources further downstream of the proposed mining activity.	Watercourse Ecology	Pre-construction planning	• Ensure that as far as possible all infrastructure is placed outside of aquatic resources. In particular, mention is made of the need to not encroach on the Blyde River and Peach Tree Stream and to protect these two systems from the impact of adjacent mining; • It must be ensured that the design and construction of all infrastructure prevents failure; • In addition, very clear separation of clean and dirty water areas must be included in the design of the mine in such a way as to ensure the mine is fully compliant with Regulation GN704; • Refer to specialist groundwater ecology report for detailed mitigation measures.	Detailed planning, taking into account all the risks identified and consequent mitigation requirements	The planning will be done such that the watercourses will be preserved and all aspects of water management regulations will be adhered to during construction, operation and closure phases	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements
Planning of the mine layout, stockpiles, WRD, dams and other infrastructure	Impact on faunal habitat, species diversity and SCC	Fauna	Pre-construction planning	• Good planning of infrastructure placement and designs should take place with the guidance of the sensitivity maps and proposed mitigation measures within the specialist assessment reports; • A Biodiversity Action Plan, Alien Invasive Management and rehabilitation Plan must be compiled; • No open pits, topsoil stockpiles, overburden dumps or surface infrastructure should be placed within the sensitive faunal habitat units.	Detailed planning, taking into account all the risks identified and consequent mitigation requirements	Planning will be done in line with mitigation measures identified, ensuring optimal placement of infrastructure to limit damage to fauna indigenous to the area	Preservation of habitat Prevention of alien invasion Adherence to relevant nature conservation regulations
Planning of the mine layout, stockpiles,	Impact on floral habitat, species diversity and SCC	Flora	Pre-construction planning	**Floral Habitat and Diversity:** • Minimise loss of indigenous vegetation where possible through planning and suitable layouts. Limit	Detailed planning, taking into account all the risks identified and	Planning will be done in line with mitigation measures identified, ensuring optimal	Preservation of habitat

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
WRD, dams and other infrastructure				placement of infrastructure within habitat of intermediate to high sensitivity. The following changes to the current layouts are recommended: • Changes to the design of the proposed Iota Pit and Iota WRD should be considered to ensure that the footprint area falls outside of the Department of Agriculture, Forestry and Fisheries (DAFF) recommended 30 m buffer around natural forests; • Based on the findings of the Freshwater report (SAS 219038), it is considered imperative that during the planning phase, very careful consideration be given to the locality and layouts of surface infrastructure, to ensure that watercourses and their associated zones of regulation (in terms of both GN704 and GN509 as they relate to the NWA) are avoided as much as possible; • It is recommended that all stockpiles and WRDs be designed in such a manner that runoff is contained; • Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation: • Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction, operational, decommissioning and post-closure phase. AIPs should be cleared within areas where infrastructure is planned before any construction activities commence, thereby ensuring that no AIPs are spread, or soils contaminated with AIP seeds, during construction phases; and • An AIP Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur without a certified professional • Prior to the commencement of construction activities on site, a rehabilitation plan should be developed for implementation throughout the development phases;	consequent mitigation requirements	placement of infrastructure to limit damage to flora indigenous to the area	Prevention of alien invasion Adherence to relevant nature conservation regulations DAFF recommendations and regulations

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• Due to the potential for residual impacts on sensitive habitat, a biodiversity offset investigation process should be initiated as part of the planning phase and before any construction commences. **Floral SCC** • Before any construction activities can occur a detailed walk down of the area must take place, during which all floral SCC should be identified and marked by a suitably qualified specialist approved by the Mpumalanga Tourism and Parks Agency (MTPA). Surveys to be overseen by MTPA and would need to be conducted within the correct flowering season for all potentially occurring SCC – thus throughout the year over various seasons. A once-off walk-down will not suffice; • Prior to construction activities, floral SCC that will be directly impacted upon need to be removed to suitable similar habitat or to a nursery as part of a rescue and relocation plan. It is thus recommended that a nursery be set up to cultivate indigenous floral species for rehabilitation as well as to aid in the rescue and relocation of floral SCC. A nursery permit would be required. The removal and/or rescue and relocation should be overseen by a MTPA• appointed ecologist, in association with a suitably qualified horticulturist; • Permits from the relevant authorities, i.e. MTPA and DAFF, should be obtained before removal, cutting or destruction of protected species or floral SCC before any proposed mining activities may take place; • Due to the potential for a higher diversity of floral SCC occurring within the focus area than what was found during the field investigation, together with the fact that many montane SCC are only visible for a few weeks in the year when they are in flower, marking and/or rescue and relocation activities			

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				would need to take place over several seasons to coincide with the flowering period of all potentially occurring SCC.			
Mine infrastructure construction and mining development: land clearing, drilling, ground excavation and cut and fill operations	Dust from construction work, vehicle movement on haul roads and other unpaved roads, stockpiles and material handling	Air quality: dust fall-out	Construction	• Avoid dust generating works during very windy conditions (especially winds potentially transporting dust towards receptors) • Limit the number of simultaneous activities to a minimum as far as possible • Use water sprays where practicable • Dust suppression • water and chemical stabilisation • Dust suppression • water and chemicals; Early paving of permanent roads • Implement wet suppression and wind speed reduction (e.g. screens and berms) • Cover loads when hauling off-site • Cover dormant areas of stockpiles	Dust monitoring Modification to working hours/methods to reduce impact Active dust suppression Covering material to protect against wind	With the implementation of the mitigation measures and monitoring of the air quality, the construction activities will be undertaken such that the ambient air quality does not exceed the National Air Quality Standards	Dust levels Particulate matter levels
Mine infrastructure construction and mining development: Combustion of diesel in mobile equipment/vehicles [direct GHG emissions]	Vehicle tailpipe emissions Greenhouse gas (especially Carbon) emissions which contribute to climate change	Air quality: Pollution Climate Change	Construction	Servicing of vehicles, ensuring exhaust systems, brakes etc are in good working order Optimise vehicle routes and usage and ensure vehicles are in good running order, thereby limiting Carbon emissions	Maintenance of vehicles Avoiding unnecessary engine running time Planning of operations and vehicle routes	Implement maintenance plans to keep vehicles in good running order to reduce greenhouse gas emissions from e.g. exhausts, brake linings Plan and manage vehicle routes	Vehicular Carbon emission levels
Removal of topsoil from project footprint, and stockpiling thereof for rehabilitation.	• Increased risk of transportation of sediment from exposed soils in stormwater runoff, leading to increased turbidity of surface water, sedimentation of watercourses and changing the	Watercourse Ecology	Construction	Prior to bulk earthworks the entire clean and dirty water management system should be developed to ensure that all “dirty water” areas can be managed as they are created	Water management planning and implementation	Implementation of water management measures to reduce impact on watercourses and	Watercourse biodiversity preservation

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
	characteristics of the stream beds, smothering of vegetation and/or altered vegetation composition, smothering of benthic taxa and/or destruction of suitable macro-invertebrate and fish habitats; • Excavation and denuding activities will alter the natural runoff and flow regime of the area. Altered flow regime may lead to destruction of suitable macro-invertebrate and fish habitat; • Loss of riparian areas due to the disturbance of the activity; • Alteration of the chemical properties of the river as a result of vegetation removal and deforestation; • Exposure of soils, leading to increased runoff and erosion, and thus increased sedimentation of the river; • Increased sedimentation of the river, leading to smothering of benthos, loss of rheophilic taxa, diverse biotopes and potentially altering surface water quality; • Increased hardened surfaces and compacted soils thus altering the pattern, timing and distribution of recharge which affects the watercourses within the zone of influence			Development and implementation of clean and dirty water management system Refer to specialist groundwater ecology report for detailed mitigation measures.	Monitoring programmes	ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Groundwater management standards NEMA and NWA requirements DAFF guidelines

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Clearing of vegetation in proximity to the drainage systems for contractor laydown areas and construction of surface infrastructure, including preparation of open pits (outside of drainage lines).	• Loss of foraging and breeding habitat [or hampering access to such suitable habitat (loss of connectivity)] and faunal migratory corridors; and	Watercourse Ecology	Construction	Refer to specialist groundwater ecology report for detailed mitigation measures.	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines
Clearing of vegetation within the drainage systems in preparation for construction of various linear developments; loss of vegetation within the drainage line directly impacted by the Wishbone WRD.	• Proliferation of alien vegetation as a result of disturbances.	Watercourse Ecology	Construction	Refer to specialist groundwater ecology report for detailed mitigation measures.	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines
Construction of additional access and haul roads, resurfacing of existing roads and refurbishment of existing buildings: • Altered drainage patterns due to increased	• Increased water inputs to watercourses, altering flow patterns and wetting patterns leading to further changes to vegetation and aquatic biota communities; • Contaminants from roads (e.g. oil spills) contained in runoff causing pollution to surface water within	Watercourse Ecology	Construction	Refer to specialist groundwater ecology report for detailed mitigation measures.	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations	Watercourse biodiversity preservation Groundwater management standards

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
impermeable surfaces; • Installation of culverts/pipes as part of the construction of stream crossings.	freshwater resources with resulting potential direct impact on aquatic biota; • Possible incision and sedimentation of freshwater resources due to increased water velocity (direct impact on biota in terms of smothering and indirect impact in terms of habitat destruction).					guarding natural watercourses from DAFF	NEMA and NWA requirements DAFF guidelines

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Construction of surface infrastructure (e.g. additional mine offices, ablutions, stormwater management systems, etc.): • Risk of contaminated stormwater runoff (e.g. hydrocarbons, sediment, originating from impermeable surfaces); • Stockpiling of topsoil and overburden, earthworks, movement of vehicles within lower reaches of drainage systems. • Potential disposal of hazardous and non-hazardous materials in riverine areas.	• Possible contamination of the associated watercourses downstream of the surface structures (water quality impact with associated direct impact on aquatic biota); • Possible erosion/incision of the drainage systems adjacent to surface infrastructure due to concentration of stormwater runoff *Erosion and sedimentation risk with associated impact on aquatic biota and suitable habitat). • Sediment-laden runoff entering riparian habitat leading to altered water quality, and changes to aquatic habitat; and • Altered drainage/flow regimes, leading to altered runoff patterns and formation of preferential flow paths. • Altered water quality, possible changes to flow patterns as a result of blockages caused by solid waste/rubble.	Watercourse Ecology	Construction	No waste may be disposed of within any riverine habitat, and all waste should be removed to an appropriate disposal facility Refer to specialist groundwater ecology report for detailed mitigation measures. `	Water management planning and implementation Monitoring programmes	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF
Construction of surface infrastructure within drainage systems: Wishbone WRD, dam, linear developments	As for other construction activities listed above	Watercourse Ecology	Construction	Refer to specialist groundwater ecology report for detailed mitigation measures.	Water management planning and implementation	Watercourse biodiversity preservation	Implementation of water management measures to reduce impact on watercourses

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
including but not limited to haul and access roads, perimeter fence, diversion trench and so forth.					Monitoring programmes	Groundwater management standards NEMA and NWA requirements DAFF guidelines	and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF
Opening of pits by means of dozer ripping (strip mining method).	Potential sedimentation of watercourses, leading to altered channel competency, altered vegetation community structures, blanketing of benthos and loss of rheophilic taxa and suitable habitat.	Watercourse Ecology	Construction	Strict adherence to the requirements of GN704 as it relates to the NWA in order to prevent contamination of salts and CPC's to the freshwater and aquatic systems.	Water management planning and implementation Monitoring programmes	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF
Construction and mine development	None expected • no sites identified within the mine site	Sites of archaeological and cultural interest	Construction	Should archaeological sites or graves be exposed in other areas during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.	Future action if such a site is identified		
Removal of vegetation and the exposure of soils during	Erosion of exposed soils leading to increased siltation and sedimentation of	Surface water quality	Construction	• Vegetation clearance should be kept to an absolute minimum. Vegetation should only be cleared before mining each open cut and not for the entire open pit area.	Water management planning and implementation	Watercourse biodiversity preservation	Implementation of water management

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
construction. Excavation of channels and trenches and the construction of berms. Stripping and stockpiling of topsoils. Widening of roads.	downslope watercourses impacting on water quality.			• Temporary erosion measures such as sediment nets should be used during construction at the roads, pits, WRDs, channels, berms and Topsoil Stockpile areas. The nets should only be moved once the exposed area has been stabilised, after which the area should be vegetated. • Runoff from temporarily exposed areas to be managed appropriately through the implementation of measures such as berms which should guide runoff towards silt traps. • The clean diversion channels and berms to be vegetated immediately after construction. The Topsoil Stockpiles to be vegetated as soon as possible. Silt traps are proposed downslope of the Topsoil Stockpiles. • It is recommended that energy dissipation measures such as rock riprap be implemented along steep sections and exists of the channels in order to prevent erosion • Monitoring of the Blyde River upstream and downstream of the operation, as per the recommended monitoring plan provided in this report.	Monitoring programmes	Groundwater management standards NEMA and NWA requirements DAFF guidelines	measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF
Use of heavy machinery, trucks and vehicles for construction purposes.	Potential hydrocarbon spillages washed into downslope watercourses impacting on water quality.	Surface water quality	Construction	• Machinery, trucks and vehicles should be well maintained and serviced regularly as per the recommended service guide. • Refuelling should be undertaken over hard park bunded areas that adequately capture and contain spillages. • Machinery and vehicles should be parked on appropriately lined areas. • Drip trays should be used under leaking machinery. • Spillages should be reported immediately, and spill kits should be readily available at all times. • Monitoring of the Blyde River upstream and downstream of the operation, as per the	Water management planning and implementation Monitoring programmes	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				recommended monitoring plan provided in this report.			watercourses from DAFF
Construction of the Blyde River bridge crossing.	Increased erosion, suspended solids, turbidity and sedimentation. Alteration of the natural river flows.	Surface water quality	Construction	• Construction should take place during the low flow months preferably between July • October. • The river should be appropriately diverted around working areas as per an approved method statement. • Sediment nets to trap sediment immediately downstream of working areas should be employed. • Disturbed areas should be appropriately rehabilitated. • The bridge should be designed to alter the natural river flows in the least possible way, taking into consideration the high and low flows. • The river geomorphology and aquatic fauna and flora should be considered in the design, construction and operation of the bridge. • Monitoring of the Blyde River upstream and downstream of the operation, as per the recommended monitoring plan provided in this report.	Water management planning and implementation Monitoring programmes	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF
Implementation and operation of the stormwater management plan.	Loss of contributing catchment area impacting on water quantity in the Blyde River. The pits, WRDs and plant area will be operated as a closed system. Runoff from these areas will be captured and contained.	Surface water quality	Construction	There are no mitigation measures for the loss of contributing catchment area, as dirty water runoff from the mine should be captured, contained and reused in accordance with GN704 regulations. Clean upslope runoff will be diverted around the dirty areas. The annual loss of runoff in quaternary catchment B60A was calculated to be 0.4 mcm in comparison to the catchments MAR of 78.3 mcm. This is approximately 0.5 % of the quaternary catchment runoff which is not considered to be significant.	Water management planning and implementation Monitoring programmes	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
							watercourses from DAFF
All activities related to the construction of the mine infrastructure and development of the mining areas	• Employment opportunities for local people • Up-skilling of local people • Increased spending in the region • Sourcing of goods and services from suppliers in the region	Socio-Economic: Direct and flow-on employment and income opportunities	Construction	***ENHANCEMENT:*** • Prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of contractor management plan • Provide up-skilling opportunities for unskilled and semi-skilled local workers during the construction phase • If use is made of a contractor, explore possibility of placement of up-skilled local workers in other projects • Sequence the operations phase to commence after the construction phase if possible, to avoid negative cumulative impacts • Explore possible placement of local construction workers in mining operations • Prioritise the recruitment of unskilled local (Pilgrim's rest) labour if there is a risk of cumulative pressure in the demand of semi-skilled and skilled labour sources (i.e. other employers losing skilled/semi-skilled workers to the mine and then having to recruit and train)	Recruitment and training Preferential procurement programmes	Implementation of programmes to recruit and procure locally, training programmes to upskill employees as per SLP, SDL and BBBEE requirements	Conform to SLP and SDL requirements, as well as BBBEE procurement requirements
Formal/structured and Informal/unstructured in-migration (job-seekers looking for economic opportunities into the area)	• Pressure on local accommodation, increased potential of land invasion and informal settlement on nearby landowners • Pressure on other public services due to influx of newcomers to local area • Health and safety risks • crime, HIV/AIDS etc • Social conflict between newcomers and the local community	Socio-Economic: Local resources, health & safety, social interaction	Construction	• Employment of locals • Wide communication of the local labour procurement strategy • in the local community and broader regional media • long before the construction phase • Creation of temporary accommodation facilities could be implemented as part of this project although not preferred option; due to the small population in-migration of workers will be necessary. Such a facility on site should be managed in a secured, environmentally and socially acceptable manner • Contractors to ensure that workers outside the local area reside in suitable facilities and not establish informal houses	Recruitment and training Provision of accommodation Implementation of Health and Safety programmes Development of emergency plans	Implementation of programmes to recruit and procure locally, training programmes to upskill employees as per SLP, SDL and BBBEE requirements Compliance with MHSA	Conform to SLP and SDL requirements, as well as BBBEE procurement requirements MHSA regulations

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• Proper management of informal vending “stations” selling food and small goods, to avoid littering, safety risks and possible environmental pollution • On-site construction workers should be supervised at all times • First aid and/or emergency supplies should be available at various points at the construction site • Continue and extend the current HIV/AIDS awareness and support programmes, with specific focus on those in and nearby the construction site • Monitor the general health of construction workers on an on-going basis • A contractor management plan should be drawn up and implemented • The Department of Public Works and community-based representatives in the area could be informed of the construction schedules and activities. • Ensure that a proper emergency plan that fits with the Municipal Disaster Management Plan is in place • developed in conjunction with IAPs • TGME to discuss other infrastructure requirements of the construction phase with the Department of Public Works, and TCLM to pro-actively deal with the possible negative impacts • Sequence the operations phase to commence after the construction phase if possible, to avoid negative cumulative impacts			
Construction activities	• Visible construction sites • Possible storage of material and equipment • Disruption of the soil and vegetation due to the infrastructure footprints and new access routes	Socio-Economic: Sense of place	Construction	• The construction site should be kept litter free • Site rehabilitation on sections of the site should occur as soon as the construction process allows • Where heritage sites could potentially be affected the legal requirements related to heritage sites should be adhered to and a clear communication strategy should be followed with local stakeholders	Implementation of contractor management plans Implementation of rehabilitation plans, ensuring	Implementation of measures to comply with construction and rehabilitation guidelines as well as	VIA recommendation s NEMA

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• The recommendations made by the Visual Impact Assessment should be adhered to • The measures above should form part of the contractor management plan	recommendations from the various impact assessments are met	recommendations from VIA	
Construction activities	• Safety at and around the different construction sites, including fire risks • The construction site could pose risks of injury for community members and workers • Increased traffic on the local roads and access road could have possible negative impacts on road safety	Socio-Economic: Safety and Health	Construction	• The construction area should be fenced or access to the area should be controlled to avoid unauthorised entry • The construction sites should be clearly marked, and “danger” and “no entry” signs should be erected • Ensure that sufficient safety and security measures are in place in the areas surrounding the mining sites • Employ permanent security personnel for the duration of the construction period. The TGME security team can thus be re-deployed and expanded which would result in security improvements in the area • On-site operational safety risks to which construction workers would be exposed to should be addressed in accordance with the Mines Health and Safety Act • A Fire/Emergency Management Plan should be developed and implemented as soon as construction phase commences. The functionality and efficiency of the plan should be regularly reviewed • jointly by the local emergency teams, mine management, affected communities and neighbouring landowners • Appropriate fire-fighting equipment should be on site and construction workers should be appropriately trained for fire fighting • Open fires for cooking/body warmth and related purposes should not be allowed on site • All construction vehicles should be in a good condition and adhere to the road worthy standards • The construction of additional access roads should be limited	Creation and implementation of site and contractor management plan, including security on site Safety and Health programmes Fire and emergency plans Implementation of speed limits and other traffic rules on site	Implementation of various measures to comply with MHSA regulations as well as DAFF guidelines Implementation of traffic management on site Implementation of security measures on site	MHSA regulations DAFF guidelines Traffic regulations Security on site to contribute to enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• Speeds of construction vehicles should be strictly monitored • Speed limits on the local roads surrounding the construction sites should be enforced • Should local road users be affected by the movement of construction vehicles or by the construction of access roads, sufficient warning signs should be erected • All construction vehicles should be in a good condition and adhere to the road worthy standards			
Construction activities	• Dust and noise due to the inflow of workers, general construction activities and heavy vehicle movement. • Different nuisance impacts during the day and night on those within the construction site and possibly on nearby settlements or dwellings.	Socio-Economic: Nuisance factors (Noise and dust)	Construction	• The mitigation measures of the Noise and Air Quality Impact Assessments are relevant • Construction vehicles should be in a good working order • Dust suppression measures should be applied if and when necessary • Sequence the operations phase to commence after the construction phase if possible, to avoid negative cumulative impacts	Implementation of plans to minimise impact Monitoring programmes	Measures to be implemented to attain compliance to air quality and noise standards and regulations	National Air Quality standard Environmental legislation and regulations governing noise levels
Construction activities, including vehicle and people movement	• Construction vehicles could pose a threat to livestock grazing along the roads in the area. moving the livestock away/fencing the areas off could impact on the cattle owners' unauthorised/opportunistic use of the land for grazing. • Construction workers trespassing on private properties,including forestry and conservation areas and increasing the risk of fires. • Construction activities could impact negatively on tourism • Recruiting informally skilled workers from local employers could increase the	Socio-Economic: Other local economic sectors	Construction	• The construction area should be fenced to avoid unauthorised entry by animals onto the mining area • Communicate the construction schedule and vehicle movements to livestock owners, representative organisations and neighbouring property owners • Movement of construction workers should be confined to the work site as far as possible, to avoid any trespassing on forestry and privately-owned areas. • No fires should be allowed on site. • Facilitate the establishment of a business forum and/or communication forum for local businesses and community representatives • Introduce a complaints register at the mine where concerns/complaints can be voiced. • The construction site should be kept litter free	Creation and implementation of site and contractor management plan, including security on site Safety and Health programmes Fire and emergency plans Implementation of speed limits and	Implementation of various measures to comply with MHSA regulations as well as DAFF guidelines Implementation of traffic management on site Implementation of security measures on site	MHSA regulations DAFF guidelines Traffic regulations Security on site to contribute to enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
	replacement training and recruiting costs for the local agricultural and forestry sector.			• Site rehabilitation should occur as soon as the construction process allows • The recommendations made by the Visual Impact Assessment should be adhered to in order to limit any possible negative impacts on the tourism industry. • Dust suppression methods should be strictly implemented if and where required • Sufficient warning signs should be erected around vehicle movement • Involve the SAPS and other relevant stakeholders (e.g. other business entities operating in the area, as well as Police Forums and Sector Forums) in the preventative security measures to be undertaken • Prioritise recruiting unskilled workers among the unemployed. • Align unskilled wages to other sectors (tourism, agriculture, forestry) in the local economy • Specify the conduct of contract workers in worker related management plans and employment contracts.	other traffic rules on site		
Iota Pit Browns Pit Theta Pit Iota WRD Theta Wishbone WRD Stockpiles and Project Infrastructure Iota Dam Browns Dam	Impact on faunal habitat, species diversity and SCC	Fauna	Construction	**Faunal Habitat and Diversity** • All construction personnel should undergo a basic environmental induction, to ensure no poaching of local fauna or possibility of a fire occurs; • All areas of increased ecological sensitivity falling outside of the direct mine footprint should be designated as No-Go areas and be off limits to all unauthorised construction vehicles and personnel. This includes the Mountain Outcrops, Remnants of Northern Mistbelt Forest, Montane Grasslands and the Freshwater Habitat; • The construction process should be phased to limit the extent of exposed areas at any one time and ensure that the time between initial disturbance and completion of construction is as short as possible;	• Plan construction activities to include mitigation measures • Implement induction programme which includes awareness and protection of fauna and flora • Creation and implementation of site and contractor management plan,	Implementation of various measures to comply with DAFF guidelines, environmental protection regulations and construction plan Implementation of traffic management on site Implementation of security measures on site	Environmental protection regulations; DAFF guidelines; Traffic regulations; Security on site to contribute to enforcement of the various plans and the safety

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)				• Site clearance should be limited to the project footprint areas only, with disturbance limited as far as possible; • 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 minimal; • Adequate speed limits should be adhered to in order to curb the possibility of roadkill; • Construction of topsoil stockpiles and other surface infrastructure should be restricted to the transformed habitat unit; • The Biodiversity Action Plan and Alien Invasive Plant Management Plan should be initiated in this phase. **Faunal SCC** • If any potential faunal SCC are encountered during the construction phase, a suitably qualified ecologist should be contacted immediately for relocation purposes; • Any unauthorised collection of faunal species, especially faunal SCC, by construction personnel should be strictly prohibited. **Disposal of construction related material** • All construction related waste and material is to be disposed of at a registered waste facility; and No waste of construction rubble is to be dumped in the surrounding natural habitats. **Increased personnel on site** No illicit fires should be allowed during any phases of the proposed mining development. A Fire Management Plan (FMP) should be set in place to ensure that any fires that do originate can be	including security on site • Safety and Health programmes • Fire and emergency plans Implementation of speed limits and other traffic rules on site • Creation and designation of no-go areas	Implementation of access control to sensitive areas	and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				managed and / or stopped before significant damage to the environment occurs; and No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be in areas of existing high disturbance, and not encroach upon sensitive habitats.			
Iota Pit Browns Pit Theta Pit Iota WRD Theta Wishbone WRD Stockpiles and Project Infrastructure Iota Dam Browns Dam Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)	Impact on floral habitat, species diversity and SCC	Flora	Construction	**Floral Habitat and Diversity** All areas of increased ecological sensitivity falling outside of the direct mine footprint should be designated as No-Go areas and be off limits to all unauthorised construction vehicles and personnel. This includes the Mountain Outcrops, Montane Grasslands and the Freshwater Habitat; The construction process should be phased to limit the extent of exposed areas at any one time and ensure that the time between initial disturbance and completion of construction is as short as possible; Site clearance should be limited to the project footprint areas only, with disturbance limited as far as possible; 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 minimal; and Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g. implement an AIP Management and Control Plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities and reduce sediment loads to the Freshwater Habitat (Blyde River and its tributaries);	• Plan construction activities to include mitigation measures • Implement induction programme which includes awareness and protection of fauna and flora • Creation and implementation of site and contractor management plan, including security on site • Safety and Health programmes • Fire and emergency plans Implementation of speed limits and other traffic rules on site	Implementation of various measures to comply with DAFF guidelines, environmental protection regulations and construction plan Implementation of traffic management on site Implementation of security measures on site Implementation of access control to sensitive areas	Environmental protection regulations; DAFF guidelines; Traffic regulations; Security on site to contribute to enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				An AIP Management and Control Plan should be implemented, and an AIP monitoring programme followed during the construction phase in order to prevent the re-establishment of AIPs. • Ongoing alien and invasive plant monitoring and clearing/control should take place throughout all phases of the development, and the project perimeters should be regularly checked for AIP proliferation and to prevent spread into surrounding natural areas; and • AIP management for construction-phase activities should be focused on limiting their spread, e.g. roadsides should be monitored, as they serve as common corridors along which AIP species are introduced and dispersed, and disturbed areas should regularly be monitored for AIP recruitment until successfully rehabilitated; All soils compacted as a result of construction activities falling outside of development footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas; and A rehabilitation plan should be in place and implemented within disturbed areas where work has been completed. **Floral SCC** All floral SCC within the construction footprint should have been rescued and relocated, or removed, where permits were obtained, before construction commences; and Any unauthorised collection or harvesting of floral material, especially floral SCC, by construction personnel should be strictly prohibited. **Disposal of construction related material** All construction related waste and material is to be	• Creation and designation of no-go areas		

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				disposed of at a registered waste facility; and No waste of construction rubble is to be dumped in the surrounding natural habitats. **Increased personnel on site** No illicit fires should be allowed during any phases of the proposed mining development. A Fire Management Plan (FMP) should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; and No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be in areas of existing high disturbance, and not encroach upon sensitive habitats.			
Iota, Browns and Theta Pits Iota WRD 1 and 2 Theta Wishbone WRD Surface Infrastructure and Linear Development (Powerlines, Haul Roads, Stockpiles, PCDs etc)	• Site clearing, including the removal of topsoil and vegetation • Construction of general surface infrastructure and transportation of materials and stockpiling • Altering the topography of the area through the creation of stockpiles and WRD higher than the proposed heights • Potential erosion and loss of topsoil leading to higher visual contrast • An increase in construction vehicular and human activity in the area, leading to an increase in dust suspension • Earthworks resulting in increased dust suspension • Construction of additional access roads. Cut and fill of slopes for the construction of the access roads will	Visual Aspects	Construction	• The development footprints and disturbed areas should be kept as small as possible and the areas of natural vegetation and topsoil removal should be kept to a minimum. • The extent of all surface infrastructure footprint areas and permanent structures should be minimised to what is absolutely essential. • It should be ensured that existing vegetation in the vicinity of TGME Theta Hill Project Area is retained during the construction phase to ensure that visual scarring of landscape and vegetation clearing does not occur beyond the mining footprint area. • Erosion, which may lead to high levels of visual contrast and further detract from the visual environment, should be prevented throughout the lifetime of the project by means of putting soil stabilisation measures in place and concurrent rehabilitation.	• Plan construction activities to include mitigation measures • Implement induction programme which includes awareness and protection of fauna and flora • Creation and implementation of site and contractor management plan, including security on site	Implementation of various measures to comply with DAFF guidelines, environmental protection regulations and construction plan Implementation of traffic management on site Implementation of security measures on site	Environmental protection regulations; DAFF guidelines; Traffic regulations; Security on site to contribute to enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
	become highly visible if not re-vegetated and shaped to blend in with the existing topography • Vegetation damage, scarring of the terrain, and altering of landforms or contours • Increased amount of human activity, construction vehicles, and other equipment • Use of security lighting during the construction phase			• It should be ensured that topsoil, run of mine and strategic ore stockpiles are not steeply sloped, so as to blend in with the undulating terrain. • The berms should be vegetated with indigenous grass species, to reduce the visual impact of the soil contrast from the open pits. • The relevant exposed construction site areas and access and haul roads should be irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff. • Rubble should be removed from site on a regular basis. • Litter and dust management measures should be in place at all times. • The sites should be kept neat and tidy at all times. • On site mining activities will be limited to be undertaken between 6am and 6pm. • Excavated areas are to be infilled with available material concurrently during operational phase, decommissioning and closure. • Excavation is to be kept to a minimum and limited to essential areas. • The height of structures should be as low as possible, where this can be achieved without increasing the infrastructure footprint. • The height of the stockpiles and WRDs should not exceed the proposed heights, to ensure that the skyline of the landscape is not affected, beyond what is anticipated. • The identification of appropriate colours and textures for facility materials should take into account both summer and winter appearance. • Natural colours should be used in all instances and the use of highly reflective material should be avoided. Any metal surfaces should be painted to fit in with the	• Safety and Health programmes • Fire and emergency plans Implementation of speed limits and other traffic rules on site • Creation and designation of no-go areas	Implementation of access control to sensitive areas	

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				natural environment in a colour that blends in effectively with the background. White structures are to be avoided as these will contrast significantly with the natural surroundings. • The use of permanent signs and project construction signs should be minimised and visually unobtrusive. • During rehabilitation, the removal of infrastructure, complete backfilling into open cast areas, ripping of roads and reshaping of impacted areas to blend in with the surrounding mountainous terrain should take place.			
Theta Hill Project area	Light nuisance/disturbance	Night time lighting	Construction	• A lighting engineer may be consulted to assist in the planning and placement of light fixtures for the mining infrastructures in order to reduce visual impacts associated with glare and light trespass; • Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas, i.e. away from settlements, villages, towns, and the main roads. • Wherever possible, lights should be directed downwards so as to avoid illuminating the sky; • The use of high light masts and high pole top security lighting should be avoided along the periphery of the TGME 10167 study areas. Any high lighting masts should be covered to reduce glow; • As far as possible, construction activities should be restricted to daylight hours, in order to limit the need to bright floodlighting and the potential for skyglow and to avoid the use of additional night-time lighting for security purposes; • Outdoor lighting in the vicinity of the proposed infrastructure areas should be strictly controlled; • Care should be taken when selecting luminaries to ensure that appropriate units are chosen and that their	Design/choice of optimal methods for lighting up areas at night, taking into account the recommendations from the impact assessment	Using technology to minimise impacts and to comply with environmental regulations governing light pollution and health and safety regulations for lighting at workplaces	Environmental regulations governing light pollution MHSA regulations governing lighting of the workplace

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				location will reduce spill light and glare to a minimum. Only "full cut-off" light fixtures that direct light only below the horizontal should be used on the building; • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose; • The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent should be considered to reduce skyglow (BLM, 2013) • Censored and motion lighting may be installed at office areas to prevent use of lights when not needed; • Vehicle-mounted lights or portable light towers are preferred over permanently mounted lighting for night time maintenance activities. If possible, such lighting should be equipped with hoods or louvers and be aimed toward the ground to avoid causing glare and skyglow			
Mine operation	Dust from mining operations, including loading haultrucks Dust from vehicle movement on haul roads and other unpaived roads Dust from vehicle movement on unpaived roads Dust from stockpiles and material handling	Air quality: Dust fall-out	Operation	• Avoid dust generating works during very windy conditions (especially winds potentially transporting dust towards receptors) • Limit the number of simultaneous activities to a minimum as far as possible • Use water sprays where practicable • Dust suppression • water and chemical stabilisation • Dust suppression • water and chemicals; Early paving of permanent roads • Implement wet suppression and wind speed reduction (e.g. screens and berms) • Cover loads when hauling off-site Cover dormant areas of stockpiles	Dust monitoring Modification to working hours/methods to reduce impact Active dust suppression Covering material to protect against wind	With the implementation of the mitigation measures and monitoring of the air quality, the construction activities will be undertaken such that the ambient air quality does not exceed the National Air Quality Standards	Dust levels Particulate matter levels
Combustion of diesel in mobile equipment /vehicles	Vehicle tailpipe emissions	Air quality: Pollution	Operation	Servicing of vehicles, ensuring exhaust systems, brakes etc are in good working order	Maintenance of vehicles	Implement maintenance plans to keep vehicles in good running order to reduce greenhouse	Vehicular Carbon emission levels

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[direct GHG emissions]	Greenhouse gas (especially Carbon) emissions which contribute to climate change	Climate Change		Optimise vehicle routes and usage and ensure vehicles are in good running order, thereby limiting Carbon emissions	Avoiding unnecessary engine running time Planning of operations and vehicle routes	gas emissions from e.g. exhausts, brake linings Plan and manage vehicle routes	
All aspects of operation • goods purchased, electricity consumption, municipal waste generation, product transport, employee commuting etc [sources of indirect GHG emissions]	Greenhouse gas (especially Carbon) emissions which contribute to climate change	Climate Change	Operation	Optimise energy consumption to reduce electricity usage. Mitigation on other aspects not in the project's control	Operations optimisation to reduce energy consumption (diesel and electricity)	Every effort to be made to keep GHG emissions as low as possible	Levels of Carbon emissions
Alteration of the local hydrological regime due to potentially poorly managed stormwater and compaction of soils and increased extent of impermeable surfaces.	• Erosion of terrestrial areas as preferential flow paths are formed in the landscape, resulting in sedimentation of watercourses, leading to altered channel competency, altered vegetation community structures, blanketing of benthos and loss of rheophilic taxa and suitable habitat.	Watercourse Ecology • soil erosion	Operation	Refer to specialist groundwater ecology report for detailed mitigation measures.	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines
Presence of clean and dirty separation infrastructure upstream of surface	• Potential for erosion of terrestrial areas as a result of the formation of preferential flow paths, leading to sedimentation of the watercourses;	Watercourse Ecology: reduction in stormwater	Operation	Pollution prevention through infrastructure design, in order to prevent, eliminate and/or control potential groundwater pollution plumes, in accordance with any recommendations made in geohydrological specialist	Water management planning and implementation	Implementation of water management measures to reduce impact on	Watercourse biodiversity preservation

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infrastructure; Presence of diversion trench around perimeter fence • loss of catchment yield due to stormwater containment.	• Reduction in volume of water entering the watercourses, leading to loss of recharge (and thus desiccation) of downstream system; and • Altered vegetation communities due to moisture stress.	entering watercourses		study; Refer to specialist groundwater ecology report for detailed mitigation measures.	Monitoring programmes	watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Groundwater management standards NEMA and NWA requirements DAFF guidelines
Deposition of tailings, waste rock, general operations of the mine: Possible pollution of surface water as result of seepage/runoff from proposed infrastructure (e.g. water treatment facilities, ROM stockpiles, PCD, WRD, TSF and workshop/fuel storage areas).	• Possible contamination of surface and ground water, leading to impaired water quality and salination of soils within riparian areas; • Sedimentation of watercourses could lead to altered water quality, altered channel integrity and altered vegetation community structures; and • Changes to vegetation growth due to increased nutrients as a result of altered groundwater properties.	Watercourse Ecology: changes to groundwater properties	Operation	No dirty water (as defined by GN704 as it relates to the NWA) is to be released into the receiving environment; Special attention needs to be paid to the use of the existing TSF and the lining thereof according to the specifications of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008); Water treatment facilities to be implemented prior to the commencement of activities and to be maintained throughout the LOM to the minimum specifications of GN704 as it relates to the NWA	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines
Deposition of tailings, waste rock, general operations of the mine	Increased risk of sediment transport in surface runoff from surface infrastructure to watercourses, leading to altered water quality and sedimentation of freshwater systems.	Watercourse Ecology: altered water quality and sedimentation of freshwater systems.	Operation	Refer to specialist groundwater ecology report for detailed mitigation measures.	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements

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						watercourses from DAFF	DAFF guidelines
Blasting of rock to access the geological resource.	• Eutrophication of the receiving environment as a result of excess nitrates contained in surface water runoff, causing possible eutrophication resulting in loss of biotic integrity and potable water within the catchment; and • Possible sedimentation of watercourses, leading to altered channel competency, altered vegetation community structures, blanketing of benthos and loss of rheophilic taxa and suitable habitat.	Watercourse Ecology	Operation	Refer to specialist groundwater ecology report for detailed mitigation measures.	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines
Water extraction for mining operations	• Potential formation of a cone of depression, resulting in loss of baseflow in river, in turn potentially resulting in altered riparian vegetation community structures; and • Potential for groundwater and surface water contamination, leading to loss of biotic integrity and potable water within the catchment.	Watercourse Ecology: Groundwater levels	Operation	Refer to specialist groundwater ecology report for detailed mitigation measures.	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines
Opencast Mining	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the regional groundwater level	Groundwater Level	Operation	The proposed mining will take place above the groundwater table and no impact is expected. Collect inflow water as close as possible to source to prevent prolonged contact with rock	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance	Watercourse biodiversity preservation

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
	Water flow into the mine resulting in water quality contamination	Groundwater Quality (from the mining operation)		Clean and dirty water separation.		with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Groundwater management standards NEMA and NWA requirements DAFF guidelines
Waste Rock Dumps & waste rock material used for stormwater berms	Groundwater contamination from waste bodies	Groundwater Quality	Operation	Assessment of the waste material which indicated low potential risk Geochemical modelling that showed sufficient neutralising and adsorption capacity to prevent contaminants from reaching the groundwater table Management measures such as compaction and the installation of a drain system at the base of the waste pile Monitoring to assess the impact	Modelling and monitoring measures Engineering design to mitigate issues	Implementation of measures to monitor and ensure compliance with NEMA and NWA regulations	NEMA NWA
Mining activities	None expected • no sites identified within the mine site	Sites of archaeological and cultural interest	Operation	Should archaeological sites or graves be exposed in other areas during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.	Future action if such a site is identified		
Open pit mining through non-perennial drainage lines as well as the deposition of waste rock in drainage lines.	Loss of hydrological connection and function (note that the non-perennial drainage lines in the project area are not fed by wetlands or groundwater). Loss of water quantity reporting to the Blyde River. Alteration of surface water drainage patterns.	Surface water quality	Operation	Diversion of upslope clean runoff around the pits and WRDs as per the SWMP. Concurrent backfilling and rehabilitation of the pits as per the rehabilitation plan, which will return some of the previously lost contributing catchment area. Restoration of the drainage lines where possible. Diversion of upslope water around the WRDs as the footprints of the WRDs expand.	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations	Watercourse biodiversity preservation Groundwater management standards

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
	Damming/ponding of water upslope of the WRDs					guarding natural watercourses from DAFF	NEMA and NWA requirements DAFF guidelines
Open pit mining, development of the WRDs and stockpiles, and operation and management of the PCDs and other dirty water dams.	Runoff and spills from the mine infrastructure impacting on the water quality of the Blyde River. Parameters of concern include elevated suspended solids, turbidity, dissolved salts (TDS), heavy metals and pH (it must be noted that the geochemical assessment indicated an unlikely potential for AMD).	Surface water quality	Operation	Implementation of the proposed SWMP to capture, contain and reuse dirty water runoff from the mine in a closed system. Daily inspections and careful management of the water levels within the PCDs and other dirty dams, to ensure that sufficient freeboard is available at all times, in accordance GN704. Frequent desilting of the proposed channels and silt traps, as per the monitoring plan outlined in the report. Any excess water within the closed dirty system should be adequately and appropriately dealt with, in agreement with the DWS. Monitoring of the Blyde River at upstream and downstream positions	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines
Abstraction of water from the Blyde River for use at the plant.	During the dry months, approximately 20 000 m3/month of water may need to be abstracted from the Blyde River, which will result in a loss of quantity flowing downstream. The mean monthly runoff during the dry months for quaternary catchment B60A is approximately 2 mcm. 20 000 m3/month is less than 1 % of the mean monthly runoff.	Surface water quality	Operation	It is recommended that water is sourced from the PCDs and other dirty water sources prior to abstractions from the Blyde River. Should sufficiently sized PCDs be constructed, then minimal water will be required from the Blyde River. The Blyde River should be a last option in terms of obtaining makeup water for the plant. It is also recommended that surrounding flooded historical adits in the area are investigated, as possible sources of water for the plant during the dry season.	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines

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Use of heavy machinery, trucks and vehicles during the operational phase.	Potential hydrocarbon spillages washed into downslope watercourses impacting on water quality.	Surface water quality	Operation	Machinery, trucks and vehicles should be well maintained and serviced regularly as per the recommended service guide. Refuelling should be undertaken over hard park bunded areas that adequately capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays should be used under leaking machinery. Spillages should be reported immediately, and spill kits should be readily available at all times. Monitoring of the Blyde River upstream and downstream of the operation, as per the recommended monitoring plan provided in this report.	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines
Use of heavy machinery, trucks and vehicles during the operational phase.	Erosion along roads leading to increased suspended solids and sedimentation of downslope watercourses impacting on water quality.	Surface water quality	Operation	Berms placed at appropriate spacings across the roads as discussed in the proposed SWMP. Regular inspections and maintenance of roads.	Road planning, construction and maintenance to implement the mitigation measures Regular road inspections	Construction of roads and verges to take into account and implement surface water regulations requirements	Surface water management standards NEMA and NWA requirements DAFF guidelines
Eccentric ripper activities	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Operation	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	Implementation of measures to mitigate noise generated by the mining operation Employees to be issued with appropriate hearing protection	Implementation of mitigation measures to comply with environmental laws for noise regulation	Environmental legislation and regulations governing noise levels MHSA Regulations

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
					Monitoring programmes		
Crushing activities at the ripper	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Operation	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	Implementation of measures to mitigate noise generated by the mining operation Employees to be issued with appropriate hearing protection Monitoring programmes	Implementation of mitigation measures to comply with environmental laws for noise regulation	Environmental legislation and regulations governing noise levels MHSA Regulations
Pit activities	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Operation	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	Implementation of measures to mitigate noise generated by the mining operation Employees to be issued with appropriate hearing protection Monitoring programmes	Implementation of mitigation measures to comply with environmental laws for noise regulation	Environmental legislation and regulations governing noise levels MHSA Regulations
ROM	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Operation	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast	Implementation of measures to mitigate noise generated by the mining operation	Implementation of mitigation measures to comply with environmental laws for noise regulation	Environmental legislation and regulations governing noise levels

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	Employees to be issued with appropriate hearing protection Monitoring programmes		MHSA Regulations
Hauling of material to the processing plant	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Operation	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	Implementation of measures to mitigate noise generated by the mining operation Employees to be issued with appropriate hearing protection Monitoring programmes	Implementation of mitigation measures to comply with environmental laws for noise regulation	Environmental legislation and regulations governing noise levels MHSA Regulations
Hauling of waste rock to the waste rock dump	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Operation	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	Implementation of measures to mitigate noise generated by the mining operation Employees to be issued with appropriate hearing protection Monitoring programmes	Implementation of mitigation measures to comply with environmental laws for noise regulation	Environmental legislation and regulations governing noise levels MHSA Regulations

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Additional traffic	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Operation	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	Implementation of measures to mitigate noise generated by the mining operation Employees to be issued with appropriate hearing protection Monitoring programmes	Implementation of mitigation measures to comply with environmental laws for noise regulation	Environmental legislation and regulations governing noise levels MHSA Regulations
Emergency generator	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Operation	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	Implementation of measures to mitigate noise generated by the mining operation Employees to be issued with appropriate hearing protection Monitoring programmes	Implementation of mitigation measures to comply with environmental laws for noise regulation	Environmental legislation and regulations governing noise levels MHSA Regulations
Employment of permanent and contract workers, and procurement of goods and services	• Employment opportunities for local people • Up-skilling of local people • Increased spending in the region • Sourcing of goods and services from suppliers in the region	Socio-Economic: Direct and flow-on employment and income opportunities	Operation	***ENHANCEMENT:*** • 100% recruitment of unskilled labour from local communities, with focus on Pilgrim's Rest, Schoonplaas/Newtown and Darks Gully • Provide up-skilling opportunities for unskilled and semi-skilled local workers as per SLP • Explore possible placement of local construction workers in mining operations	Improvement in local economy – job creation, up-skilling of locals, procurement from local suppliers of goods and services	Implementation of the mine's SLP and other HR-related policies and procedures will facilitate human resource development, preferential local employment and	Local employment equity and procurement requirements

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• Prioritise the recruitment of unskilled local (Pilgrim's rest) labour if there is a risk of cumulative pressure in the demand of semi-skilled and skilled labour sources (i.e. other employers losing skilled/semi-skilled workers to the mine and then having to recruit and train) • Put a contractor management plan (including direct service providers) in place to ensure that the local employment and procurement targets of the operations are met. The targets should also be aligned to the Mining Charter of 2018 • Plan the operational phase to commence after the construction phase to prevent cumulative impacts in terms of local labour demand, in-migration and related challenges • Develop a database of goods and services that could potentially be outsourced to the local community • Establish a supplier development programme as part of the Local Economic Development component of the SLP • Participate in the development of a regional mine supplier hub to promote the development of a local supply base (e.g. the enterprise hub in Lydenburg, launched by Glencore)		procurement, thus also complying with Government regulations such as BBBEE	
Procurement of goods and services; payment of taxes and royalties; contributions under SLP	• The benefits of additional taxes, royalties as well as an increase in the National Levy is a benefit for the larger national economy • Pilgrim's Rest and surrounds, as affected mining community close to the project, will be the focus of the Local Economic Development Fund that forms part of the SLP	Socio-Economic: Increase in public revenue	Operation	***ENHANCEMENT:*** • Develop an updated Local Economic Plan as part of an updated SLP for the project in consultation with the local community • Ensure that the current allocation as per TGME's Mine Works Programme for the updated SLP is in line with the targets of the Mining Charter of 2018 • Monitor and manage the social contribution of multinational suppliers (in-house as well as suppliers to contractor and direct service providers)	Planning and implementation of measures to further boost the local economy Payment of taxes and royalties	The mine will set the example for compliance with SARS and DMR requirements Compliance with the mine's SLP	SARS and DMR requirements Mine SLP

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
					Health and safety monitoring programmes		
Formal/structured and Informal/unstructured in-migration (job-seekers looking for economic opportunities into the area)	• Pressure on local accommodation, increased potential of land invasion and informal settlement on nearby landowners • Pressure on other public services due to influx of newcomers to local area • Health and safety risks • crime, HIV/AIDS etc • Social conflict between newcomers and the local community	Socio-Economic: Local resources, health & safety, social interaction	Operation	• Employment of locals • Wide communication of the local labour procurement strategy • in the local community and broader regional media • long before the operational phase commences • Mine management, contractors and service providers should ensure that workers outside the local area should reside in suitable facilities and not establish informal houses • Continue with plans to provide accommodation facilities for mine workers on land belonging to the old Caravan Park. The involvement of the Department of Public Works is critical in this regard. • Should temporary accommodation be established at the Caravan Park, this facility should be managed in an environmentally and socially acceptable manner to avoid any social conflict and environmental pollution • Security measures to avoid unauthorised access at the Caravan Park should be established • Proper management of informal vending "stations" selling food and small goods, to avoid littering, safety risks and possible environmental pollution • Continue and extend the current HIV/AIDS awareness and support programmes, with specific focus on those in and nearby the construction site • Monitor the general health of construction workers on an on-going basis • All the requirements above should form part of the contractor management plan • Maintenance of the roads frequently used by workers travelling from outside places (e.g. Sabie, Graskop) should be discussed and negotiated with the	Facilitation of local development especially of accommodation facilities Health monitoring and promotional programmes Road safety awareness and maintenance of roads under the mine's control Mine security to assist with crime prevention on the mine premises	Measures to be implemented will facilitate compliance with health and safety regulations, traffic control and crime prevention	MHSA SLP Road safety regulations General laws of the country

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				Mpumalanga Department of Public Works, Road and Transport • Assist the TCLM and provincial department with the planning and implementation processes of IDP priority projects in Pilgrim's rest. Align these priorities with the SLP and the needs of the local community members. • Establish a forum, with representatives of TGME and local stakeholders for discussing potential issues of community conflict • Sequence the operations phase to commence after the construction phase if possible, to avoid negative cumulative impacts			
Mining operations	• Visible mining sites • Possible storage of material and equipment • Disruption of the soil and vegetation due to the infrastructure footprints and new access routes	Socio-Economic: Sense of place	Operation	• Mining areas should be rehabilitated as soon as the Mining Works Programme allows • The recommendations made by the Visual Impact Assessment should be adhered to • Operational mining activities with potential noise impacts should be mitigated and noise generating activities should be kept to normal working hours where possible • The recommendations made by the Noise Impact Assessment should be adhered to • The measures above should form part of the contractor management plan	Implementation of contractor management plans Implementation of rehabilitation plans, ensuring recommendations from the various impact assessments are met	Implementation of measures to comply with construction and rehabilitation guidelines as well as recommendations from VIA	VIA recommendation s NEMA
Mining operations	• Safety at and around the different construction sites, including fire risks • The construction site could pose risks of injury for community members and workers • Increased traffic on the local roads and access road could have possible negative impacts on road safety	Socio-Economic: Safety and Health	Operation	• Mining areas should be fenced, and permanent security should be in place • Access roads should be fitted with security cameras and equipped with a controlled barrier. • Workers should not be allowed to leave the designated mining areas during working hours. • A Health and Safety Plan should be implemented, and all managers should take First Aid and other relevant safety courses	Creation and implementation of site and contractor management plan, including security on site Safety and Health programmes	Implementation of various measures to comply with MHSA regulations as well as DAFF guidelines Implementation of traffic management on site	MHSA regulations DAFF guidelines Traffic regulations Security on site to contribute to

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• Ensure that sufficient safety and security measures are in place in the areas surrounding the mining sites • Employ permanent security personnel for the duration of the construction period. • On-site operational safety risks to which construction workers would be exposed to should be addressed in accordance with the Mines Health and Safety Act (MHSA) • A Fire/Emergency Management Plan should be developed and implemented as soon as construction phase commences, and regularly reviewed • jointly by the local emergency teams, mine management, affected communities and neighbouring landowners • Appropriate fire-fighting equipment should be on site and construction workers should be appropriately trained for fire fighting • Implement safety measures to limit fire hazards and implement fire breaks where possible. • Open fires for cooking/body warmth and related purposes should not be allowed on site • All construction vehicles should be in a good condition and adhere to the road worthy standards • The construction of additional access roads should be limited • Speeds of construction vehicles should be strictly monitored • Speed limits on the local roads surrounding the construction sites should be enforced • Should local road users be affected by the movement of construction vehicles or by the construction of access roads, sufficient warning signs should be erected • All construction vehicles should be in a good condition and adhere to the road worthy standards • Access from gravel roads to local main roads should be in line with the road standard and requirements to	Fire and emergency plans Implementation of speed limits and other traffic rules on site	Implementation of security measures on site	enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				accommodate the traffic load and traffic patterns. • Set up a platform whereby community members and miners can report any illegal mining activities • Involve the SAPS and other relevant stakeholders in the preventative security measures to be undertaken in terms of illegal mining • Contract a private security company (or existing security) to prevent illegal miners from accessing mined areas. • The mine could assist in implementing a community and employee health awareness plan • The general health of employees should be monitored on an on-going basis through local health care services • The mine could, through LED programmes and infrastructure development assist in improving the overall health services within the communities.			
Mining operations	• Dust and noise due to the inflow of workers, general mining activities and heavy vehicle movement. • Different nuisance impacts during the day and night on those within the mining site and possibly on nearby settlements or dwellings.	Socio-Economic: Nuisance factors (Noise and dust)	Operation	• The mitigation measures of the Noise and Air Quality Impact Assessments should be adhered to • Operational mining activities with potential noise impacts should be mitigated and should be kept to normal working hours where possible • Heavy machinery and heavy vehicles should be kept in a good working order. Also, ensure that all vehicles and equipment comply with generally accepted noise levels and noise abatement regulations • Personnel should be equipped with the necessary noise protection equipment • Dust suppression measures should be applied if and when necessary • Sequence the operations phase to commence after the construction phase if possible, to avoid negative cumulative impacts	Implementation of plans to minimise impact Monitoring programmes	Measures to be implemented to attain compliance to air quality and noise standards and regulations	National Air Quality standard Environmental legislation and regulations governing noise levels

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Mining operations	• Negative impacts due to the change in the town's character (see also sense of place), especially on nature-based tourist activities • Nuisance and safety issues related to increased traffic on the R533 • Health and safety concerns • possible increase in crime targeting tourists • Nuisance factors associated with noise and dust • The mining project might crowd out tourism jobs, hence negatively affecting toursim in the long term	Socio• Economic: Impact on local tourism sector	Operation	• Site rehabilitation should occur as soon as the mining process allows • The mining site should be kept litter free • The recommendations made by the Visual Impact Assessment should be adhered to. • The mitigation measures of the Noise and Air Quality Impact Assessments should be adhered to • Operational mining activities with potential noise impacts should be mitigated and should be kept to normal working hours where possible • Heavy machinery and heavy vehicles should be kept in a good working order. Also, ensure that all vehicles and equipment comply with generally accepted noise levels and noise abatement regulations • Dust suppression measures should be applied if and when necessary • Sequence the operations phase to commence after the construction phase if possible, to avoid negative cumulative impacts • TGME should proceed in developing and implementing a detailed tourist strategy for Pilgrims Rest as part of its LED programme in close consultation with the local community and local tourism sector. Some ideas that could be explored further include: • Commitment from business visitors to the mine to use the overnight facilities in Pilgrim's Rest or the immediate surroundings • Develop old adits in tourist spots with view point to contrast with modern mining • Caravan park space development (one-part offices, the other ablution blocks and ground clearance and maintenance for caravan standing areas) – TGME already took over the golf course • Development of old TGME stall/space that sells memorabilia	Creation and implementation of site and contractor management plan, including security on site Safety and Health programmes Fire and emergency plans Implementation of speed limits and other traffic rules on site	Implementation of various measures to comply with MHSA regulations as well as DAFF guidelines Implementation of traffic management on site Implementation of security measures on site	MHSA regulations DAFF guidelines Traffic regulations Security on site to contribute to enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• Assist with maintenance of e.g. the road between Graskop and Pilgrim's (bush clearance and some repairs) • Museum support (gold panning) • Assist and liaise with SAFCOL in promoting and re-establishing their hiking trails • Facilitate the establishment of an ATM in town • Provide support by sponsoring transaction advisors to develop local SMMES in vacant business areas • Liaise directly with Mount Sheba resort and other business that might be negatively affected by the mining operations • Expanding their existing involvement in the Pilgrim's Rest Golf Club by assisting with the management and maintenance of the club, and by providing the impetus for capacity building and skills transfers • Liaise and assist with the promotion of Road safety on the R533 • Involve the SAPS and other relevant stakeholders (e.g. other business entities operating in the area, as well as Police Forums and Sector Forums) in the preventative security measures to be undertaken • Any other recommendations above that relate to mitigating the negative impacts of in-migration also applies to this impact • Other mitigation measures discussed under the other economic impacts below also applies to this impact • Facilitate the establishment of a local Business and Tourism Chamber for Pilgrim's Rest. Regional tourism chambers could assist in this regard. • Engage on a regular basis with the tourism sector through the local business chambers (Sabie, Graskop and Pilgrim's Rest) to address issues that could negatively impact on local businesses, specifically tourist businesses.			

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• Once established, assist the local business chamber and/or tourism forum to become a member of the regional organisations/forums • TGME can assist in changing the negative perception among South Africans, and possibly among international tourists of Pilgrim's Rest not being a popular tourist destination to a highly ranked tourism destination			
Mining activities, including vehicle and people movement	• Mining vehicles could pose a threat to livestock grazing along the roads in the area. moving the livestock away/fencing the areas off could impact on the cattle owners' unauthorised/opportunistic use of the land for grazing. • Mine workers trespassing on private properties,including forestry and conservation areas and increasing the risk of fires. • Mining activities could impact negatively on tourism • Recruiting informally skilled workers from local employers could increase the replacement training and recruiting costs for the local agricultural and forestry sector.	Socio-Economic: Other local economic sectors	Operation	• Effective management of the mining activities to avoid any environmental pollution focusing on water, and dust pollution, and limiting any increase in noise levels as per the respective environmental management plans (high priority) • Treated discharge water could possibly be used for irrigation purposes e.g. at the golf course and caravan park if such a proposal adheres to environmental regulations • Workers should not be allowed to leave the operations site while on duty • A fire hazard management plan on and off site is required • Set up a grievance mechanism by introducing a complaints register at the mine where concerns/complaints with regards to e.g. noise related to construction activities can be voiced. • Prioritise recruiting unskilled workers among the local unemployed • Align unskilled wages to other sectors (tourism, agriculture, forestry) in the local economy • The active mining area should be fenced to avoid unauthorised entry by animals onto the mining area • Specify the conduct of contract workers in worker related management plans and employment contracts.	Creation and implementation of site and contractor management plan, including security on site Safety and Health programmes Fire and emergency plans Implementation of speed limits and other traffic rules on site	Implementation of various measures to comply with MHSA regulations as well as DAFF guidelines Implementation of traffic management on site Implementation of security measures on site	MHSA regulations DAFF guidelines Traffic regulations Security on site to contribute to enforcement of the various plans and the safety and security on the site

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Contribution of mining to local economy	Lack of diversification of economic sectors in the region	Socio-Economic: Local economic diversity and economic stability	Operation	• Focus on the support of non-mining related activities in community development programmes • Focus on the develop of the local tourist market in community development programmes • Focus the local procurement programme on non-core mining inputs in Pilgrim's Rest with a broader regional market (e.g. catering, accommodation) • If a supplier development programme is established, focus the programme on non-core mining inputs in Pilgrim's Rest with a broader regional market	Development and implementation of SLP to include inputs into development of non-mining-related activities in the area	Working with the local community to establish sustainable alternative income streams	SLP
Mining activities, especially the use of water and energy	• No negative impacts are anticipated on the water quantity or quality, provided mitigation measures followed • refer water-related aspects • Possible risk of sedimentation from dirty water run-off • Sedimentation around water courses resulting from mining activities	Socio-Economic: Intensity of water and energy consumption	Operation	• Develop a resource use plan with the specific objective to minimize the mining operations' energy and water use as far practical • Ensure that water quality and quantity issues are managed appropriately through engineering controls and through regular and required quality and quantity groundwater monitoring • Mitigation measures of the Geohydrology and Surface Water Hydrology Impact Assessments should be strictly implemented. • Treated discharge water could possibly be used for irrigation purposes e.g. at the golf course and caravan park if such a proposal adhere to environmental regulations	Development and implementation of resource usage and management plans Implementation of water management plans Monitoring programmes	Implementation of measures will facilitate compliance with resource management regulations, NWA, ESKOM regulations	NWA Resource management legislation
Mining activities around Brown's Hill Pit and the Theta/Browns WRD (Wishbone)	• Visual impact • Noise and dust • Safety risks	Socio-Economic: Brown's Hill Settlement (inhabitants ±10)	Operation	• A comprehensive Resettlement Action Plan (RAP) should be developed in consultation with the affected inhabitants. This plan would include the number of dwellings and individuals to be affected, timeframes and the availability of a site where resettlement could occur. • Representatives of the DPW and TGME should liaise with the inhabitants and local councillor with regards to the resettlement process and timeframes. This communication should further ensure that the correct	Develop and implement the recommended RAP	These measures are required to comply with health and safety regulations regarding proximity of habitation to mine works	MHSA Social and labour regulations

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				information regarding this issue is portrayed to the community members. • It would be desirable to address issues relating to resettlement as a matter of urgency and also to provide definitive timeframes linked to any possible resettlement.			
Iota Pit Browns Pit Theta Pit Iota WRD Theta Wishbone WRD Stockpiles and Project Infrastructure Iota Dam Browns Dam Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)	Impact on faunal habitat, species diversity and SCC	Fauna	Production	**Faunal Habitat and Diversity** • All construction personnel should undergo a basic environmental induction, to ensure no poaching of local fauna or possibility of a fire occurs; • All areas of increased ecological sensitivity falling outside of the direct mine footprint should be designated as No-Go areas and be off limits to all unauthorised construction vehicles and personnel. This includes the Mountain Outcrops, Remnants of Northern Mistbelt Forest, Montane Grasslands and the Freshwater Habitat; • The construction process should be phased to limit the extent of exposed areas at any one time and ensure that the time between initial disturbance and completion of construction is as short as possible; • Site clearance should be limited to the project footprint areas only, with disturbance limited as far as possible; • 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 minimal; • Adequate speed limits should be adhered to in order to curb the possibility of roadkill; • Construction of topsoil stockpiles and other surface infrastructure should be restricted to the transformed habitat unit;	• Plan mining activities to include mitigation measures • Implement induction programme which includes awareness and protection of fauna and flora • Creation and implementation of site and contractor management plan, including security on site • Safety and Health programmes • Fire and emergency plans Implementation of speed limits and other traffic rules on site	Implementation of various measures to comply with DAFF guidelines, environmental protection regulations and construction plan Implementation of traffic management on site Implementation of security measures on site Implementation of access control to sensitive areas	Environmental protection regulations; DAFF guidelines; Traffic regulations; Security on site to contribute to enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• The Biodiversity Action Plan and Alien Invasive Plant Management Plan should be initialled in this phase. **Faunal SCC** • If any potential faunal SCC are encountered during the construction phase, a suitably qualified ecologist should be contacted immediately for relocation purposes; • Any unauthorised collection of faunal species, especially faunal SCC, by construction personnel should be strictly prohibited. **Disposal of construction related material** • All construction related waste and material is to be disposed of at a registered waste facility; and No waste of construction rubble is to be dumped in the surrounding natural habitats. **Increased personnel on site** No illicit fires should be allowed during any phases of the proposed mining development. A Fire Management Plan (FMP) should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; and No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be in areas of existing high disturbance, and not encroach upon sensitive habitats.	• Creation and designation of no-go areas		
Iota Pit Browns Pit Theta Pit	Impact on floral habitat, species diversity and SCC	Flora	Production	**Floral Habitat and Diversity** All areas of increased ecological sensitivity falling outside of the direct mine footprint should be designated as No-Go areas and be off limits to all unauthorised construction vehicles and personnel. This includes the Mountain Outcrops, Montane Grasslands	• Plan mining activities to include mitigation measures • Implement induction	Implementation of various measures to comply with DAFF guidelines, environmental	Environmental protection regulations; DAFF guidelines;

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Iota WRD Theta Wishbone WRD Stockpiles and Project Infrastructure Iota Dam Browns Dam Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)				and the Freshwater Habitat; The construction process should be phased to limit the extent of exposed areas at any one time and ensure that the time between initial disturbance and completion of construction is as short as possible; Site clearance should be limited to the project footprint areas only, with disturbance limited as far as possible; 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 minimal; and Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g. implement an AIP Management and Control Plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities and reduce sediment loads to the Freshwater Habitat (Blyde River and its tributaries); An AIP Management and Control Plan should be implemented, and an AIP monitoring programme followed during the construction phase in order to prevent the re-establishment of AIPs. • Ongoing alien and invasive plant monitoring and clearing/control should take place throughout all phases of the development, and the project perimeters should be regularly checked for AIP proliferation and to prevent spread into surrounding natural areas; and • AIP management for construction-phase activities should be focused on limiting their spread, e.g. roadsides should be monitored, as they serve as common corridors along which AIP species are	programme which includes awareness and protection of fauna and flora • Creation and implementation of site and contractor management plan, including security on site • Safety and Health programmes • Fire and emergency plans Implementation of speed limits and other traffic rules on site • Creation and designation of no-go areas	protection regulations and construction plan Implementation of traffic management on site Implementation of security measures on site Implementation of access control to sensitive areas	Traffic regulations; Security on site to contribute to enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				introduced and dispersed, and disturbed areas should regularly be monitored for AIP recruitment until successfully rehabilitated; All soils compacted as a result of construction activities falling outside of development footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas; and A rehabilitation plan should be in place and implemented within disturbed areas where work has been completed. **Floral SCC** All floral SCC within the construction footprint should have been rescued and relocated, or removed, where permits were obtained, before construction commences; and Any unauthorised collection or harvesting of floral material, especially floral SCC, by construction personnel should be strictly prohibited. **Disposal of construction related material** All construction related waste and material is to be disposed of at a registered waste facility; and No waste of construction rubble is to be dumped in the surrounding natural habitats. **Increased personnel on site** No illicit fires should be allowed during any phases of the proposed mining development. A Fire Management Plan (FMP) should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; and No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing			

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				roads. Where this is not feasible, new roads are to be in areas of existing high disturbance, and not encroach upon sensitive habitats.			
Iota, Browns and Theta Pits Iota WRD 1 and 2 Theta Wishbone WRD Surface Infrastructure and Linear Development (Powerlines, Haul Roads, Stockpiles, PCDs etc)	• Site clearing, including the removal of topsoil and vegetation • Construction of general surface infrastructure and transportation of materials and stockpiling • Altering the topography of the area through the creation of stockpiles and WRD higher than the proposed heights • Potential erosion and loss of topsoil leading to higher visual contrast • An increase in construction vehicular and human activity in the area, leading to an increase in dust suspension • Earthworks resulting in increased dust suspension • Construction of additional access roads. Cut and fill of slopes for the construction of the access roads will become highly visible if not re-vegetated and shaped to blend in with the existing topography • Vegetation damage, scarring of the terrain, and altering of landforms or contours • Increased amount of human activity, construction vehicles, and other equipment • Use of security lighting during the construction phase	Visual Aspects	Construction	• The development footprints and disturbed areas should be kept as small as possible and the areas of natural vegetation and topsoil removal should be kept to a minimum. • The extent of all surface infrastructure footprint areas and permanent structures should be minimised to what is absolutely essential. • It should be ensured that existing vegetation in the vicinity of TGME Theta Hill Project Area is retained during the construction phase to ensure that visual scarring of landscape and vegetation clearing does not occur beyond the mining footprint area. • Erosion, which may lead to high levels of visual contrast and further detract from the visual environment, should be prevented throughout the lifetime of the project by means of putting soil stabilisation measures in place and concurrent rehabilitation. • It should be ensured that topsoil, run of mine and strategic ore stockpiles are not steeply sloped, so as to blend in with the undulating terrain. • The berms should be vegetated with indigenous grass species, to reduce the visual impact of the soil contrast from the open pits. • The relevant exposed construction site areas and access and haul roads should be irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff. • Rubble should be removed from site on a regular basis. • Litter and dust management measures should be in	• Plan mining activities to include mitigation measures • Implement induction programme which includes awareness and protection of fauna and flora • Creation and implementation of site and contractor management plan, including security on site • Safety and Health programmes • Fire and emergency plans Implementation of speed limits and other traffic rules on site • Creation and designation of no-go areas	Implementation of various measures to comply with DAFF guidelines, environmental protection regulations and construction plan Implementation of traffic management on site Implementation of security measures on site Implementation of access control to sensitive areas	Environmental protection regulations; DAFF guidelines; Traffic regulations; Security on site to contribute to enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				place at all times. • The sites should be kept neat and tidy at all times. • On site mining activities will be limited to be undertaken between 6am and 6pm. • Excavated areas are to be infilled with available material concurrently during operational phase, decommissioning and closure. • Excavation is to be kept to a minimum and limited to essential areas. • The height of structures should be as low as possible, where this can be achieved without increasing the infrastructure footprint. • The height of the stockpiles and WRDs should not exceed the proposed heights, to ensure that the skyline of the landscape is not affected, beyond what is anticipated. • The identification of appropriate colours and textures for facility materials should take into account both summer and winter appearance. • Natural colours should be used in all instances and the use of highly reflective material should be avoided. Any metal surfaces should be painted to fit in with the natural environment in a colour that blends in effectively with the background. White structures are to be avoided as these will contrast significantly with the natural surroundings. • The use of permanent signs and project construction signs should be minimised and visually unobtrusive. • During rehabilitation, the removal of infrastructure, complete backfilling into open cast areas, ripping of roads and reshaping of impacted areas to blend in with the surrounding mountainous terrain should take place.			
Theta Hill Project area	Light nuisance/disturbance	Night time lighting	Operation	• A lighting engineer may be consulted to assist in the planning and placement of light fixtures for the mining	Design/choice of optimal methods for	Using technology to minimise impacts and	Environmental regulations

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				infrastructures in order to reduce visual impacts associated with glare and light trespass; • Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas, i.e. away from settlements, villages, towns, and the main roads. • Wherever possible, lights should be directed downwards so as to avoid illuminating the sky; • The use of high light masts and high pole top security lighting should be avoided along the periphery of the TGME 10167 study areas. Any high lighting masts should be covered to reduce glow; • As far as possible, construction activities should be restricted to daylight hours, in order to limit the need to bright floodlighting and the potential for skyglow and to avoid the use of additional night-time lighting for security purposes; • Outdoor lighting in the vicinity of the proposed infrastructure areas should be strictly controlled; • Care should be taken when selecting luminaries to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Only “full cut-off” light fixtures that direct light only below the horizontal should be used on the building; • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose; • The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent should be considered to reduce skyglow (BLM, 2013) • Censored and motion lighting may be installed at office areas to prevent use of lights when not needed; • Vehicle-mounted lights or portable light towers are preferred over permanently mounted lighting for night	lighting up areas at night, taking into account the recommendations from the impact assessment	to comply with environmental regulations governing light pollution and health and safety regulations for lighting at workplaces	governing light pollution MHSA regulations governing lighting of the workplace

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				time maintenance activities. If possible, such lighting should be equipped with hoods or louvers and be aimed toward the ground to avoid causing glare and skyglow			
Decommissioning / removal of surface infrastructure.	• Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soils and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems (watercourses); • Proliferation of alien vegetation due to disturbances, which will impact natural flow regimes; and • Potential visual scars, affecting aesthetic features and faunal habitat.	Watercourse Ecology: Compacted soils, latent impacts of vegetation losses.	Closure and rehabilitation	Ensure that soils are replaced in the correct layers, ripped and re-reprofiled post-closure, and that vegetation is restored to a point where succession will lead to the same conditions as the pre-mining state as a minimum; Rehabilitation measures should be implemented. Implementation should be overseen by a suitably qualified Environmental Site Officer (ESO) with freshwater experience and the ESO should sign off the rehabilitation before the relevant contractors leave site; Minimum of ten years' post-closure monitoring to be undertaken; and Refer to Table 27; Aspect 4, 7 and 8 for detailed mitigation measures.	Development and implementation of rehabilitation plan to take into account all mitigation measures Management of rehabilitation process Monitoring programmes	The implemented measures will ensure compliance with all legislation governing rehabilitation of mine sites	NEMA NWA Environmental legislation and regulations
Opencast Mining	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the regional groundwater level Water seep through the mining waste used in the rehabilitation, becomes contaminated and impact on the groundwater	Groundwater Level Groundwater Quality (within the rehabilitated mine workings)	Closure and rehabilitation	The proposed mining will take place above the groundwater table and no impact is expected. Waste assessment indicated that the rock to be returned into the pit will not have an adverse impact on the water quality	Development and implementation of rehabilitation plan to take into account all mitigation measures Management of rehabilitation process Monitoring programmes	The implemented measures will ensure compliance with all legislation governing rehabilitation of mine sites	NEMA NWA Environmental legislation and regulations

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Waste Rock Dumps & waste rock material used for stormwater berms	Groundwater contamination from waste bodies	Groundwater Quality	Closure and rehabilitation	Assessment of the waste material which indicated low potential risk Geochemical modelling that showed sufficient neutralising and adsorption capacity to prevent contaminants from reaching the groundwater table Management measures such as compaction and the installation of a drain system at the base of the waste pile Rehabilitation including shaping, capping and vegetation	Modelling and monitoring measures Engineering design to mitigate issues	Implementation of measures to monitor and ensure compliance with NEMA and NWA regulations	NEMA NWA
Closure and rehabilitation of the pits and WRDs and long-term impacts on water quality	At closure, the WRDs will be capped and vegetated. The pits will mostly be backfilled, however, voids will remain. These voids will fill with water from rainfall. The plant will no longer require water for processing, and therefore, no abstractions will take place from the Iota and Wishbone PCDs. Due to the high rainfall of the area, over time, it is likely that the remaining pit voids and PCDs will fill and spill. The quality of water in the voids and PCDs in the long-term is likely to be similar to that described in the geochemical assessment in the Geohydrological Study for Scenario 2. The water quality will be alkaline, with moderate to fairly high levels of salinity, with an unlikely risk of AMD. However, elevated metals namely arsenic, chromium, mercury and nickel are likely to occur.	Surface water quality	Closure and rehabilitation	Exposed areas such as the WRDs should be vegetated to prevent erosion. The WRDs should be designed to avoid steep slopes as far as possible. Diversion of upslope runoff around the voids and PCDs, once rehabilitation measures have been successfully implemented. Use of water from the voids and PCDs for irrigation of vegetation established on the WRDs as part of the rehabilitation plan. Should the plant be used for further future projects, then water can be sourced from the PCDs and voids. Monitoring of the Blyde River post-mine closure, as per the recommended monitoring plan provided in this report. The stormwater management plan should be revised near mine closure. It is recommended that sustainable long-term solutions are investigated, such as a paddock retention system along the toe of the WRDs, which will capture runoff and settle out sediment	Water management planning and implementation Monitoring programmes	Implementation of water management measures to reduce impact on watercourses and ensure compliance with NWA and NEMA requirements, as well as regulations guarding natural watercourses from DAFF	Watercourse biodiversity preservation Groundwater management standards NEMA and NWA requirements DAFF guidelines

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
	The climate change study indicated that there will be a general decrease in rainfall, but that extreme rainfall events will increase.						
Removal of infrastructure	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Closure and rehabilitation	Demolition activities involving heavy duty machinery to be limited to daytime working hours problem.	Implementation of measures to mitigate noise generated by the mining operation Employees to be issued with appropriate hearing protection Monitoring programmes	Implementation of mitigation measures to comply with environmental laws for noise regulation	Environmental legislation and regulations governing noise levels MHSA Regulations
Backfill of disturbed areas	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Closure and rehabilitation	Activities involving heavy duty machinery to be limited to daytime working hours	Implementation of measures to mitigate noise generated by the mining operation Employees to be issued with appropriate hearing protection Monitoring programmes	Implementation of mitigation measures to comply with environmental laws for noise regulation	Environmental legislation and regulations governing noise levels MHSA Regulations
Planting of grass/vegetation of rehabilitated areas	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	Noise	Closure and rehabilitation	Planting of grass and vegetation to be done during daytime working hours.	Implementation of measures to mitigate noise	Implementation of mitigation measures to comply with	Environmental legislation and regulations

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
					generated by the mining operation Employees to be issued with appropriate hearing protection Monitoring programmes	environmental laws for noise regulation	governing noise levels MHSA Regulations
Theta Hill project closure	Job losses	Socio-Economic: Loss of direct and flow-on jobs due to closure	Closure and rehabilitation	• Ensure that the mine develops additional resources and increase its LoM in order to maintain and promote job security • As per the requirements of the SLP develop mechanisms to assist employees prior to the retrenchment date in the transition phase and after closure of the operations. This would include providing portable skilled development programmes during the operational phase of the mine, providing assistance in accessing available and suitable jobs with other local mines or companies etc. • Focus on supporting non-core local supply links in procurement strategies as well as potential local enterprise development programmes during the operational phases of the mine to facilitate easier transitioning of local suppliers to other customers	Implementation of SLP Upskilling of locals Development of local suppliers Follow labour legislation regulations during redundancy process	Implementation will ensure compliance with labour legislation	Labour legislation
Theta Hill project closure: end of social and economic development period	The risk exists that projects and local government structures become dependent on the funding that they receive from the proponent and that projects and local governance will fail due to the decrease in funding.	Socio-Economic: Decrease/termination of community investment funds to local communities	Closure and rehabilitation	• Ensure that the mine develops additional resources and increase its LoM in order to maintain and promote job security • Focus on community support programmes with that build local capacity and sustainability in the local community	Development and implementation of transition plans	Implementation of transition plans to comply with social responsibility guidelines	Social responsibility guidelines

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• Plan projects with an exit strategy of which beneficiaries are aware of			
Illegal mining	Negative impacts of illegal mining which could spill over into the forestry and conservation areas	Socio-Economic: Increase in Illegal Mining Activities	Closure and rehabilitation	• Adhere to modern mining designs that makes it more difficult for illegal miners to enter mining areas after closure • Close any openings to underground mining sites in the vicinity • Allocate funds to implement security measures to remove illegal miners from the local areas for another 5 years after closure	Develop and implement mining methods to reduce possibilities for illegal mining after mine closure	Implementation of measures to reduce crime opportunities	Criminal law in South Africa
Closure and rehabilitation	If the rehabilitation is not successful, negative permanent visual impacts would remain	Socio-Economic: Sense of Place Impact	Closure and rehabilitation	• Mining areas should be rehabilitated as soon as the Mining Works Programme allows • The recommendations made by the Visual Impact Assessment should be adhered to • Mining infrastructure should be removed or where applicable should be maintained and incorporated into a mining tourism strategy • Re-vegetation and landscaping options should be considered but should aim to re-establish the area to its pre-mining state as far as possible. • The end land-use should be determined in consultation with the local community and relevant government departments to determine what is required from an environmental perspective but to also address localised community needs	Developent and implementation of mine closure and rehabilitiation plan to take into account all identified mitigation measures Monitoring and reporting programmes	Implementation of closure and rehabilitation plan to ensure compliance with all relevant environmental protection legislation, NEMA, NWA, Environmental Protection regulations	NEMA, NWA, Environmental Protection regulations
Iota Pit Browns Pit Theta Pit Iota WRD	Impact on faunal habitat, species diversity and SCC	Fauna	Closure and rehabilitation	**Faunal Habitat and Diversity** Implement all recommendations as per the mine closure plan; All surface infrastructure should be removed, and waste material disposed of at a registered dump site. Waste and remnant mine related material should not be dumped or left within the focus area;	• Plan rehabilitation activities to include mitigation measures • Implement induction programme which includes awareness	Implementation of various measures to comply with DAFF guidelines, environmental protection regulations and construction plan	Environmental protection regulations; DAFF guidelines;

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Theta Wishbone WRD Stockpiles and Project Infrastructure Iota Dam Browns Dam Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)				Where soils have been compacted, they are to be ripped and where necessary reprofiled; Indigenous grass species are to be used for revegetation of disturbed areas. Due to the proposed layouts falling within CBAs, the end-goal of rehabilitation would need to aim to achieve the pre-mined condition as far as possible; and Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity reinstatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area. **Ongoing AIP Management** A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure. Where areas are disturbed during decommissioning activities, proliferation of alien invasive species within these areas should be continually monitored and controlled.; and Follow-up with alien and invasive plant control measures for a period of at least 5 years post-closure.	and protection of fauna and flora • Creation and implementation of site and contractor management plan, including security on site • Safety and Health programmes • Fire and emergency plans Implementation of speed limits and other traffic rules on site • Creation and designation of no-go areas	Implementation of traffic management on site Implementation of security measures on site Implementation of access control to sensitive areas	Traffic regulations; Security on site to contribute to enforcement of the various plans and the safety and security on the site
Iota Pit Browns Pit Theta Pit Iota WRD Theta Wishbone WRD	Impact on floral habitat, species diversity and SCC	Flora	Closure and rehabilitation	**Floral Habitat and Diversity** Implement all recommendations as per the mine closure plan; All surface infrastructure should be removed, and waste material disposed of at a registered dump site. Waste and remnant mine related material should not be dumped or left within the focus area; Where soils have been compacted, they are to be ripped and where necessary reprofiled; Indigenous grass species are to be used for	• Plan rehabiltation activities to include mitigation measures • Implement induction programme which includes awareness and protection of fauna and flora •	Implementation of various measures to comply with DAFF guidelines, environmental protection regulations and construction plan	Environmental protection regulations; DAFF guidelines; Traffic regulations; Security on site to contribute to

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Stockpiles and Project Infrastructure Iota Dam Browns Dam Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)				revegetation of disturbed areas. Due to the proposed layouts falling within CBAs, the end-goal of rehabilitation would need to aim to achieve the pre-mined condition as far as possible; and Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity reinstatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area. **Floral SCC** Floral SCC, if encountered within the decommissioning footprint areas, are to be handled with care and the relocation of sensitive plant species to suitable similar habitat is to be overseen by a suitably qualified botanist/horticulturist in association with a MTPA recommended ecologist; and Monitoring of relocation success of rescued and relocated floral SCC should continue for up to 2 years after closure or until a suitably qualified botanist/horticulturist determines the relocation activities to be successful. **Ongoing AIP Management** A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure. Where areas are disturbed during decommissioning activities, proliferation of alien invasive species within these areas should be continually monitored and controlled.; and	Creation and implementation of site and contractor management plan, including security on site • Safety and Health programmes • Fire and emergency plans Implementation of speed limits and other traffic rules on site • Creation and designation of no-go areas	Implementation of traffic management on site Implementation of security measures on site Implementation of access control to sensitive areas	enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				Follow-up with alien and invasive plant control measures for a period of at least 5 years post-closure.			
Iota, Browns and Theta Pits Iota WRD 1 and 2 Theta Wishbone WRD Surface Infrastructure and Linear Development (Powerlines, Haul Roads, Stockpiles, PCDs etc)	• Demolition, removal of infrastructure and partial backfilling of opencast pits leading to further dust generation, erosion and changes in the visual character of the project area • Ineffective rehabilitation leading to poor vegetation cover with bare areas remaining present, opencast pit areas not being completely backfilled and surface infrastructure remaining • Ongoing proliferation of alien vegetation • Potential ineffective rehabilitation leading to extensive areas of bare soil scarring the landscape • Stationary and vehicle mounted lighting during the • Partial backfilling resulting in voids remaining within the opencast pits leading to altered contours and mountainous terrain.	Visual Aspects	Closure and rehabilitation	• Decommissioning footprints and disturbed areas should be kept as small as possible and no further indigenous vegetation should be cleared or soils exposed for this purpose. • All areas where infrastructure is removed should be shaped to resemble the pre-development landscape and revegetated as soon as possible. • The open pits should be backfilled, shaped and revegetated to resemble the surrounding mountainous landscape as far as is feasible. • Concurrent/ progressive rehabilitation should be implemented and disturbed areas should be rehabilitated as soon as possible and as soon as areas become available by replacing topsoil and revegetating disturbed areas. • Indigenous and locally occurring plant species selected for use in re-vegetation should be selected taken quick growth rates into consideration in order to cover bare areas and prevent soil erosion. • Upon final rehabilitation, it should be aimed to remove as much surface infrastructure where practically feasible and to reshape the landscape to blend in with the surrounding mountainous terrain.	• Plan rehabilitation activities to include mitigation measures • Implement induction programme which includes awareness and protection of fauna and flora • Creation and implementation of site and contractor management plan, including security on site • Safety and Health programmes • Fire and emergency plans Implementation of speed limits and other traffic rules on site • Creation and designation of no-go areas	Implementation of various measures to comply with DAFF guidelines, environmental protection regulations and construction plan Implementation of traffic management on site Implementation of security measures on site Implementation of access control to sensitive areas	Environmental protection regulations; DAFF guidelines; Traffic regulations; Security on site to contribute to enforcement of the various plans and the safety and security on the site

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
Theta Hill Project area	Light nuisance/disturbance	Night time lighting	Closure and rehabilitation	• A lighting engineer may be consulted to assist in the planning and placement of light fixtures for the mining infrastructures in order to reduce visual impacts associated with glare and light trespass; • Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas, i.e. away from settlements, villages, towns, and the main roads. • Wherever possible, lights should be directed downwards so as to avoid illuminating the sky; • The use of high light masts and high pole top security lighting should be avoided along the periphery of the TGME 10167 study areas. Any high lighting masts should be covered to reduce glow; • As far as possible, construction activities should be restricted to daylight hours, in order to limit the need to bright floodlighting and the potential for skyglow and to avoid the use of additional night-time lighting for security purposes; • Outdoor lighting in the vicinity of the proposed infrastructure areas should be strictly controlled; • Care should be taken when selecting luminaries to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Only “full cut-off” light fixtures that direct light only below the horizontal should be used on the building; • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose; • The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent should be considered to reduce skyglow (BLM, 2013) • Censored and motion lighting may be installed at office areas to prevent use of lights when not needed;	Design/choice of optimal methods for lighting up areas at night, taking into account the recommendations from the impact assessment	Using technology to minimise impacts and to comply with environmental regulations governing light pollution and health and safety regulations for lighting at workplaces	Environmental regulations governing light pollution MHSA regulations governing lighting of the workplace

Activity	Potential Impact (Size and scale)	Aspects Affected	Project Phase	Mitigation and Management Measures	Mitigation Type	Compliance with Standards	Standard to be achieved
				• Vehicle-mounted lights or portable light towers are preferred over permanently mounted lighting for night time maintenance activities. If possible, such lighting should be equipped with hoods or louvers and be aimed toward the ground to avoid causing glare and skyglow			
Final rehabilitation and closure plan	• Geotechnical stability related to created and altered landforms • Surface stability (i.e. erosion control) • Surface water runoff control and sedimentation management • Functional cover system design (layered growth medium for re-establishment of vegetation and biodiversity) • Alien and invasive species management and control • Seasonality of revegetation efforts and successful establishment • Visual appearance and sense of place objectives • Geochemical stability	All environmental aspects	Closure and rehabilitation	• The monitoring of the identified potential impacts will be crucial with a view to informing the success and sustainability of rehabilitation and remediation activities • The opportunity to attain successful and sustainable rehabilitation and closure lies in the integration of the rehabilitation plan with the mine plan. This is where most of the gains can be made at the initiation of the project and throughout the project which would create the basis for achieving the rehabilitation and closure objectives. • It is the view of the authors that the rehabilitation plan presented herein, if implemented in accordance with all recommendations and specifications, could achieve a stable and sustainable geochemical, geotechnical and ecological post-mining land use.	Implementation of rehabilitation plans Monitoring and reporting	Implementation of all identified actions to ensure compliance with all applicable legislation, including NEMA, NWA, MHSA, Environmental Protection et al	NEMA, NWA, MHSA, Environmental Protection et al

34.10. Impact Management Actions

Table 61: Impact Management Actions for the Construction Phase

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Project Kick Off and Planning		Control potential deviations from the approved EMPr	Planning stage	Ensure contractors are aware of the required management measures stipulated in the EMPr
Project Kick Off and Planning		Control potential deviations from the approved EMPr	Planning stage	Ensure all construction staff is familiar with the Environmental Awareness Plan
Project Kick Off and Planning		Control potential deviations from the approved EMPr	Planning stage	Ensure that all staff is familiar with the emergency procedure and plan
Site Establishment and construction of infrastructure: • Access Roads; • Pollution Control Dams • Open cast Mining Areas (Browns / Theta/ Iota) • Waste Rock dump sites; • Buildings including workshops, change house-lamp room, offices, stores, contractors' laydown area and parking; • A pollution control dam trenches / Berms / pipeline;	Groundwater Contamination	Control through management a monitoring of spillages. Where spillages occur, the soil should be stripped and disposed of as stipulated in the EMPr.	Pre-Construction and Construction phase	Compliance with the NWA and conditions of the WUL Compliance with the regulations under the GN704

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
• Stormwater management infrastructure; • Power Supply infrastructure • A package sewage plant; • Haul roads; • Bridge Crossing construction; • Strategic Ore Stockpile areas and Topsoil stockpile areas; • Fence; and • Fuel storage area.				
	Drawdown of groundwater leading low groundwater levels	Monitoring of groundwater levels	Pre-Construction and Construction phase	Compliance with the NWA and conditions of the WUL
	Contamination of surface water resources (watercourses and unnamed tributary	Monitoring through rehabilitation and management of spills Rehabilitate contaminated areas	Pre-Construction and Construction phase	Compliance with the NWA and conditions of the WUL Compliance with the regulations under the GN704
	Permanent loss of habitat and floral species of conservation concern.	Preserve and enhance the biodiversity of the habitat unit, no-go alternative should be considered Offsetting or compensation for residual loss to be considered only as a last resort	Pre-construction and Construction phases	Comply with existing legislation National Environmental Management: Biodiversity Act 2004 (Act No 10 of 2004) National Biodiversity Offset Policy and Alien and Invasive Species Regulations, 2014. No vegetation clearance

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
				outside of demarcated areas
	The location of infrastructure occur directly within watercourses (especially in the case of linear infrastructure which traverse several drainage systems) and within the 32m or 100m zones of regulation according This location was selected after extensive consideration of the overall biodiversity impacts as well as other technical constraints to develop a layout with the least impact, and especially on biodiversity	During the planning phase, the location of access roads should take into consideration the sensitivity maps, and wherever possible, access roads should not be planned adjacent to, or traversing, any watercourse. Should it be essential that access roads cross over any watercourse, this should be planned at existing crossing points or points of existing disturbance within the river and/or riparian zone	Pre-construction and Construction phases	NEMA and GN 704 of the NWA
	Migration of animal life due to disturbance caused proposed project	Relocation of affected species of conservation importance Management of site activities	Pre-construction and Construction phases	Remain within the designated area demarcated for mining activities. Ensure minimal clearance of vegetation
	Mortality and disturbance of fauna	Management of site activities	Pre-construction and Construction phases	Remain within the designated area demarcated for mining activities. Ensure minimal clearance of vegetation

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
	Soil compaction and erosion as a result of development activities and storm water runoff, reducing the efficiency of floral re-establishment and leading to a loss of favourable floral habitat and consequently a further loss of diversity	Retain topsoil integrity for the reuse in rehabilitation Vegetation clearance shall be kept to a minimum. No clearance of vegetation outside demarcated areas	Pre-construction and Construction phases	Retain topsoil integrity for the reuse in rehabilitation Vegetation clearance shall be kept to a minimum. No clearance of vegetation outside demarcated areas
Transportation of material and movement of vehicles and machinery on construction areas	Possible increase in nuisance dust and carbon emissions and ambient air pollutants due to movement of vehicles and operation of machinery and equipment	Dust control measures	Pre-construction and Construction phases	Comply with the requirements of the National Environmental Management: Air Quality Act, 2004: Dust Regulation guidelines for rural communities. Comply with the requirements of the Minimum Emission Standards
Vegetation clearance and excavation of construction sites	Altered drainage patterns due to increased impermeable surfaces. Installation of culverts/pipes as part of the construction of stream crossings	It should be ensured that no development of any geographically variable infrastructure takes place within 100m of the Blyde River, its tributaries, or any other delineated freshwater resource in line with regulation GN704 of the NWA as far as possible, while ensuring that mining is done safely and to optimise resource abstraction as far as possible without causing irreversible harm to the watercourses of the region	Pre-construction and Construction phases	
Altering the topography of the area through the creation of stockpiles and WRD higher than the proposed heights	Impact on the existing landscape and visual character of the region	The height of the stockpiles and WRDs should not exceed the proposed heights, to ensure that the skyline of the landscape is not affected, beyond what is anticipated	Pre-construction and Construction phases	The development footprints and disturbed areas should be kept as small as possible and the areas of natural vegetation and topsoil removal

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
				should be kept to a minimum
Transportation of material and movement of vehicles and machinery on construction areas	Increase in ambient noise levels due to movement of vehicles and machinery	Management and maintenance of construction vehicles. Management using noise dissipating technologies e.g. noise mufflers	Pre-construction and Construction phases	Remain within the Noise Regulation Standards for Rural Areas. Ensure that noise levels are below the National Noise Control Regulations, SANS 10103:2008 Guidelines
Vegetation clearance and excavation of construction sites	Potential destruction of graves and areas of archaeological importance	Control through clear demarcation of construction sites to ensure avoidance of graves and other heritage sites	Pre-construction and Construction phases	Comply with the requirements of the National Heritage Resources Act, 1999 (Act 25 of 1999)
Waste Management	Improper waste management has potential to contaminate water sources	Waste Management	Pre-construction and Construction phases	Comply with the requirements of the National Environmental Management: Waste Act, 2008 (Act 51 of 2008)
Vegetation clearance	Changes in the topography may be experienced as a result of bush clearing and construction vehicles on site		Pre-construction and Construction phases	Ensure vegetation clearance and footprints of excavated area are kept to a minimum
Excavations	Removal of local geology as a result of construction activities	Control of the construction footprints and ensuring that vegetation clearance shall be kept to a minimum. No clearance of vegetation outside demarcated areas	Pre-construction and Construction phases	Ensure vegetation clearance and footprints of excavated

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
				area are kept to a minimum
Recruitment	Impact from the influx of job seekers	Management of the implementation of the SLP	Pre-construction and Construction phases	Comply with the conditions of the SLP
Social	Formal/structured in-migration (workers associated with project moving into the local area):	Employment of locals (within the low to semi-skilled positions) already residing in Pilgrim's Rest should receive priority as this would limit the negative impacts (e.g. infrastructure requirements) associated with a sudden population increase and to avoid possible conflict arising between locals and the outside workforce	Pre-construction and Construction phases	Comply with the conditions of the SLP

Table 56. Impact Management Actions for the Operational Phase

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Disposal of waste rock on the waste stockpile	Fugitive dust and fine particulate emissions affecting ambient air quality	Dust control Air quality monitoring	Operation	Comply with the requirements of the National Environmental Management: Air Quality Act, 2004: Dust Regulation guidelines for rural communities Comply with the requirements of the Minimum Emission Standard
Fugitive vehicle emissions from the gravel maintenance road	Fugitive dust and fine particulate emissions affecting ambient air quality	Dust control Air quality monitoring	Operation	
Heavy vehicle exhaust emissions	CO, NO2, SO2 and fine particulate emissions affecting ambient air quality	Air quality monitoring	Operation	
Hauling of waste rock for storage in	Soil contamination from hydrocarbon spills from	Management and monitoring of spills	Operation	Comply with the NEM: WA

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
their respective storage facilities	vehicles; and Soil contamination from spillage/poor handling of product and waste rock outside the designated areas			
Stockpiling of discard and waste rock. Containment of sediment laden water in PCD	Soil contamination due to leaching of soluble product and waste constituents into soils underlying the stockpiles; and Contamination of soil adjacent to product and waste stockpiles due to run-off or seepage of soluble product or waste rock constituents	Management and motoring of integrity of infrastructure	Operation	Comply with the NEM: WA Comply with the NEMA Comply with the NWA
Waste disposal and movement of vehicles and machinery	Contamination of soils by hydrocarbon pollutants Potential hydrocarbon spillages washed into downslope watercourses impacting on water quality	Management and monitoring of spills	Operation	Comply with the NEM: WA
Open Cast Mining	Water flow into the mine resulting in water quality contamination	Would mainly be direct rainfall. Collect inflow water as close as possible to source to prevent prolonged contact with rock Clean and dirty water separation	Operation	Comply with the NWA Comply with conditions of WUL
Waste Rock Dumps	Groundwater contamination from waste bodies	Assessment of the waste material which indicated low potential risk Geochemical modelling that showed sufficient neutralising and adsorption capacity to prevent contaminants from reaching the groundwater table Management measures such as compaction and the installation of a drain system at the base of the waste pile	Operation	Comply with the NWA Comply with conditions of WUL

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
		Monitoring to assess the impact		
Hauling of waste rock for storage in their respective storage facilities.	Water resource contamination from hydrocarbon spills from vehicles and equipment, sewage package plant, was-bay, change-house and laundry.	Surface water quality monitoring	Operation	Comply with the NWA Comply with conditions of WUL
Waste rock stockpile and PCD.	Open pit mining through non-perennial drainage lines as well as the deposition of waste rock in drainage lines.	Surface water quality monitoring Diversion of upslope clean runoff around the pits and WRDs as per the SWMP. Concurrent backfilling and rehabilitation of the pits as per the rehabilitation plan, which will return some of the previously lost contributing catchment area. Restoration of the drainage lines where possible. Diversion of upslope water around the WRDs as the footprints of the WRDs expand. Runoff and spills from the mine infrastructure impacting on the water quality of the Blyde River. Parameters of concern include elevated suspended solids, turbidity, dissolved salts (TDS), heavy metals and pH (it should be noted that the geochemical assessment indicated an unlikely potential for AMD).	Operation	Comply with the NWA Comply with conditions of WUL
Construction of the Blyde River bridge crossing.	Increased erosion, suspended solids, turbidity and sedimentation. Alteration of the natural river flows	Construction should take place during the low flow months preferably between July - October. The river should be appropriately diverted around working areas as per an approved method statement. Sediment nets to trap sediment immediately downstream of working areas should be employed. Disturbed areas should be appropriately rehabilitated.	Operation	Comply with the NWA Comply with conditions of WUL

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
		The bridge should be designed to alter the natural river flows in the least possible way, taking into consideration the high and low flows. The river geomorphology and aquatic fauna and flora should be considered in the design, construction and operation of the bridge. Monitoring of the Blyde River upstream and downstream of the operation, as per the recommended monitoring plan provided in this report.		
Implementation and operation of the stormwater management plan	Loss of contributing catchment area impacting on water quantity in the Blyde River. The pits, WRDs and plant area will be operated as a closed system. Runoff from these areas will be captured and contained.	There are no mitigation measures for the loss of contributing catchment area, as dirty water runoff from the mine should be captured, contained and reused in accordance with GN704 regulations. Clean upslope runoff will be diverted around the dirty areas. The annual loss of runoff in quaternary catchment B60A was calculated to be 0.4 mcm in comparison to the catchments MAR of 78.3 mcm. This is approximately 0.5 % of the quaternary catchment runoff which is not considered to be significant.	Operation	Comply with the NWA Comply with conditions of WUL
Implementation and operation of the stormwater management plan	Loss of contributing catchment area impacting on water quantity in the Blyde River. The pits, WRDs and plant area will be operated as a closed system. Runoff from these areas will be captured and contained.	There are no mitigation measures for the loss of contributing catchment area, as dirty water runoff from the mine should be captured, contained and reused in accordance with GN704 regulations. Clean upslope runoff will be diverted around the dirty areas. The annual loss of runoff in quaternary catchment B60A was calculated to be 0.4 mcm in comparison to the catchments MAR of 78.3 mcm. This is approximately 0.5 % of the quaternary catchment runoff which is not considered to be significant.	Operation	Comply with the NWA Comply with conditions of WUL
Abstraction of water from the	During the dry months, approximately 20 000	It is recommended that water is sourced from the PCDs and other dirty water sources prior	Operation	Comply with the NWA

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Blyde River for use at the plant	m3/month of water may need to be abstracted from the Blyde River, which will result in a loss of quantity flowing downstream. The mean monthly runoff during the dry months for quaternary catchment B60A is approximately 2 mcm. 20 000 m3/month is less than 1 % of the mean monthly runoff	to abstractions from the Blyde River. Should sufficiently sized PCDs be constructed, then minimal water will be required from the Blyde River. The Blyde River should be a last option in terms of obtaining makeup water for the plant. It is also recommended that surrounding flooded historical adits in the area are investigated, as possible sources of water for the plant during the dry season.		Comply with conditions of WUL
Vehicles and use of equipment/ machinery	Contamination of soils and downstream water resources	Surface water quality monitorinG	Operation	Comply with the NWA Comply with conditions of WUL
Vegetation clearing and earth works	Establishment and spread of alien invasive species	Management of infestation of alien invasive plant species through implementation of the eradication programme Monitoring mine area	Operation	Eradicate all alien invasive plant species as they emerge
Construction phase activities	Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC, and/or due to the harvesting of protected floral species by mining and operational personnel	Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g. implement an AIP Management and Control Plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities and reduce sediment loads to the Freshwater Habitat (Blyde River and its tributaries)	Operation	Eradicate all alien invasive plant species as they emerge Comply with the requirements of the NEMA and NFA
Vegetation clearing and earth works	Risk of discharge and contamination from all operational facilities may	Manage all edge effects stemming from mining operations and infrastructure areas:	Operation	Eradicate all alien invasive plant species as they emerge

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
	pollute receiving environment leading to altered floral habitat	Implement erosion control measures where necessary to ensure that further habitat loss does not occur. Erosion should be monitored on a continual basis throughout the operational phase, particularly in the vicinity of disturbed areas and where increased human activities will take place; All soils compacted as a result of operational activities falling outside of the proposed infrastructure areas should be ripped and profiled. Special attention should be paid to alien and invasive plant control within these areas;		Comply with the requirements of the NEMA and NFA
Construction, operational and closure phase activities	Clearing of vegetation in proximity to the drainage systems for contractor laydown areas and construction of surface infrastructure, including preparation of open pits (outside of drainage lines).	Measures to contain and reuse as much water as possible within the mine process water system should be sought, and very strict control of water consumption should take place. Detailed monitoring should be implemented and maintained to ensure that all water usage is continuously optimised; No dirty water runoff should be permitted to reach the riverine resources during the entire life of mine, and clean and dirty water management systems should be put in place to prevent the contaminated runoff (suspended solids and salts and water with low pH) from entering the receiving aquatic environment. Clean and dirty water runoff systems should be constructed before construction of any other infrastructure takes place.	Operation	Comply with the NWA Comply with conditions of WUL

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
		Adequate stormwater management should be incorporated into the design of the proposed mining project in order to prevent erosion and the associated sedimentation of the riparian and instream areas		
Construction phase activities	Loss of ecological communities due to increased sedimentation and the potential mobilisation of pollutants	Monitoring Of vegetation on site	Operation	Comply with the NWA Comply with conditions of WUL
Iota, Browns and Theta Pits	Ongoing vegetation clearing, scarring of the terrain and altering of landforms or contours	The berms should be vegetated with indigenous grass species, to reduce the visual impact of the soil contrast from the open pits	Operation	Comply with the Visual Impact Assessment
Operational phase	Employment	Management of the implementation of the SLP Establish a supplier development programme as part of the Local Economic Development component of the SLP	Operation	Management of the implementation of the SLP
Operational phase	Skills transfer and development	Put a contractor management plan (including direct service providers) in place	Operation	Management of the implementation of the SLP
Operational phase	Community development	100% recruitment of unskilled labour from local communities, with focus on Pilgrim's Rest, Schoonplaas/Newtown and Darks Gully; up-skilling of local labour force as per SLP	Operation	Management of the implementation of the SLP
Operational phase	Regional and economic development	Management of the implementation of the SLP	Operation	Management of the implementation of the SLP
Operational phase	Loss of employment (construction workers)	Management of the implementation of the SLP	Operation	Management of the implementation of the SLP

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Operational phase	Health and safety risk	Manage through health and safety policies and training	Operation	Comply with provisions of the Occupational Health and Safety Act Comply with the provisions of the Mine Health Act
Operational phase	Possibility of unearthing unknown graves or other buried cultural/archaeological items		Operation	Comply with the requirements of the National Heritage Resources Act, 1999 (Act 25 of 1999)
Movement of construction vehicles	Risk of vehicle collision	Speed control and limitation of the times when construction vehicles may be on the roads Manage through road upgrades	Operation	
Storage of chemicals and fuel	Spills of chemicals (e.g., hydrocarbon). Soil contamination on adjacent land potentially occurring due to inappropriate waste disposal and potential oil and diesel leakages from vehicles and machinery	Management and monitoring of spills Monitoring and management of the integrity of infrastructure	Operation	Comply with the requirement of the NEM: WA
Construction, operational and closure phase activities	Impacts on the Tourism Sector of Pilgrim's Rest	TGME should proceed in developing and implementing a detailed tourist strategy for Pilgrims Rest as part of its LED programme in close consultation with the local community and local tourism sector	Operation	Comply with the Noise and Air Quality Impact Assessments
Construction, operational and closure phase activities	Impact on Brown's Hill Settlement	A comprehensive Resettlement Action Plan (RAP) should be developed in consultation with the affected inhabitants. This plan would include the number of dwellings and individuals to be affected, timeframes and the	Operation	Comply with the Resettlement Action Plan (RAP)

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
		availability of a site where resettlement could occur. Representatives of the DPW and TGME should liaise with the inhabitants and local councillor with regards to the resettlement process and timeframes.		

Table 57. Impact Management Actions for the Decommissioning and Closure Phase

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Spills of chemicals (e.g., hydrocarbon). Soil contamination on adjacent land potentially occurring due to inappropriate waste disposal and potential oil and diesel leakages from vehicles and machinery	Spillage of chemical solutions during the dismantling of plant equipment, pipelines or pumps which were in contact with chemicals solution may contaminate the soils; Spillage of diesel, oils and greases from the dismantled plant equipment, resulting in hydrocarbon contamination of exposed soils	Soil monitoring and management of spills Groundwater and surface water monitoring	Decommission and Closure Phase	Comply with the closure objectives. Comply with the requirements of the NEM: WA
Removal of redundant infrastructure	Soil compaction in areas where active heavy machinery will be mobilised for the shaping of the final landform; and Loss of soil organic matter due to increased aeration (caused by soil disturbance) and subsequent organic matter decomposition.	Soil monitoring and management of spills	Decommission and Closure Phase	Comply with the closure objectives
Grading of project site to ensure long-term	Soil handling to convey soil from topsoil stockpile to project site for surface rehabilitation activities,	Soil monitoring and management of spills	Decommission and Closure Phase	Comply with the closure objectives

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
drainage conditions on site	may result in degradation of soil quality due to soil disturbance. Contamination of soil by handling of soil with contaminated earth moving machinery (machinery previously used for handling mine waste such as waste rock). Insufficient soil volumes to meet end land use soil requirements.	Groundwater and surface water monitoring		Comply with provisions of the NWA Comply with provisions of the WUL
Destruction of all surface infrastructure; Backfill and closure	Potential groundwater contamination resulting from seepage from waste rock dump.	Groundwater monitoring	Decommission and Closure Phase	Comply with the closure objectives Comply with provisions of the NWA Comply with provisions of the WUL
Closure and rehabilitation of the pits and WRDs and long-term impacts on water quality	At closure, the WRDs will be capped and vegetated. The pits will mostly be backfilled, however, voids will remain. These voids will fill with water from rainfall. The plant will no longer require water for processing, and therefore, no abstractions will take place from the Iota and Wishbone PCDs. Due to the high rainfall of the area, over time, it is likely that the remaining pit voids and PCDs will fill and spill. The quality of water in the voids and PCDs in the long-term is likely to be similar to that described in the geochemical assessment in the Geohydrological	Exposed areas such as the WRDs should be vegetated to prevent erosion. The WRDs should be designed to avoid steep slopes as far as possible. Diversion of upslope runoff around the voids and PCDs, once rehabilitation measures have been successfully implemented. Use of water from the voids and PCDs for irrigation of vegetation established on the WRDs as part of the rehabilitation plan. Should the plant be used for further future projects, then water can be sourced from the PCDs and voids. Monitoring of the Blyde River post-mine closure, as per the recommended monitoring plan provided in this report. The stormwater management plan should be revised near mine	Decommission and Closure Phase	Comply with the closure objectives Comply with provisions of the NWA Comply with provisions of the WUL

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
		closure. It is recommended that sustainable long-term solutions are investigated, such as a paddock retention system along the toe of the WRDs, which will capture runoff and settle out sediment		
Removal of redundant infrastructure	Spillage of chemical solutions during the dismantling of plant equipment, pipelines or pumps which were in contact with chemicals solution may contaminate the soils; Spillage of diesel, oils and greases from the dismantled plant equipment, resulting in hydrocarbon contamination of exposed soils	Soil monitoring and management of spills Groundwater and surface water monitoring	Decommission and Closure Phase	Comply with the closure objectives Comply with provisions of the NWA Comply with provisions of the WUL
Soil placement and revegetation of project site	Soil handling to convey soil from topsoil stockpile to project site for surface rehabilitation activities may result in erosion and sedimentation. Contamination of soil by handling of soil with contaminated earth moving machinery (machinery previously used for handling mine waste such as waste rock).	Management of erosion	Decommission and Closure Phase	Minimise soil loss
Vegetation clearing and earth works	Establishment and spread of alien invasive species	Control and management through implementation of the Alien Invasive Plant Species eradication programme	Decommission and Closure Phase	Comply with the Alien Invasive Species Eradication Programmes
Use of heavy machinery	Changes in surface water quality due to contamination from heavy construction equipment	Surface water quality monitoring	Decommission and Closure Phase	Comply with the closure objectives Comply with provisions of the NWA Comply with provisions of the WUL

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Construction, operational and closure phase activities	Permanent loss of habitat and floral species of conservation concern	Preserve and enhance the biodiversity of the habitat unit, no-go alternative should be considered Offsetting or compensation for residual loss to be considered only as a last resort	Decommission and Closure Phase	Comply with existing legislation National Environmental Management: Biodiversity Act 2004 (Act No 10 of 2004) National Biodiversity Offset Policy and Alien and Invasive Species Regulations, 2014. No vegetation clearance outside of demarcated areas
Operational and closure phase activities	Water Quality Deterioration – Acidic Mine Drainage	Surface water quality monitoring	Decommission Phase	Comply with the provisions of the Mine Health Act Comply with the Provisions of the Health and Safety Act
Decommissioning and closure phase activities	Permanent alteration of site topographical and visual character of due to presence of overburden dump	Monitor and manage visual impacts	Decommission and Closure Phase	Reprofile the area as much as possible Revegetate the dump to minimise visual impacts
Decommissioning and closure phase activities	Reinstatement of visual resource value due to dismantling of mining buildings and subsequent rehabilitation of footprint areas. Visible dust plumes during rehabilitation	Monitor and manage visual impacts • Dust control	Decommission and Closure Phase	Comply with the provisions of the Mine Health Act Comply with the Provisions of the Health and Safety
Downscaling and retrenchment	Loss of employment	Manage qualifications of mine workers and implement programmes in the SLP to enable workers to source employment elsewhere on decommissioning of the mine	Decommission and Closure Phase	comply with provisions of the SLP Comply with provisions of the Labour Relations
Downscaling and retrenchment	Reduced regional economic development	Ensure that the mine develops additional resources and increase	Decommission and Closure Phase	Comply with provisions of the SLP

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
		its LoM in order to maintain and promote job security Focus on community support programmes with that build local capacity and sustainability in the local community		
Decommissioning and closure phase activities	illegal mining activities after closure	Adhere to modern mining designs that makes it more difficult for illegal miners to enter mining areas after closure Close any openings to underground mining sites in the vicinity Allocate funds to implement security measures to remove illegal miners from the local areas for another 5 years after closure	Decommission and Closure Phase	Comply with provisions of the SLP
Downscaling and retrenchment	Reduced community investment		Decommission and Closure Phase	Comply with provisions of the SLP Comply with provisions of the Labour Relations Act Closure phase The closure and rehabilitation phase should have no impact
Closure phase	Sense of Place Impact after closure	Mining areas should be rehabilitated as soon as the Mining Works Programme allows The recommendations made by the Visual Impact Assessment should be adhered to Mining infrastructure should be removed or where applicable should be maintained and	Decommission and Closure Phase	Comply with provisions of the SLP

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
		incorporated into a mining tourism strategy		
Closure phase	The closure and rehabilitation phase should have no impact on any identified cultural and heritage resources	Manage and control access to heritage sites	Decommission and Closure Phase	Comply with provisions of the NHRA
Movement of construction vehicles	Risk of vehicle collision / Risk of pedestrian accidents	Management and enforcement of road speed limits	Decommission and Closure Phase	Comply with speed limits.

35. Financial Provision

35.1. Description of closure objectives and extent to which they align with the baseline characterization.

These objectives may be adapted based on the practical implementation and knowledge or research outcomes at the time. For these land-uses to realise, the four primary closure objectives should be met, with specific objectives for each of the domains as described below:

- Surface infrastructure to be removed, and sites rehabilitated to a restored ecosystem or alternative vegetation cover with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition in order to reach biodiversity targets;
- Transport infrastructure to be rehabilitated to a restored ecosystem or alternative vegetation cover with the main objective to achieve biodiversity targets. Those roads that will remain as access roads as a result of pre-closure negotiations with landowners and stakeholders, shall be sufficiently upgraded to minimise erosion and sedimentation potential. Transfer of maintenance agreements with regards to the road surface and stormwater management infrastructure, should be formalised. Residual impacts and environmental risks should be assessed at that time to have the best basis for decision-making, especially for transport infrastructure that traverses sensitive ecosystems;
- All equipment and electrical infrastructure to be removed, and their footprints rehabilitated to a restored ecosystem or an alternative vegetation cover with the main objective of achieving biodiversity targets. No infrastructure to remain on site unless a beneficial gain is identified and agreed upon with landowners/ stakeholders;
- All waste rock dumps to be rehabilitated with a vegetation cover with the main objective to achieve biodiversity targets. It is paramount that geotechnical, erosional and geochemical stability is achieved, and that no pollution shall emanate from the waste rock dumps;
- Final voids, terrace cuts and/or pits shall be safe for humans and animals, or access should be restricted until such time as it is declared safe and stable. A suitable cover system shall be imported to enable healthy vegetation establishment that supports a pre-defined species diversity to achieve biodiversity targets;
- All dams relating to pollution control shall be removed and rehabilitated only when the risk of pollution or sedimentation is within prescribed standards. The site should be restored to the original ecosystem or alternative vegetation cover to achieve biodiversity targets;
- All product stockpiles to be sold, and the footprints rehabilitated to a restored ecology or to an alternative vegetation cover which can achieve biodiversity targets. All topsoil stockpiles to be used in rehabilitation procedures and the footprints vegetated with a cover that supports a pre-defined species diversity to achieve biodiversity targets.

It is recommended that the progress of the rehabilitation be monitored to ensure sustainability. This requires an understanding of the basic baseline environment, as well as project management to ensure that the rehabilitation program is a success.

35.2. Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

The draft EIA/EMPr was made available to all registered I&APs for a 30-day review and comment period. All comments received and responses provided to the stakeholders were incorporated into the final EIA/EMPr and was collated into a Comments and Responses Register. The final EIA/EMPr was submitted to the DMR&E for decision making.

35.3. Rehabilitation plan

Refer to Appendix 16 for the complete Rehabilitation and Closure Plan associated with the proposed project.

35.4. Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The Rehabilitation Plan has been compiled in support of the primary closure objectives which are to remove the mining infrastructure and rehabilitate the land to a suitable land use which represent pre-mining conditions and provides a safe and sustainable environment for surrounding receptors. Refer to Appendix 16 for the complete Rehabilitation and Closure Plan associated with the proposed project.

35.5. Quantum of financial provision required to manage and rehabilitate the environment

CALCULATION OF THE QUANTUM

Applicant: **TGME**
Evaluators: **Minelock / Globesight / OMI solutions**

No.	Description	Unit	A Quantity	B Master Rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
1	Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m3	70 000.00	14.71	1	1	1 029 700.00
2 (A)	Demolition of steel buildings and structures	m2	517.24	204.96	1	1	106 013.51
2 (B)	Demolition of reinforced concrete buildings and structures	m2	1 322.76	302.05	1	1	399 539.66
3	Rehabilitation of access roads	m2	119 600.00	36.68	1	1	4 386 928.00
4 (A)	Demolition and rehabilitation of electrified railway lines	m		355.99	1	1	0.00
4 (B)	Demolition and rehabilitation of non-electrified railway lines	m		194.18	1	1	0.00
5	Demolition of housing and/or administration facilities	m2		408.93	1	1	0.00
6	Opencast rehabilitation including final voids and ramps	ha	63.02	214 888.54	1	1	13 542 275.79
7	Sealing of shafts adits and inclines	m3		110.03	1	1	0.00
8 (A)	Rehabilitation of overburden and spoils	ha	84.45	143 259.03	1	1	12 098 225.08
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha		178 426.53	1	1	0.00
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	14.13	518 235.21	1	1	7 322 663.52
9	Rehabilitation of subsided areas	ha		119 957.86	1	1	0.00
10	General surface rehabilitation	ha	12.83	113 485.31	1	1	1 456 016.53
11	River diversions	ha		113 485.31	1	1	0.00
12	Fencing	m	3299	126.45	1	1	417 158.55
13	Water management	ha	13.46	43 150.31	1	1	580 803.17
14	2 to 3 years of maintenance and aftercare	ha	187.89	15 102.61	1	1	2 837 629.39
15 (A)	Specialist study	Sum		0		1	0.00
15 (B)	Specialist study	Sum		0		1	0.00
					Sub Total 1		44 176 953.20
1	Preliminary and General		5301234.38		weighting factor 2 1		5 301 234.38
2	Contingencies		4417695.32				4 417 695.32
					Subtotal 2		53 895 882.91
					VAT (15%)		8 084 382.44
					Grand Total		**61 980 265.34**

35.6. Confirm that the financial provision will be provided as determined.

Provided the Mining Right is approved, TGME will provide for closure as per the legal requirements. A liability assessment will also need to be undertaken annually to ensure the financial provision is in line with the closure cost.

36. Compliance monitoring and performance assessment

TGME is responsible for the implementation of all monitoring, mitigation and management measures, as well as compliance with the EMPr. The recommended monitoring for the identified impacts is detailed below. The applicant is recommended to keep a record of all environmental monitoring taken on site.

36.1. Monitoring of Impact Management Actions

Please refer to Table 58.

36.2. Monitoring and Reporting Frequency

Please refer to Table 58.

36.3. Responsible Persons (Roles and Responsibilities)

In order to plan, construct and operate the proposed project, it is important that all parties understand their duties and responsibilities. TGME and their contractors will be responsible for the construction of the proposed project and ensure that all activities undertaken by TGME are undertaken in compliance with the project's EA and EMPr. It is recommended that TGME monitor construction activities at a frequency, which will be determined by the construction schedule. The following sections describe the functions of the key team members.

Generic roles that need to be defined for the project include:

- Competent Authority;
- Project Developer;
- Environmental Control Officer (ECO);
- Safety, Health and Environmental Representative; and
- Site Manager.

The typical requirements of each of the roles are provided in the following sections.

36.3.1. Competent Authority (DMRE)

The DMRE plays a lead role in the implementation of environmental policies, legislation and regulations. Their role is to ensure that the construction and operation of the proposed Theta Gold Mine is conducted in a sustainable manner, in compliance with the relevant environmental legislation. DMR&E is responsible for approving the EMPr for the project and any revisions and amendments thereto.

36.3.2. Project Developer

The Project Developer (TGME) is the 'owner' of the project and as such is responsible for ensuring that the conditions of the EA/WML issued in terms of NEMA and NEM: WA (should the project receive such authorisation) are fully complied with, as well as ensuring that any other necessary permits or licenses are obtained and complied with. It is expected that TGME will appoint the Environmental Control Officer, SHE Manager and Site Manager.

TGME will be responsible for:

- Ensuring that all team members are aware of their roles and responsibilities
- Taking overall responsibility for all activities that occur in the proposed project and associated infrastructure;
- Ensuring that all commitments/conditions contained in the EA and EMPr are communicated and adhered to by TGME employees to all team members and contractors.

During the construction phase:

- Appoint a Project Management Team to oversee the Contractor and act as a liaison between the Environmental Control Officer (ECO) and the Contractor;
- Ensure that the Contractor is aware of and adheres to the provisions of this EMPr;
- Ensure that the Contractor remedies problems timeously and to the satisfaction of the authorities;
- Appoint an independent and suitably qualified ECO to ensure that the Contractor abides by the EMPr;
- Ensure that an independent ECO audits the site to ensure compliance with the respective environmental legislation by parties.

During the operation phase:

- Ensure that the Project Management Team oversees the Contractor/s and act as a liaison between the ECO and the Contractor/s;
- Ensure that the Contractor is aware of and adheres to the provisions of this EMPr;
- Ensure that the Contractor remedy problems timeously and to the satisfaction of the authorities;
- Ensure that an independent ECO audits the site to ensure compliance with the respective environmental legislation by parties.

During decommissioning phase:

- Ensure that the Project Management Team oversees the Contractor/s and act as a liaison between the ECO and the Contractor/s;
- Ensure that the Contractor is aware of and adheres to the provisions of this EMPr;
- Ensure that the Contractor remedy problems timeously and to the satisfaction of the authorities;
- Ensure that an independent ECO audits the site to ensure compliance with the respective environmental legislation by parties.

36.3.3. Operations Manager

The Operations Manager will report to TGME and be responsible for:

Complying with the EMPr and EA commitments and any other legislative requirements as applicable to their workings;

Adhering to any instructions issued by the project manager on advice of the ECO.

36.3.4. Contractor (s) and sub-contractors

The Contractor (s) (including Sub-Contractors) will report to the Project Management Team and be responsible for:

- Appointing an Environmental Representative who will ensure that all construction activities on site are undertaken in accordance with the EMPr;
- Drafting Environmental Method Statements to mitigate environmental impacts;
- Informing all employees and sub-contractors of their roles and responsibilities in terms of the EMPr;
- Ensuring that all employees and sub-contractors comply with this EMPr;
- Complying with the EMPr and EA commitments and any other legislative requirements as applicable to their workings;
- Adhering to any instructions issued by the project manager on advice of the ECO;
- Submitting an environmental report at identified site meetings on the environmental incidents that have occurred within the period before the site meeting;

- Arranging that all employees and those of the subcontractors receive appropriate training prior to the commencement of construction, taking cognisance of this EMPr and EA.
- The Contractor has a duty to demonstrate respect and care for the environment in which they are operating. The Contractor will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the EMPr, environmental regulations and relevant legislation.

36.3.5. Environmental Control Officer

The ECO will report to TGME and the ECO shall be an independent qualified environmental professional with the relevant environmental expertise and shall be responsible for:

- Fully understanding the commitments in the EMPr and EA;
- Ensuring that the EA conditions are upheld;
- Familiarising him / herself with the project and EMPr, and ensuring compliance with the relevant legislation applicable to the project and TGME Safety Health and Environmental Policy and procedures;
- Advising management on environmental issues and recommendations for the proposed development;
- Informing key, on-site staff through initial environmental awareness briefing of their roles and responsibilities in terms of the EMPr;
- Communicating the contents of the EMPr and EA to the contractor and sub-contractor staff members. Training will be required to ensure all staff members are aware of the requirements of the EMPr;
- Liaising with environmental statutory bodies, including but not limited to, DMR and DWS, where deemed necessary;
- Monitoring the implementation of the EMPr and EA throughout the project, by means of site inspections and meetings;
- Arranging for liaison with Interested and Affected Parties (I&AP) s on environmental issues of concern;
- Authorising the removal of personnel and / or equipment should they contravene the conditions of the EMPr and EA;
- Compiling a checklist of areas of non-compliance;
- Identifying areas of non-compliance, and recommending measures to rectify them in consultation with TGME and the Contractor;
- Ensuring follow-up and resolution of all non-compliance;
- Compiling monthly progress reports for submission to the Project Manager and DMR&E;
- Reporting directly to TGME;
- Reviewing and approving Environmental Method Statements submitted by the contractor to mitigate environmental impacts;
- The audit report will be submitted to the Contractor for comment prior to submission to the TGME;
- Undertaking a post-construction inspection, which may result in recommendations for additional clean-up and rehabilitation measures; and
- Undertaking regular site inspections to assess compliance with the EMPr and EA and take appropriate action to rectify non – conformances.

36.3.6. Safety, Health and Environmental Representative

The Safety, Health and Environmental (SHE) Representative will report to Project Management Team and be responsible for:

- Ensuring that all environmental and health and safety conditions are undertaken by all staff and contractors on site;
- Overseeing all work done by the ECO; and
- Ensuring that corrective actions are followed up and closed out

36.4. Time Period for Implementing Impact Management Actions

Please refer to Table 58.

36.5. Mechanism for Monitoring Compliance

Please refer to Table 58.

Table 58. Compliance monitoring and performance assessment against EMPr

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
Air quality	Construction phase impacts and operational phase impacts	• Six (6) months prior to the construction phase (as agreed with the ECO), a suitable baseline dust fallout and particulate monitoring network should be installed along the boundary of the mining operation to establish baseline concentrations prior to the construction phase; • During construction, the baseline monitoring network should be maintained along the boundary of the mining operation to meet the NEM: AQA requirements; • The air monitoring network to include at a minimum dust fallout, PM10, and PM2.5. • A meteorological station should be installed onsite one month prior to the construction phase as this data is required for several NEM: AQA reporting requirements; and • Any complaints as to the management of onsite air quality should be directed to the site management. Complaints and any actions arising from a complaint will be recorded in a complaint register to be maintained by site management.			TGME, ECO, Contractors	Monthly monitoring and reporting
Soil quality	Maintain the soil quality along areas which will be developed for mining as well as areas adjacent to mine waste storage facilities	Collection of at least one sample where visible signs of contamination is noted (spillage or seepage areas/zones)	All areas which will be developed for mining	pH and salinity; Major anions and cations; Sulphate, phosphate, Nitrate, total dissolved solids, electrical conductivity; Heavy metals and hydrocarbons	TGME, ECO, Contractors	Biannually
Soil stockpiles	Maintain and minimise the quality and degradation of soil stockpiles	Collection of at least one composite sample per stockpile	Soil stockpiles	pH and Salinity; Organic matter content for the topsoil; Metal and hydrocarbons; Stockpile height (<3 m).	TGME, ECO, Contractors	Biannually
Soil Erosion	Mitigate and minimise soil erosion	Infrastructure and surface water bodies on-site to be maintained in accordance	Soil stockpiles Developed areas Haul roads	Visual assessment of soil stockpile heights and conditions	TGME, ECO, Contractors	Monitoring will be done on an quarterly basis or after a heavy rain event.

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
		with the surface water management plan		Assess the condition and effectiveness of vegetation on the stockpiles; Assess any evidence of erosion (as per the Surface water management plan); Assess the effectiveness of water		
Land Use change	Maintain and minimise land use change within the mining area	Evaluation of changes in land use within the mining precinct using satellite imagery	Mining licence area	Collection of satellite imagery	TGME, ECO, Contractors	Every two years
Rehabilitated Areas	Performance against set biodiversity targets Landscape stability Hydrology and sedimentation control Plant species establishment:	Year 1: Plant and establish pioneer species; Establish biodiversity hot-spots; and Plant and establish 5% of pre-mining species diversity Year 2: Monitoring and maintenance of species establishment undertaken during year 1 to ensure successful and sustainable establishment. Year 3: Plant and establish 30% of pre-mining species diversity Year 4 onwards: Monitoring and maintenance of species establishment undertaken during years 1-3 to ensure successful and sustainable establishment.			TGME, ECO, Contractors	Annually reviewed
Groundwater	Monitoring of groundwater levels and water quality	A groundwater monitoring network is currently in place, but several of the boreholes are too shallow and therefore dry. The monitoring programme needs to be upgraded and expanded to include the new mining areas Please refer to the groundwater assessment report for the location of the monitoring points. A groundwater monitoring network will be implemented. *Physical Parameters*:			TGME, ECO, Contractors, Groundwater Specialists	In the operational phase and closure phase, biannual monitoring of groundwater quality and groundwater levels is recommended. Quality monitoring should take place during the wet and dry seasons, i.e. during June and December

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
		•Groundwater levels; •In-field measurements of Temp, EC, TDS and pH. *Chemical Parameters:* The list of parameters that should be included in the monitoring of the site are shown below: **Constituent** pH Conductivity in mS/m at 25ºC Total dissolved solids at 180ºC Alkalinity as $CaCO_3$ Ammonia as N Nitrate as N Chloride as Cl Sulphate as SO_4 Boron as B Fluoride as F Phosphate as P Sodium as Na Potassium as K Calcium as Ca Magnesium as Mg Arsenic as As Barium as Ba Cadmium as Cd Total chromium as Cr Copper as Cu Iron as Fe Lead as Pb Manganese as Mn Mercury as Hg Chemical Oxygen Demand				
Surface water	Downstream water quality	Point 1 /2 downstream of the proposed bridge crossing, plant and TSF Point 3: downstream of the PCDs and Browns Pit, Point 4: downstream of the non-perennial stream draining the Iota WRD to the north. Point 5 on a non-perennial stream near Pilgrims Rest, to capture any potential contamination to the east of the project		Suspended solids, Nitrite, Iron Turbidity Ammonia Manganese pH Orthophosphate Chromium Electrical Conductivity Fluoride Copper Total Dissolved Solids Calcium Lead Alkalinity Magnesium Zinc Chloride Sodium Mercury Sulphate Potassium Nickel Nitrate Aluminium Arsenic	TGME, ECO, Contractors, Surface Water Specialists	Monthly monitoring AND should be implemented at least a year prior the commencement of construction activities.

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
Surface Water	Earth works and vegetation clearing during construction, operation and decommissioning	Assess area for erosion and spillages			TGME, ECO, Contractors, Surface Water Specialists	Weekly or daily rainfall periods until construction and decommissioning are complete
Surface Water	Use and storage of chemicals, including refuelling areas	Maintain storage areas; Clean and dispose in accordance with legislation Monitor and maintain stormwater containment systems; Clean and dispose in accordance with legislation. Samples should be collected from the PCD as necessary Monitor water resources.			TGME, ECO, Contractors, Surface Water Specialists	Weekly of daily inspection during high rainfall periods; Monthly/ quarterly water quality samples for PCD and downstream water resource
Terrestrial Ecology	Establishment and spread of alien invasive species	An alien invasive species (AIS) control programme should be developed and implemented during all phases of the proposed project; AIS control should be undertaken in both the project site, and natural habitat and rehabilitated areas immediately adjacent to the site; It is recommended that the programme include: • A combined approach using both chemical and mechanical control methods; • Periodic follow-up treatments, informed by regular monitoring; and • Monitoring should take place in disturbed areas, as well as adjacent undisturbed areas			TGME, ECO, Contractors, Ecologist	Bi-annually
Terrestrial Ecology	Loss of SCC	Permanent monitoring plots should be established in areas surrounding the surface infrastructure and rehabilitated areas. These plots should be designed to accurately monitor the following parameters: • Measurements of the crown and basal cover as applicable in the various habitat units; • Species diversity and species abundance; • Impact of dust on flora; • Recruitment of indigenous species and of alien and invasive species; Alien vs Indigenous plant ratio; • Erosion levels and the efficacy of erosion control measures; • Vegetation community structure including species composition and diversity which should be compared to pre-development conditions; Presence, abundance and			TGME, ECO, Contractors, Ecologist	Bi-annually
Terrestrial Ecology	Rehabilitation success The rehabilitation plan should be continuously updated in accordance with the monitoring results in order to ensure that optimal rehabilitation				TGME, ECO, Contractors, Ecologist	Every 5 years

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
	measures are employed; Monitoring and inspection of the mine nursery to take place throughout the mining phase so ensure floral species for rehabilitation and/or rescue and relocation purposes will be successful Results of the monitoring activities should be taken into account during all phases of the proposed mining development and action should be taken to mitigate impacts as soon as negative effects from mining related activities become apparent; and The method of monitoring should be designed to be subjective and	condition of floral SCC communities, and Monitoring of relocation success of rescued and relocated floral SCC.				

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
	repeatable in order to ensure consistent results.					
Faunal Ecology	Loss of faunal habitat, species and faunal SCC	Pitfall traps can be used to monitor invertebrate diversity; Sherman traps can be used to monitor small mammal diversity; and Fixed and random points for bird counts to determine species composition and diversity trends	Monitoring points should be established in areas surrounding the mining area.	Species diversity (mammal, invertebrate, amphibian, reptile and avifaunal); Species abundance; and Faunal community structure including species composition and diversity which should be compared to pre-development conditions	TGME, ECO, Contractors, Ecologist	Annual basis
Aquatic Ecology	Potential for erosion of terrestrial areas as a result of the formation of preferential flow paths, leading to sedimentation of the watercourses; Reduction in volume of water entering the watercourses, leading to loss of recharge (and thus desiccation) of downstream system; and Altered vegetation	Any areas where active erosion is observed should be rehabilitated and a system of berms and swales should be utilised to slow movement of water Riparian resources need to be monitored using the wetland assessment protocols: • PES according to the IHI method (Kleynhans, 2008) (refer to Freshwater assessment) as applicable; • Riparian zonation monitoring to determine whether impacts on base flow levels are occurring; • Water quality monitoring as part of the mine's water quality monitoring program; and • Monitoring of the riparian vegetation assemblage, in particular alien vegetation. Where applicable, VEGRAI should be used as part of the monitoring process Aquatic biomonitoring should take place on a bi-annual basis by a SA RHP Accredited assessor, in order to identify any emerging issues in the receiving environment using the following indices in the assessment: • Habitat assessments using IHAS (6 monthly) and the IHIA (annually); • Aquatic macro-invertebrates using SASS5 and the MIRAI EcoStatus tool (6 monthly);			TGME, ECO, Contractors, Freshwater specialist	Monthly

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
	communities due to moisture stress.	• Fish community integrity using the FRAI EcoStatus tool (Annually in summer); and • Diatoms and the application of the SPI index (6 monthly). Ongoing monitoring of the trends in ecological integrity of the assessed sites in the vicinity of the existing and proposed TGME mining facilities Close monitoring of water quality (surface water, groundwater and process water) should take place. Monitoring of water quality should take place monthly, during which time basic parameters such as pH, Dissolved Oxygen (DO) and Electrical Conductivity (EC) are measured; Should EC or pH values reach an undesirable level, suitable mitigation measures should be implemented; Toxicity testing of the mine's process water facilities, the groundwater and surface water resources should take place concurrently with the biomonitoring program, in order to monitor the toxicological risk of the process water system to the receiving environment and in particular the groundwater resources. These ongoing toxicological tests should be compared to baseline data to monitor and manage any emerging impacts over time. Tests should include the following test organisms as a minimum: • Vibrio fischeri; • Poecilia reticulata; and • Daphnia pulex. Should emergency discharge from any process water system be required, definitive toxicological testing according to the Direct Estimation of Ecological Effect Potential (DEEEP) protocol should take place, in order to define safe discharge volumes and ensure sufficient dilution; Results of future assessments must be compared spatially and temporally to the results of this study. If it is observed through biomonitoring information that significant negative changes are taking place in ecological integrity (Change of Class), it should be taken as an indication that the system is suffering stress and mitigatory actions should be identified and				

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
		where possible, implemented; and ➢ Biomonitoring results very strongly rely on the competency level of the assessor. All future biomonitoring studies must be undertaken by an accredited assessor and it would be preferable to utilise the same assessor in subsequent studies in order to allow for more accurate comparison of data over time.				
Noise	Noise Receptors	One month prior to the construction phase, a suitable baseline noise monitoring campaign should be undertaken at the nearby sensitive receptors to establish baseline concentrations prior to the construction phase; During construction, noise monitoring should be implemented quarterly; During operations, noise monitoring should be implemented on an annual basis; Any noise complaints should be directed to the site management. Complaints and any actions arising from a complaint will be recorded in a complaint register to be maintained by site management. Calibrated equipment should be used at all times and at the measuring points given in the noise assessment should be used. Conducted in terms of the recommendations of the Noise Control Regulations and SANS 10103 of 2008 and the guidelines for the measurement of ground vibration and air pressure levels			TGME, ECO, Contractors, Noise specialist	Quarterly for a year after which it can change to an annual basis
Visual	Visual Intrusion and loss of sense of place	The following points aim to guide the design of the monitoring plan: Development and implementation of a decommissioning and site revegetation plan in order to ensure that the area's pre-development scenic quality and integrity is restored and that the project area is visually integrated into the surrounding landscape setting. Important aspects addressed should include requirements that most aboveground and near-ground structures be removed, that the project site be re-graded, and that indigenous vegetation be re-established to be consistent with the surrounding landscape.			TGME, ECO, Contractors	Annually

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
		The selected KOPs should be used over the life of the project to review the success of the mitigation plan Predevelopment visual conditions and the inventoried visual quality rating and scenic integrity should be reviewed after construction; The visual monitoring programme should be based on the following parameters: • Airborne dust (in line with air quality assessment) • Visibility of lights at night from surrounding receptors; • Number of lights visible; • Vegetation cover and height; and • Disturbance to receptors Maintenance of mining infrastructures and operations must be monitored throughout the operational phase of the project, to ensure that deterioration of the infrastructure does not occur, in turn affecting the aesthetics of the area.				
Health and Safety	Health and safety of personnel	Routine safety checks, safety training and Inspections to be carried out during the construction and operation phase to enforce the use of Personnel Protective Equipment (PPE). This should also be included in the safety requirements of the Contract.			TGME, ECO, Contractors	Routine inspection and Quarterly reporting
Social	Maximise local employment opportunities and limit skills inequities associated with the construction and operation	Prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of contractor management plan during construction and operations. Meet the targets of mining legislation and the relevant mining charter for employment of HDI in management positions and core skills Put a procurement strategy as well as a contractor management plan (if relevant) in place to ensure that 100% local employment target in terms of unskilled labour is met. Up-skill the local labour force as per SLP Explore possible placement of local construction workers in mining operations			Human resources /SLP officer	Annually as per SLP and procurement strategies

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
		Develop a database of goods and services that could potentially be outsourced to the local community Establish a supplier development programme as part of the Local Economic Development component of the SLP Participate in the development of a regional mine supplier hub to promote the development of a local supply base Where local contractors are used, put a contractor management plan in place to ensure that the local employment and procurement targets of the operations are met.				
Social	Minimise any potential negative impacts associated with the inflow of workers and jobseekers	Employment of locals (within the low to semi-skilled positions) already residing in the larger Pilgrim's Rest area should receive priority as this would limit the negative impacts (e.g. Infrastructure requirements) associated with a sudden or additional population increase. The local labour procurement strategy as well as proof of residence required should be clearly communicated in the local community and broader regional media well in advance of the construction phase. The communication strategy should ensure that unrealistic employment expectations are not created. TGME to discuss the infrastructure requirements of the pre-construction and construction phase with the TCLM and DPWRT to pro-actively deal with the possible negative impacts Maintenance of the roads frequently used by construction traffic should be discussed and negotiated with the Mpumalanga Department of Public Works, Road and Transport Accommodation requirements of the construction team should be addressed prior to the construction phase commencing The Department of Public Works and community based representatives in the area such as the councillor, business representatives, and so forth should be informed of the construction schedules and activities Introduce contractual obligations for contractors to use local labour as far as possible.			TGME and Contractor	TGME, Mpumalanga Province, TCLM and local leaders should monitor indicators listed above to ensure that these have been met

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
		Contractors to ensure that foreign workers reside in suitable facilities and not establish informal houses. Security measures to avoid unauthorised access at the Caravan Park should be established, in the event that workers will be accommodated at the Caravan Park (upgraded) Workers should be supervised at all times. Information distributed as part of the existing HIV/Aids awareness campaigns undertaken in the area should again be focused on and communicated to the local workforce. The development of informal vending "stations" where food and small goods are sold should be properly managed, to avoid littering, safety risks and possible environmental pollution First aid and/or emergency supplies should be available at various points at the construction and operations sites The general health of workers should be monitored on an on-going basis Ensure that a proper emergency plan that fits with the Municipal Disaster Management Plan is in place. Such a plan should be developed by DPWRT/TCLM in consultation with the TGME The creation of temporary accommodation facilities is not preferred or recommended from a social perspective although it could be implemented as part of this project. Should a temporary accommodation facility be required, this facility should be managed in an environmentally and socially acceptable manner to avoid any social conflict and environmental pollution. Should a temporary accommodation unit be established at the Caravan Park, this facility should be managed in an environmentally and socially acceptable manner to avoid any social conflict and environmental pollution				

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
		Assist the TCLM and provincial department with the planning and implementation processes of IDP priority projects in Pilgrim's Rest. Align these priorities with the SLP and the community needs. Establish a forum, with representatives of TGME and local stakeholders for discussing potential issues of community conflict The relevant actions related to this objective should form of a contractor management plan				
Social	Assist Initiatives to Develop the Local Tourism Industry	TGME should proceed in developing and implementing a detailed tourist strategy for Pilgrims Rest as part of its LED programme in close consultation with the local community. Some ideas that could be explored further include: • commitment from business visitors to mine to use overnight facilities in Pilgrim's Rest or immediate surroundings • develop old adits in tourist spots with view point to contrast with modern mining • caravan park space development (one-part offices the other ablution blocks and ground clearance and maintenance for caravan standing areas) – TGME already took over the golf course • Development of old TGME stall/space that sells memorabilia • upgrade road between Graskop and Pilgrim's (bush clearance and some repairs) • museum support (gold panning) • facilitate the establishment of ATM and petrol station in town • provide support by sponsoring transaction advisors to develop local SMMEs in vacant business areas Liaise directly with Mt Sheba resort and other business that might be negatively affected by the mining operations Liaise and assist with the promotion of Road safety on the R533			TGME	TGME, Mpumalanga Province, TCLM and the local business community

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
		Involve the SAPS and other relevant stakeholders (e.g. other business entities operating in the area, as well as Police Forums and Sector Forums) in the preventative security measures to be undertaken Any other recommendations above that relate to mitigating the negative impacts of in-migration also applies to this impact Other mitigation measures discussed under the other economic impacts below Facilitate the establishment of a local business and tourism chamber for Pilgrim's rest and engage on a regular basis with the tourism sector through the local business chambers (Sabie, Graskop and Pilgrim's Rest) to address issues that could negatively impact on local businesses, specifically tourist businesses. TGME can assist in changing the negative perception among South Africans, and possibly among international tourists of Pilgrim's Rest not being a popular tourist destination to a highly ranked tourism destination The contractor could communicate the construction schedule and vehicle movements to the livestock owners and/or representative organisation namely the Maorabjang Communal Property Association				
Social	Resettlement of the residents of the Brown's Hill Settlement	A comprehensive Resettlement Action Plan (RAP) should be developed in consultation with the affected inhabitants. This plan would include the number of dwellings and individuals to be affected, timeframes and the availability of a site where resettlement could occur. Representatives of the DPW and TGME should liaise with the inhabitants and local councillor with regards to the resettlement process and timeframes. This communication should further ensure that the correct information regarding this issue is portrayed to the community members.			TGME, appointed consultant and Brown's Hill residents	Prior to construction phase

Aspect	Impacts Requiring Monitoring Programmes / Objectives	Functional Requirements For Monitoring			Roles And Responsibilities	Monitoring And Reporting Frequency And Time Periods For Implementing Impact Management Actions
		Detailed Actions	**Monitoring Location**	**Parameters**		
		It would be desirable to address issues relating to resettlement as a matter of urgency and also to provide definitive timeframes linked to any possible resettlement				
Waste Management	Waste Management	Maintain a waste manifest book to record volumes of waste leaving the site, including recyclables. Keep safe disposal certificates on file on site for Hazardous waste. Way Bridge slips should be obtained for all other waste streams and kept on file on site Bins should be clearly marked for recycling and visible on site Performance Indicator: • % local labour employed in different skill categories • % HDSA in management positions • Training programmes completed by local labour force • % of goods and services procured from local community by type of product			TGME, ECO, Contractors	Monthly daily and report on a monthly basis
Heritage resources	Destruction of graves and cultural resources	A person or entity, e.g. the Environmental Control Officer, should be tasked to take responsibility for the heritage sites and should be held accountable for any damage. Known sites should be located and isolated, e.g. by fencing them off. All construction workers should be informed that these are no-go areas, unless accompanied by the individual or persons representing the Environmental Control Officer as identified above. In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official should be part of the team executing these measures.			TGME, ECO, Contractors	Monthly Monitoring and reporting

37. Frequency of the submission of the performance assessment report.

A monthly site visit and report shall be compiled by the ECO and will include all aspects of the EMPr, as required.

Annual environmental audits must be undertaken to ensure compliance with the EMPr and EA/WML. The environmental audit reports must also include the financial provision and must be submitted to the DMRE.

38. Environmental Awareness Plan

It is important to ensure that the Contractors and employees associated with the proposed project the appropriate level of training and awareness to ensure that continual environmental due diligence and conservation is exercised at all levels of work carried out. Employees, contractors and sub-contractors must be made aware of their responsibilities in terms of relevant legislation, guidelines as well as this EMPr and EA.

Environmental conditions will be included in the contracts issued to the contractors, making them aware of the potential environmental impacts and risks associated with the proposed project. The importance of implementing the conditions in the EMPr and the necessity of good housekeeping practices will be made known to the contractors and employees of TGME and the contractors in order to prevent accidental spillages and avoid subsequent environmental impacts.

Training needs will be identified based on the EMPr requirements and capacity of TGME employees and contractors. In order to ensure environmental due diligence and protection of environmental harm, it is vital that all employees are trained to perform their designated role in alignment with the EMPr and EA.

The aim of the environmental awareness plan is to:

- Promote environmental education and conservation within the working place;
- Inform employees and contractors on the applicable environmental procedures and programmes;
- Provide job specific training on the specification of environmental conservation and protection applicable to the respective construction activities.

39. Communication of environmental risks

The training pertaining to the environmental awareness will include the following:

- All personnel (construction and operation staff) will undergo induction, which as a minimum will include Safety, Health and Environmental awareness;
- All attendees will sign an acknowledgement register upon receiving and understanding the induction;
- Environmental risks will be identified together with the specific job training that may be required to address these risks. Construction and operation staff will be trained on the implementation of emergency procedures where relevant.

An Environmental Awareness and Risk Assessment Schedule has been developed and is outlined in Table 67. The purpose of this schedule is to ensure that onsite employees are not only rained, but that the principles are continuously re-enforced.

Table 59. Environmental Training and Awareness Schedule

Type of Forum	Frequency	Time allocation	Objective
Internal Management Meetings	Monthly	One-hour workshop	A workshop session in which the following is discussed: Current status of environmental compliance; Environmental concerns and non-compliances recorded; Weekly, monthly, quarterly, annually and 5-year mine plan; Environmental risks and requirements; Action plan.
Induction (all staff and workers)	Prior to first time site access, and biannually thereafter	1-hour training on environmental awareness training as part of site induction	Develop an understanding of what is meant by the natural environmental and social environment and establish a common language as it relates to environmental, health, safety and community aspects. Establish a basic knowledge of the environmental legal framework and consequences of non-compliance. Clarify the content and required actions for the implementation of the EMP. Confirm the spatial extent of areas regarded as sensitive and clarify restrictions. Provide a detailed understanding of the definition, the method for identification and required response to emergency incidents.
Awareness Talks (all staff and workers)	Weekly	30-minute awareness talks	Current status of environmental compliance; Environmental concerns and non-compliances recorded; Based on actual identified risks and incidents (if occurred) reinforce legal requirements, appropriate responses and measures for the adaptation of mitigation and/or management practices.
Risk Assessments (supervisor and workers involved in task)	Daily	Daily task-based risk assessment	Establish an understanding of the risks associated with a specific task and the required mitigation and management measures on a daily basis as part of daily tool box talks.

39.1. Mitigation and management of Environmental Risks

As prescribed in Table 66, Task/Issue based Risk Assessments must be undertaken with all workers involved in the specific tasks in order to establish an understanding of the risks associated with a specific task and the required mitigation and management measures contained in this report.

39.1.1. Environmental Awareness Training Content

Induction Training: It is recommended that the following environmental awareness training be provided to all staff and workers who will be involved in all the activities at the mine:

- Description of the approved activities and content of the mining right;
- An overview of the applicable legislation and regulations as they relate to environmental, health, safety and community;
- Content and implementation of the approved EMPr specifically:
    - Allocated roles and responsibilities;
    - Management and mitigation measures; and
    - Identification of risks and requirements adaptation.
- Sensitive environments and features:
- Description of environmentally sensitive areas and features; and
- Prohibitions as it relates to activities in or in proximity to such areas.
- Emergency Situations and Remediation:
    - Methodology for the identification of areas where accidents and emergencies may occur, communities and individuals that may be affected;
    - An overview of the response procedure;
    - Equipment and resources;
    - Designate of responsibilities;
- Communication, including communication with the potentially affected communities and responsible authorities; and
- Training schedule to ensure effective response.

39.1.2. Development of procedures and checklists

It is recommended that the following procedures are developed, and all staff and workers are adequately trained on the content and implementation thereof:

- Emergency Preparedness and Response: The procedure to be developed to specifically include risk identification, preparedness, response measures and reporting. The procedure will specifically include spill and fire risk, preparedness and response measures. The appropriate emergency control centres (fire department, hospitals etc.) will be identified and the contact numbers obtained and made available on site. The procedure must be developed in consultation will potentially affected landowners. In the even that risks are identified, which may affect adjacent landowners (or other persons), the procedure will include appropriate communication strategy to inform such persons and provide response measures to minimize the impact.
- Incident Reporting Procedure: Incident reporting to be undertaken in accordance with an established incident reporting procedure to:
    - Provide details of the responsible person, including any person who
    - Is responsible for the incident;
    - Owns any hazardous substance involved in the incident;
    - Was in control when the incident occurred.
    - Provide details of the incident (time, date, location);
    - The details of the cause of incident;
    - Identify aspects of the environment affected;
    - The details of corrective action taken; and
    - The identification of any potential residual or secondary risks that must be monitored and corrected or managed.
- Environmental and Social Audit Checklist: Recommended than an environmental audit checklist be established to include the environmental and social mitigation

and management measures as developed and approved as part of the EMPr. Non-conformances to be identified, and corrective action taken where required.

40. Manner in Which Risks Will Be Dealt with In Order to Avoid Pollution or The Degradation of The Environment

It is recommended that the effectiveness and efficiency of this plan be monitored by the performance of annual audits aimed at testing the environmental awareness of employees directly and the analysis of the root causes of environmental incidents, including non-conformance to legal requirements, to determine which incidents were caused by a lack of environmental awareness and training. Recommended that TGME establish a trained and equipped emergency response team to deal with foreseeable incidents such as fires, accidents and environmental impacts and to evaluate the Environmental Awareness Plan. This evaluation to entail the auditing of the operation during the construction and operation phase once the activity has commenced.

It is recommended that Management establish and maintain procedures for the internal communication between the various levels and functions of the organisation, and receiving, documenting and responding to relevant communication from external I&APs. It is recommended that the organisation consider processes for external communication on its significant environmental aspects and record its decision. Communication is a management responsibility. All line supervisors are responsible for effective communication within their own sections. It is recommended that Environmental risks are dealt with through training and communication to ensure minimal degradation of the environment.

It is recommended that the Environmental Awareness Plan be sufficient to make all those involved with the project aware of those risks that may occur as well as the necessary mitigation required to minimise these risks. TGME and its contractors to take the Environmental Awareness Plan seriously in order to show that they are sensitive to the environment's well–being, empowerment of the local people and returning the land to appropriate use once the reclamation activities have been completed.

Recommended that Non-compliance be dealt with by the SHE and site manager on a case-to-case basis. Secondary offenders or serious offences may be dealt with immediately, and where necessary disciplinary hearings and suspension to be considered.

41. Specific information required by the Competent Authority

All information committed to in the scoping report and as requested by the DMRE to date has been incorporated in the EIA/EMPr.

The financial provision for the environmental rehabilitation and closure requirements of mining operations is governed by NEMA, as amended, which provides in Section 24P that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision will be reviewed annually as required by the DMRE.

42. Undertaking

The EAP herewith confirms

a) the correctness of the information provided in the reports

b) the inclusion of comments and inputs from stakeholders and I&APs ;

c) the inclusion of inputs and recommendations from the specialist reports where relevant; and

d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed;

Signature of the Environmental Assessment Practitioner

Batho Earth Social and Environmental Consulting

Name of company

Date

Undertaking by the client:

Herewith I, the person whose name and identity number is stated below, confirm that I am the person authorised to act as representative of the applicant in terms of the resolution submitted with the application, and confirm that the above report comprises EIA and EMP compiled in accordance with the guideline on the Departments official website and the directive in terms of sections 29 and 39 (5) in that regard, and the applicant undertakes to execute the Environmental management plan as proposed.

Full Names and Surname

Identity Number

Designation

Signature

Date

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APPENDIX 3: NEWSPAPER ADVERTISEMENT

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Appendix 4: Social Economic Assessment

Appendix 5: Soil, Land Use and Land Capability Assessment

Appendix 6: Floral Terrestrial Ecological Assessment

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Appendix 8: Heritage Impact Assessment

Appendix 9: Freshwater Ecological Assessment

Appendix 10: Hydrology and Freshwater Assessment

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