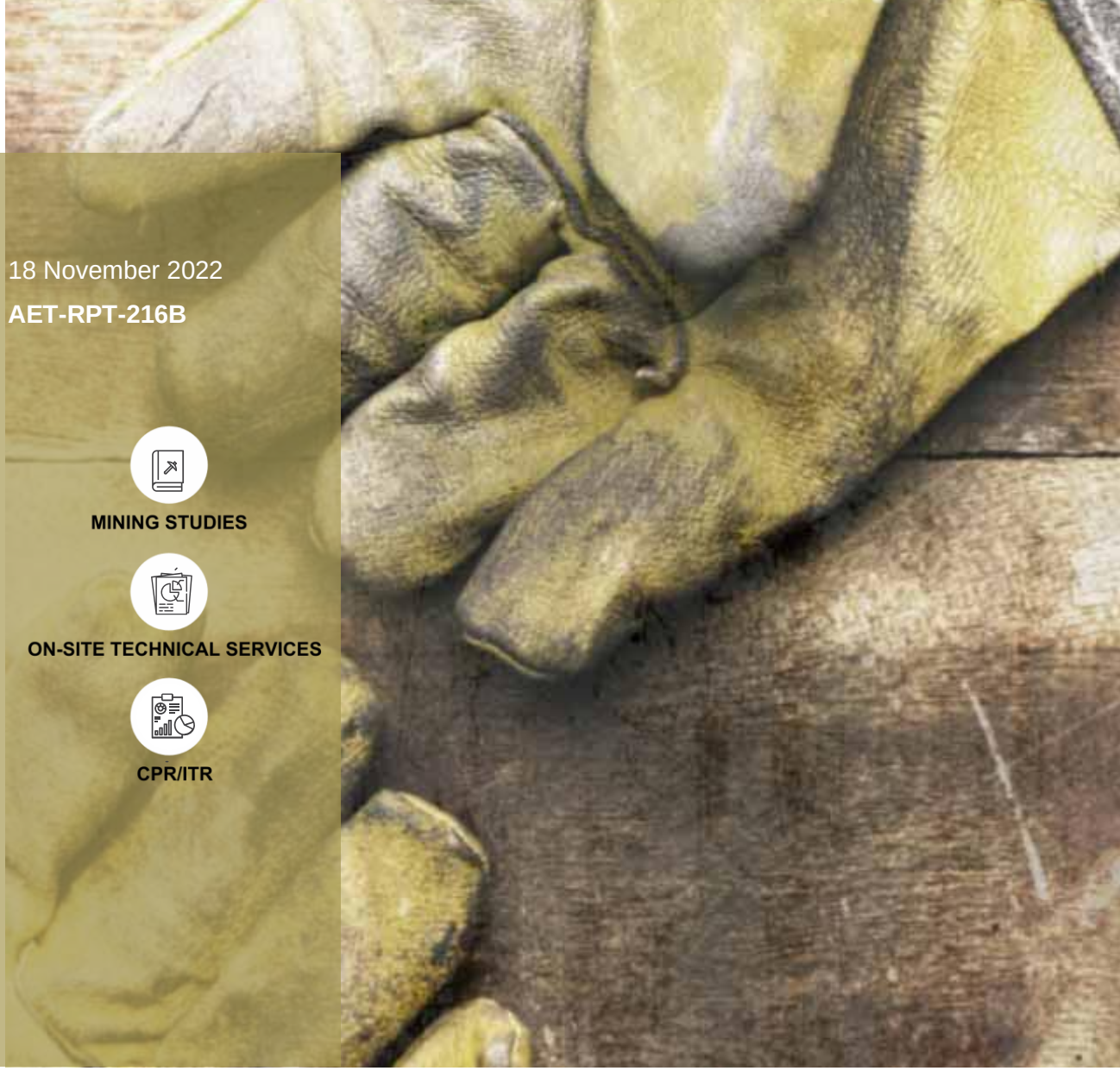

Date: 18 November 2022

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MINING STUDIES

ON-SITE TECHNICAL SERVICES

CPR/ITR

Technical Report

Draft scoping report for Kameelhoek mine, Postmasburg, Northern Cape Province

For: Essential Prospects 101 (Pty) Ltd

Prepared by: Ukwazi Mining Studies (Pty) Ltd

UKWAZI advisory

www.ukwazi.com

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

DRAFT SCOPING REPORT FOR KAMEELHOEK MINE, POSTMASBURG, NORTHERN CAPE PROVINCE

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998) AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT (ACT 59 OF 2008) IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED)

Name of Applicant: Essential Prospects 101 (Pty) Ltd

Postal address: 151 Empire Place, Sandhurst, Sandton, 2146

Physical address: 151 Empire Place, Sandhurst, Sandton, 2146

File reference number SAMRAD: NC30/5/1/2/2/10088 MR

PROTECTION OF PERSONAL INFORMATION ACT NOTICE:

In compliance with the Protection of Personal Information Act, No. 37067 of 26 November 2013, any personal information provided herein has been provided exclusively for use as part of the public participation registration process, and may therefore not be utilised for any purpose, other than that for which it was provided. No additional copies may be made of documents containing personal information unless permission has been obtained from the owner of said information. All documentation containing personal information must be destroyed as soon as the purpose for which the information was collected has run out.

PLEASE NOTE:

The outline of this report was compiled in terms of the official Environmental Impact Assessment ("EIA") & Environmental Management Programme ("EMPR) report template by the Department of Mineral Resources and Energy ("DMRE"). Where repetition occurs as a result of the template being used, the relevant information will be cross referenced. An executive summary of the most important aspects of the report is provided in order to assist the reader.

NOTICE FROM THE DMRE:

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

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

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a 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 ("EAP") must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE SCOPING PROCESS

1) The objective of the scoping process is to, through a consultative process—

(a) identify the relevant policies and legislation relevant to the activity;
(b) motivate 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 and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
(d) identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
(e) identify the key issues to be addressed in the assessment phase;
(f) agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
(g) identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

Executive summary

1. Introduction

Essential Prospects 101 (Pty) Ltd intends to develop an iron and manganese ore mining operation near Postmasburg in the Northern Cape Province of South Africa. A mining right application and environmental authorisation process was undertaken in 2015 for the proposed Kameelhoek Mine. Essential Prospects was awarded an environmental authorisation on 12 December 2016, while the mining right was granted on 11 September 2018. Construction on the mine has not yet commenced.

Changes to the mine layout and design that received environmental authorisation in 2016 is now proposed which requires that a full scoping and environmental impact assessment process is followed to obtain the necessary authorisations. The scoping & EIA process will be undertaken in terms of the National Environmental Management Act (Act no. 107 of 1998) ("NEMA") read with the EIA Regulations, 2014 (GNR 982 of 4 December 2014, as amended), as well as the National Water Act (Act 36 of 1998) ("NWA"). Prior to the development of the project Essential Prospects will have to acquire the necessary environmental authorisation, and relevant licences and/or permits to commence with the proposed project.

2. Project description

The proposed project will mine iron and manganese ore. During the first two years of the life of mine the target will be to mostly mine high-grade ore sources (A+, A and B types) located to the south of the mining right area. The planned on-site processing plant (for the processing of lower C grade ores) is scheduled to be constructed during this time. The A+ grade ROM material will be crushed (on-site) and transported to Kolomela mine as direct shipping ore. All A and B grade ROM material will be crushed and transported to Sishen mine for further processing. All C grade material will be mined and stockpiled during the first two years and then processed at the on-site processing plant. The proposed beneficiation plant will be configured to process both Fe ore and Mn ore through the same facility and will allow for the processing of ore from external sources for toll processing.

The LOM is planned for 12 years, after which direct mine rehabilitation and closure activities is scheduled to be completed over a period of approximately two years.

As stated above, changes to the mine layout and design that received EA in 2016 is proposed that requires that a full scoping and EIA process is followed to obtain the necessary authorisations. Construction on the mine has not yet commenced.

Table 6 below provides a summary of the main variances between the project description included in the 2015 EIA vs what is proposed now.

Table 1: Project description variances between the project approved in the 2015 EIA vs what is proposed now.

Aspect	Project description in 2015 EIA	Project proposed
On-site plant	Modular crushing and screening plant (only)	Beneficiation plant that includes crushing, screening, grinding, milling and high-intensity magnetic separation circuits
Tailings	No provision for tailings production or disposal	Tailings to be produced by the beneficiation plant to be disposed on site
Mine residue disposal	Waste rock dumps with a maximum footprint of 5 hectares	Two WRDs with a combined footprint of 28 hectares and one co-disposal facility for the combined disposal of waste rock and tailings of 19 hectares
Production rate	36 000 tonnes iron ore per month, 2 000t manganese per month	50 000 to 54 000 ore tonnes per month 100 000 to 125 000 waste tpm

Due to the changes mentioned above, the mine layout will change from what was approved in 2016, which requires authorisation from the Department of Mineral Resource and Energy. A waste management licence in terms of the National Environmental Management Waste Act (Act 59 of 2008) is required for the disposal of mine residue. This was not a requirement at the time when the EA application for the project was submitted in 2015.

The main infrastructure requirements for the mine include:

- Open pits
- Access roads, internal roads and service roads
- Eskom power distribution lines and sub-station
- Pipelines
- Perimeter fencing and access control
- Administration offices, change houses, workshops and wash bays

- ROM crusher
- Process plant, including crushing, screening, grinding, milling and high-intensity magnetic separation circuits
- Topsoil stockpiles
- Mine residue facilities (two waste rock facilities and one combined co-disposal facility for tailings and waste rock)
- ROM and product stockpiles
- Pollution control dams
- Sewage treatment plant
- Salvage yard.

3. Project locality

The Kameelhoek mine project is located in the Northern Cape approximately 15 kilometres ("km") west of the town of Postmasburg on the remainder of the farm Kameelhoek number 478 and portion 1 of the farm Kameelhoek 477. The site is situated in the Tsantsabane Local Municipality and ZF Mgcawu District Municipality.

Approximate coordinates for the centre of the site are: Lat: - 28.313391°; Long: 22.884385°.

4. Authorisations/licences required

As part of the planning phase of the project, the following authorisations/licenses must be obtained from the relevant government departments:

1. **Environmental Authorisation:** an Environmental Impact Assessment ("EIA") in terms of NEMA read with the EIA Regulations, 2014 (GNR 982 of 4 December 2014 as amended). Listed activities applied for: Activities 9, 11, 12, 14, 19, 21D and 24 of GNR 983; Activities 6 and 15 of GNR 984.
2. **Waste Management Licence:** in terms of section 20 of the NEMWA for waste management activities as listed in GNR 921 of 29 November 2013 (as amended): Activities 10 and 11 of Category B.
3. **Water Use Licence:** the project will entail the undertaking of water uses as listed in section 21 of the NWA for 21(a), 21(b), 21(c), 21(g), 21(i) and 21(j) water uses.

5. Environmental baseline

A summary of the baseline environment is provided below. A detailed baseline description is provided in the scoping report.

5.1. Climate

Postmasburg is located within a low rainfall area with a mean annual rainfall of approximately 285mm. Rainfall is highly unpredictable with most rainfall occurring between November and April. The rainfall usually falls as a result of thunderstorms when tropical thunderstorm activity extends southwards over the Kalahari. Mean annual evaporation (2 450mm) is higher than annual rainfall, which results in a major net moisture deficit of almost 2 000mm throughout the year.

Temperature data from the Kapstevel monitoring station 8.5 km south of the site for the period 2019 to 2020 shows that temperatures range between -7°C and 38°C. The highest temperatures occurred in December and the lowest in July. During the day, temperatures increase to reach maximum at around 14:00 in the afternoon. Ambient air temperatures decrease to reach a minimum at around 06:00 i.e., just before sunrise.

During the 2019 to 2020 period, the wind field at the Kapstevel monitoring station was dominated by winds from the north. Calm conditions occurred 10.5% of the time, with average wind speed of 2.7m/s. Wind speeds decreased during night-time conditions with an increase in calms to 21.4%.

5.2. Topography

The topography of the study area is characterised by level plains with some relief, and hills or ridges. The study area comprises mostly plains with north south orientated hilly terrain in the central and western parts. The altitude ranges from 1 200m to 1 270m above sea level on the plains, to 1 290m to 1 300m on the hill tops. The mining rights area drains from the north to the south with a prominent ridgeline in the western part of the site.

5.3. Land types, soil and land capability

The land capability of the site and surrounds predominantly consist of very low to low land capability and is only suitable for wilderness or grazing. Most of the site is low shrubland that is sparsely vegetated with a low grazing potential.

The largest part of the site is marked by shallow sand deposits or rock on the surface. Glenrosa, Hutton and Coega soil forms are dominant with large areas occupied by rock outcrops.

5.4. Biodiversity

5.4.1. Critical biodiversity areas

The Soutloop in the west of the mining rights area and its associated buffer comprise of Critical Biodiversity Areas One ("CBA1"). No development is proposed in this area. Much of the central parts of Kameelhoek comprise of ESAs, while the remainder of the study area comprise of Other Natural Areas. No protected areas occur in or near the study site.

5.4.2. Broad and fine scale vegetation patterns

The study area falls within the Savanna Biome. The site is represented by two broad- scale vegetation units, i.e., Postmasburg Thornveld and Kuruman Mountain Bushveld. This vegetation map however does not reflect the true character of the site, because it has not been mapped at a very fine scale. Therefore, field-based classification of small-scale vegetation patterns were undertaken by the project ecologist. The following distinct vegetation communities were identified and is described further in the scoping report:

1. *Vachellia erioloba - Stipagrostis uniplumis* open woodland on red sand
2. *Senegalia mellifera - Aristida diffusa* open shrubland on rocky soil
3. *Pentzia incana - Enneapogon desvauxii* dwarf shrubland on calcrete
4. *Senegalia mellifera - Euclea crispa* shrubland on rocky hills
5. *Eragrostis truncata* dominated ephemeral stream beds
6. Ephemeral pans

Three protected tree species namely *Vachellia erioloba, Vachellia haematoxylon* and *Boscia albitrunca* can be found on site. A number of other protected species in terms of Schedule 1 and 2 of the Northern Cape Nature Conservation Act (Act No. 9 of 2009) ("NCNCA") can also be found on site.

5.4.3. Mammals

As many as 53 terrestrial mammals and seven bat species have been recorded in the region. Six listed terrestrial mammal species and two listed bat species potentially occur in the area. Aardvark burrows were observed in the open woodland on red sand. The African Straw-coloured Fruit-bat, Aardwolf, Cape Fox, Bat-eared Fox, African Striped Weasel, African Wildcat, Black-footed cat, Honey Badger, Striped Polecat and South African Hedgehog all have a high chance of occurring on site. The Littledale's Whistling Rat has a low potential to occur on site. Temminck's Ground Pangolin and Brown Hyaena is not expected to occur on site.

5.4.4. Reptiles

The Kameelhoek site lies within the distribution range of at least 37 reptile species. No listed species are known to occur in the area, but most reptiles of the study area are protected either according to Schedule 1 or 2 of NCNCA. Specially protected species include *Karusasaurus polyzonus* (Southern Karusa Lizard) and *Chamaeleo dilepis dilepis* (Common Flap-neck Chameleon). The Karusa Lizard is a rock- dwelling species and may potentially be associated with the hills.

5.4.5. Amphibians

Ten amphibian species are known from the region. The Giant Bull Frog (*Pyxicephalus adspersus*) is listed as Near Threatened in the Southern African Frog Atlas and is protected according to Schedule 1 of the NCNCA. The site lies within the known distribution of this species and the ephemeral pans provide ideal habitat for it on site.

No natural permanent water occurs on site that would represent suitable breeding habitats for most amphibian species, but the ephemeral stream and pans will be very important during wet periods.

5.4.6. Avifauna

The study site does not fall within or near (<150km) any of the Important Bird Areas ("IBA") defined by Birdlife South Africa. A total number of 255 bird species have been recorded from the region, of which as many as 25 are listed and classified as Vulnerable, Near Threatened, Endangered or Critically Endangered (refer to the scoping report for more information).

5.4.7. Fish

No fish are expected to occur in the ephemeral stream or pans, even when filled, mainly due to their ephemerality. Therefore, no fish species are expected to occur on site.

5.4.8. Invertebrates

Eight invertebrate species of the Northern Cape appear on the IUCN Red Data list of threatened species and are listed in Table 19. However, none of these species' distribution ranges overlap with that of the study area.

5.5. Surface water

The mining rights area is located within the D73A endorheic quaternary catchment. The non-perennial Soutloop tributary drainage runs through the north-western corner of the mining rights area and originates ±13km to the north, with its main tributaries coming from drainage lines originating in the adjacent hills. From Kameelhoek it flows southwards where it connects with the Groenwaterspruit and Skeifonteinspruit ±21km downstream. The Soutloop then meanders further south-west for ±100km, where it flows into the Orange River.

Thirty-two ephemeral pans have been identified in the study area. These are classified as natural endorheic depressions and altogether cover a total area of ±29ha. Water enters the depressions primarily through direct precipitation and overland inflow.

5.6. Hydrogeology

During April 2022, a site wide hydrocensus was conducted to verify borehole locations and monitoring points. Of the 23 boreholes surveyed, two are used for domestic use, seven for agricultural (livestock) purposes. A total of three boreholes are used for monitoring purposes and ten boreholes were abandoned/ no current use could be identified. The site is generally characterised by shallow groundwater, with levels ranging between 5mbgl and 18mbgl, especially in the Soutloop and non-impacted dolomitic aquifer zone.

The baseline water samples were evaluated based on the South African National Standards (("SANS") 241, 2015) for drinking water, and previous baseline groundwater conditions. SANS limits were only exceeded for NO_3, NH_4 and Mn in three boreholes. In general water quality at Kameelhoek is of good quality especially in the vicinity of the dolomite aquifer.

5.7. Palaeontology

No fossils were found during the field assessment by the palaeontologist, however the eastern and south-western part of the site has a high to very high palaeontological sensitivity. The dolomitic limestone that is exposed in places did not contain stromatolites (fossils), however stromatolites may be discovered in the study area when mining commences.

5.8. Heritage and cultural environment

A historic homestead and family graveyard dating back to the late 1800's is located on site. A buffer zone of more than 200m will be kept around the historic homestead and cemetery in line with the archaeologist's recommendations. Two sites with unique Late Stone Age ("LSA") artifacts were found around two pans in the north-east of the mining rights area. No development is planned in this area.

5.9. Description of the current land uses

The mining rights area is situated in a rural area, with major land uses in the region including mining and agriculture. Currently, the property is primarily used for prospecting activities, with livestock and wildlife utilising the natural pastures. The site is surrounded by mining towards the north, east (Beeshoek mine) and south-east (Kolomela mine). Existing infrastructure on site includes homesteads, farm tracks and grazing camps, while evidence of old fields and historic diggings are visible.

6. Impacts and mitigation

A list of impacts that has the potential to occur were identified in Table 30 and preliminary mitigation measures provided in Table 34. This is a requirement in terms of Appendix 2 of the 2014 EIA Regulations (as amended). The reason for including an impact statement is to identify which aspects need to be investigated further in the EIA phase by means of specialist studies and to identify mitigation measures in order to reduce the significance of the impact identified during the scoping phase.

However, take note that the preliminary impacts, mitigation measures and associated reporting are subject to being updated during the EIA phase subsequent to further and more detailed specialist studies being conducted as may be required or as new information becomes available (these being for scoping purposes at present).

7. Way forward

7.1. Final scoping report

Once the scoping phase comment period is concluded, the draft scoping report will be updated with the comments received from I&APs and the final scoping report will be submitted to the DMRE.

7.2. Specialist studies

The key issues identified during the scoping process and identified by I&APs during the public participation period will be assessed by specialist studies. The following specialist studies are currently underway or are proposed:

- Air quality impact assessment and health screening
- Climate change impact assessment
- Socio-economic impact assessment
- SLP update
- Biodiversity and wetland assessment
- Heritage assessment
- Palaeontology assessment
- Hydrogeological impact assessment, waste classification and mine water balance
- Agricultural compliance statement and hydropedological assessment
- Visual impact assessment
- Hydrology assessment and stormwater management plan
- Noise impact assessment
- Traffic impact assessment
- Geotechnical investigation.

7.3. Draft and final environmental impact assessment and environmental management programme report

Upon completion of the abovementioned specialist studies, the EIA & Environmental Management Programme Report ("EMPr") report will be compiled. The draft EIA and EMPr report will be made available to I&APs for a period of at least 30 days, whereafter the report will be updated with the comments received, finalised and submitted to the DMRE as the competent authority for consideration.

7.4. Environmental authorisation and appeal process

Once the environmental authorisation is issued all registered I&APs will be informed of the decision and provided with the opportunity to appeal should they wish to do so.

Kontak asb vir Ukwazi indien u 'n Afrikaanse opsomming benodig

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PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1. Introduction

1.1. Background

Essential Prospects 101 (Pty) Ltd ("Essential Prospects") intends to develop an iron and manganese ore mining operation near Postmasburg in the Northern Cape Province of South Africa. The Kameelhoek Mine project is located approximately 15km west of the town of Postmasburg on portion 1 of Farm 477 (Kameelhoek) and the remainder of the Farm 478, Northern Cape Region. The site is situated in the Tsantsabane Local Municipality ("TLM") and ZF Mgcawu District Municipality ("ZFMDM").

A mining right application and Environmental Authorisation ("EA") process was undertaken in 2015 for the proposed Kameelhoek Mine. Essential Prospects was awarded an EA on 12 December 2016, while the mining right ("MR") was granted on 11 September 2018 (reference number: NC30/5/1/2/2/10088 MR). Construction on the mine has not yet commenced. Changes to the mine layout and design that received EA in 2016 is now proposed which requires that a full scoping and EIA process is followed to obtain the necessary authorisations.

1.2. Terms of reference and scope of work

This report is based on the content requirements for a scoping report ("SR") as listed in Appendix 2 of the EIA Regulations 2014 (as amended) (Table 2).

Table 2: Requirements for a SR in terms of Appendix 2 of the NEMA EIA Regulations

Section of the EIA Regulations	Requirements for an Environmental Impact Report in terms of Appendix 2 of the 2017 NEMA EIA Regulations (GN R326)	Cross Reference
Appendix 2 – (2)(1)(a)	Details of - i) the EAP who prepared the report and ii) the expertise of the EAP, including a curriculum vitae.	Section 2
Appendix 2 – (2)(1)(b)	The location of the activity, including – i) the 21-digit Surveyor General code of each cadastral land parcel ii) where available, the physical address and farm name iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	Section 3 and Appendix 3
Appendix 2 - (2)(1)(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 3 and Appendix 4
Appendix 2 - (2)(1)(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 4.2
Appendix 2 - (2)(1)(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 5 and Appendix 6
Appendix 2 - (2)(1)(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 6
Appendix 2 – (2)(1)(g)	A full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including –	Section 8
	i) details of all the alternatives considered;	Section 8.1.2
	ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 9
	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;	Section 9.7
	iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 10
	v) the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and	Section 11

Section of the EIA Regulations	Requirements for an Environmental Impact Report in terms of Appendix 2 of the 2017 NEMA EIA Regulations (GN R326)		Cross Reference
		(cc) can be avoided, managed or mitigated;	
	vi)	the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Section 11.1
	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;	Section 11.2
	viii)	the possible mitigation measures that could be applied and level of residual risk;	Section 11.3
	ix)	the outcome of the site selection matrix;	Section 11.4
	x)	if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	Section 11.5
	xi)	a concluding statement indicating the preferred alternatives, including preferred location of the activity.	Section 11.6
Appendix 2 - (2)(1)(h)	A plan of study for undertaking the environmental impact assessment process to be undertaken, including-		Section 12
	i) ii)	a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity; a description of the aspects to be assessed as part of the environmental impact assessment process;	Section 12.1
	iii)	aspects to be assessed by specialists;	Section 12.2
	iv)	a description of the proposed method of assessing the environmental aspects, including aspects to be assessed by specialists;	Section 12.3
	v)	a description of the proposed method of assessing duration and significance;	Section 12.4
	vi)	an indication of the stages at which the competent authority will be consulted;	Section 12.6
	vii)	particulars of the public participation process that will be conducted during the environmental impact assessment process; and	Section 12.7
	viii)	a description of the tasks that will be undertaken as part of the environmental impact assessment process;	Section 12.8
	ix)	identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.	Section 12.9
Appendix 2 - (2)(1)(i)	An undertaking under oath or affirmation by the EAP in relation to - i) ii) iii)	the correctness of the information provided in the reports; the inclusion of comments and inputs from stakeholders and Interested & Affected Parties ("I&APs"); any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.	Section 14
Appendix 2 - (2)(1)(j)	An undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment;		Section 14
Appendix 2 - (2)(1)(k)	Where applicable, any specific information required by the competent authority; and		Section 12.10
Appendix 2 - (2)(1)(l)	Any other matter required in terms of section 24(4)(a) and (b) of the Act.		Section 12.11

2. Contact person and correspondence address

2.1. Contact details of the environmental assessment practitioner

Ukwazi Mining Studies (Pty) Ltd ("Ukwazi") assigned the environmental assessments practitioners ("EAPs") listed in Table 3 to undertake the required authorisation process for the Kameelhoek mine project.

Table 3: EAP details

Consultant Name	Designation	Contract Number	Fax Number	Email
Herman Gildenhuys	EAP	012 665 2154	012 665 1176	herman@ukwazi.com
Dr. Christine Vivier	EAP	012 665 2154	012 665 1176	christine@ukwazi.com

2.2. Expertise and qualifications of the environmental assessment practitioner

EAPs qualifications are indicated in Table 4.

Table 4: EAP qualifications and experience

Consultant Name	Qualifications	Years' Experience
Herman Gildenhuys	MSc Environmental Ecology B.Sc. Hons. Wildlife Management B.Sc. Agric Pr. Sci Nat EAPASA registered	15
Dr. Christine Vivier	PhD Environmental Management M Org Leadership MSc Medical Virology BSc Hons (Human Genetics) Pr. Sci Nat	21

2.3. Summary of the environmental assessment practitioner's past experience

Please refer to Appendix 1 for the EAPs curriculum vitae and qualifications, Appendix 2 for Ukwazi's Environmental Company Profile, and Table 4 above.

3. Description of the property

3.1. Property details

The Kameelhoek mine project is located in the Northern Cape approximately 15 kilometres ("km") west of the town of Postmasburg on the remainder of the farm Kameelhoek number 478 and portion 1 of the farm Kameelhoek 477. The site is situated in the TLM and ZFMDM.

Table 5: Property details

Property details	
Farm Name:	Portion 1 of Farm 477 (Kameelhoek) and remaining extent of Farm 478
Application area (ha)	Mining rights area: 4 638.7 hectares ("ha") Infrastructure footprint: 250 ha
Magisterial district:	ZF Mgcawu (previously Hay district)
Distance and direction from nearest town	The site is located at about 15km west of the town of Postmasburg
21-digit Surveyor General Code for each farm portion	C03100000000047700001 C03100000000047800000

Approximate coordinates for the centre of the site are:

Latitude: - 28.313391°
Longitude: 22.884385°

3.2. Locality map

The site is indicated on the locality maps in Figure 1 to Figure 3.

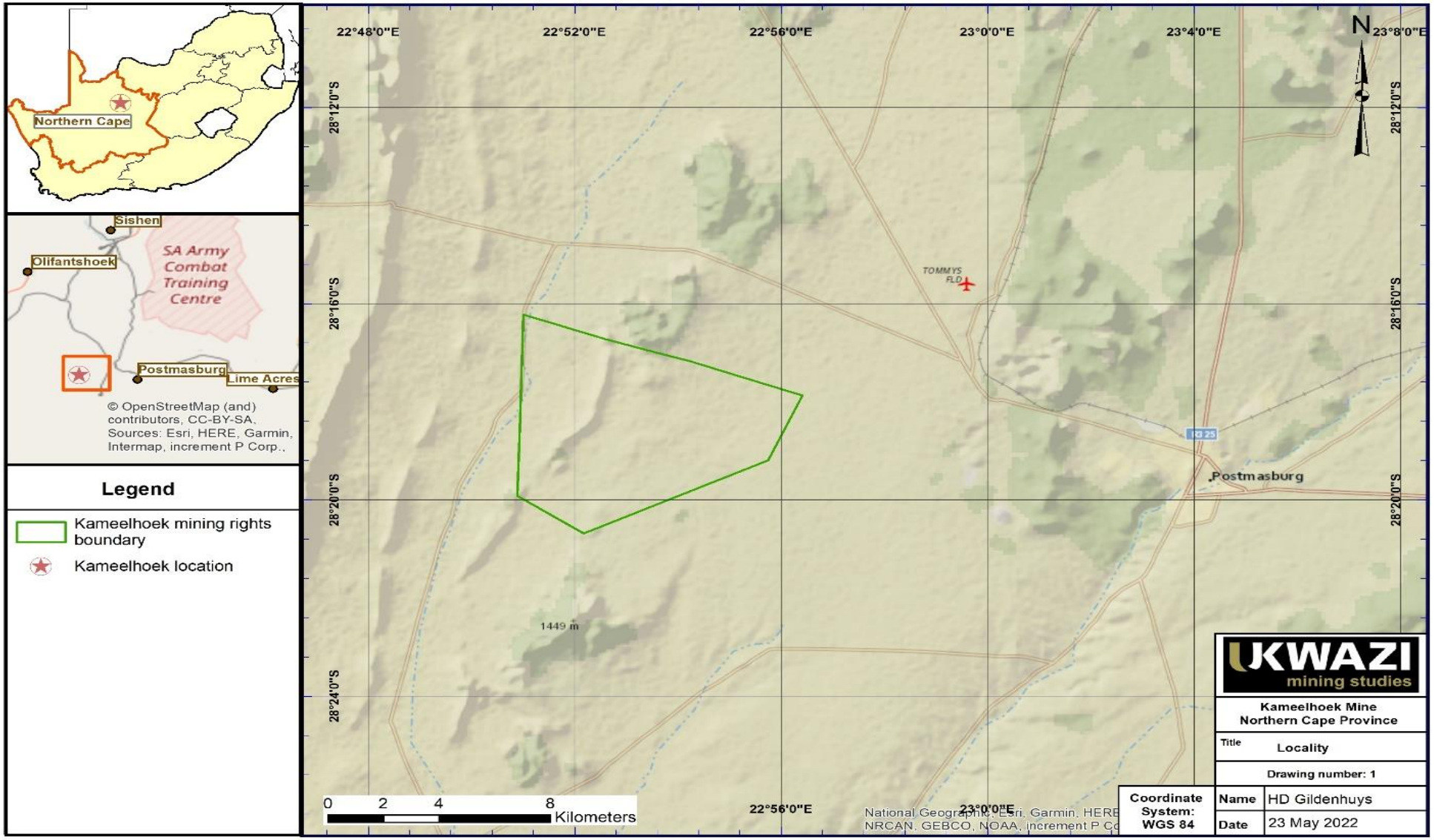

Figure 1: Kameelhoek mine regional locality map 1

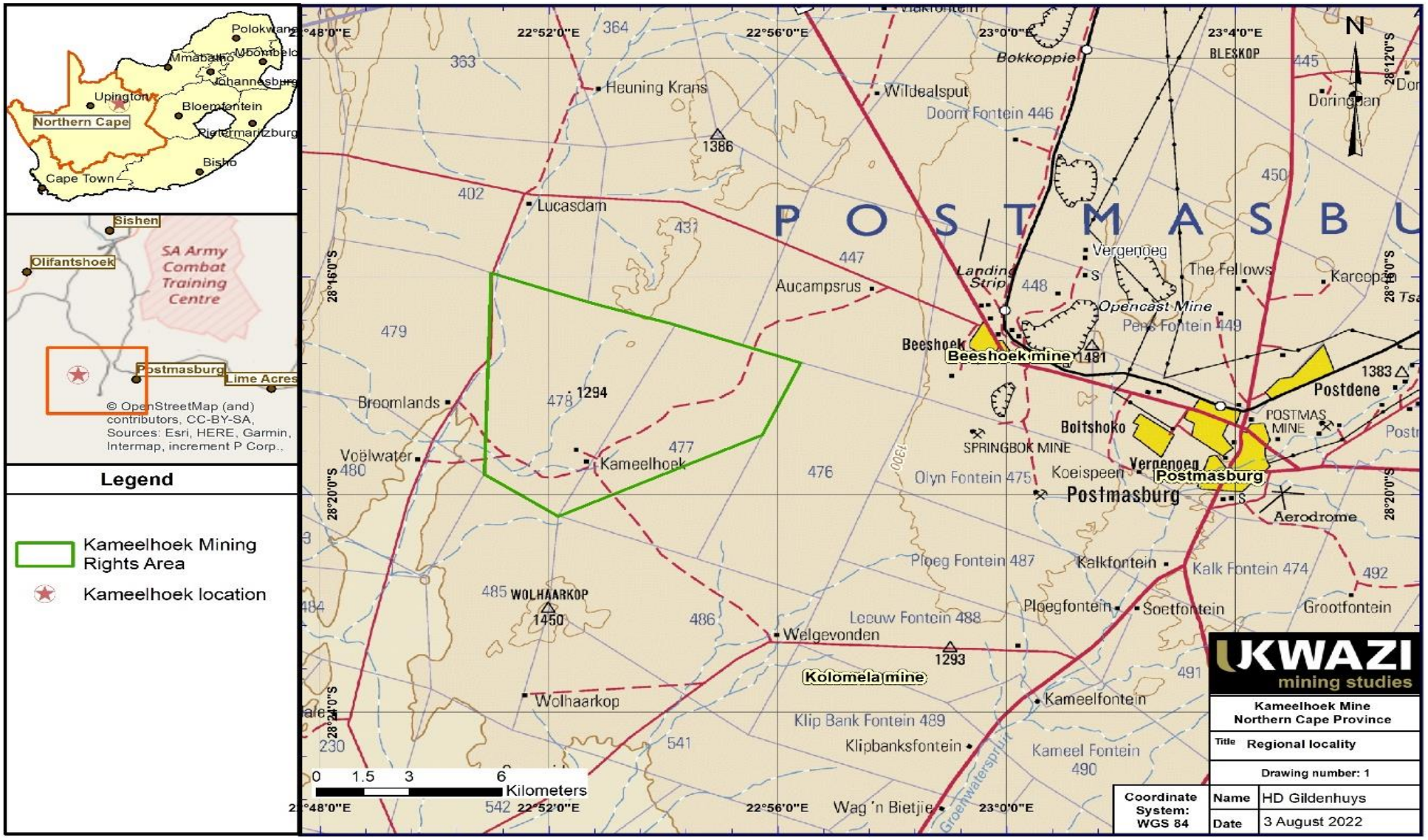

Figure 2: Kameelhoek mine regional locality map 2

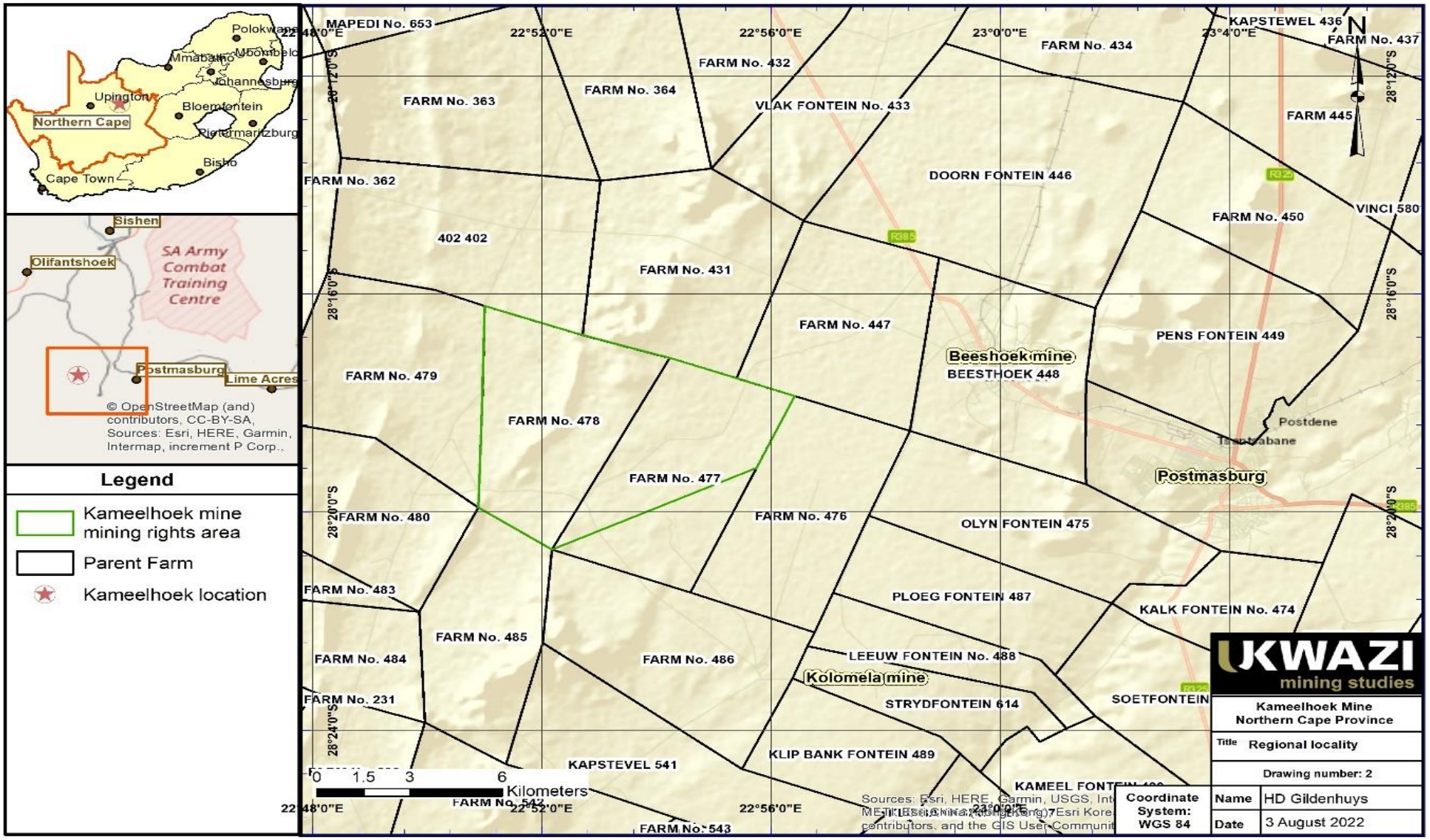

Figure 3: Locality map showing the surrounding farms

4. Description of the scope of the proposed overall activity

4.1. Project background

A mining right application and EA process was undertaken in 2015 for the proposed Kameelhoek Mine. Essential Prospects was awarded an EA on 12 December 2016, while the MR was granted on 11 September 2018 (reference number: NC30/5/1/2/2/10088 MR). Changes to the mine layout and design that received EA in 2016 is now proposed that requires that a full scoping and EIA process is followed to obtain the necessary authorisations.

Construction on the mine has not yet commenced. Table 6 below provides a summary of the main variances between the project description included in the 2015 EIA vs what is proposed now.

Table 6: Project description variances between the project approved in the 2015 EIA vs what is proposed now.

Aspect	Project description in 2015 EIA	Project proposed
On-site plant	Modular crushing and screening plant (only)	Beneficiation plant that includes crushing, screening, grinding, milling and high-intensity magnetic separation circuits
Tailings	No provision for tailings production or disposal	Tailings to be produced by the beneficiation plant to be disposed on site
Mine residue disposal	Waste rock dumps (“WRDs”) with a maximum footprint of 5 hectares (“ha”)	Two WRDs with a combined footprint of 28ha and one co-disposal facility for the combined disposal of waste rock and tailings of 19ha
Production rate	36 000 tonnes (t”) iron ore per month, 2 000t manganese per month	50 000 to 54 000 ore tonnes per month (''tpm”) 100 000 to 125 000 waste tpm

Due to the changes mentioned above, the mine layout will change from what was approved in 2016, which requires authorisation from the Department of Mineral Resource and Energy (“DMRE”). A waste management licence in terms of the National Environmental Management Waste Act (Act 59 of 2008) (“NEWMA”) is required for the disposal of mine residue. This was not a requirement at the time when the EA application for the project was submitted in 2015.

The site proposed for development is owned by Sishen Iron Ore Company (Pty) Ltd.

4.2. Listed and specified activities

4.2.1. NEMA listed activities

Listed activities from EIA listing notice 1 (GNR 983, as amended) and EIA listing notice 2 (GNR 984, as amended) that are triggered by the proposed project and that require EA are specified in Table 7.

For a preliminary site layout plan indicating the activities below refer to Appendix 4.

4.2.2. NEMWA listed activities

Listed activities from National Environmental Management: Waste Act (“NEMWA”) Category B (GNR 921, as amended) that are triggered by the proposed project and that require a waste management licence (“WML”) are specified in Table 8.

The mine residue facilities that require a WML are indicated on the preliminary site layout plan in Appendix 4.

Table 7: NEMA listed activities triggered by the proposed project

Name of activity	Applicable listing notice	Listed activity description
Pipelines for the bulk transportation of water with an internal diameter of more than 0.36m or with a throughput of more than 120 litres per second.	Listing Notice 1 (GNR 983, as amended) Activity 9	The development of infrastructure exceeding 1 000 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; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.
Facilities/infrastructure for the transmission and distribution of electricity	Listing Notice 1 (GNR 983, as amended) Activity 11	The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is- (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.
Drainage line crossing by road Open pit mining through a portion of an ephemeral pan	Listing Notice 1 (GNR 983, as amended), Activity 12	The development of- (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or **(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;-** excluding- (aa) the **development** of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of the development and where indigenous vegetation will not be cleared.
Drainage line crossing by road Open pit mining through a portion of an ephemeral pan	Listing Notice 1 (GNR 983, as amended), 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; but excluding where such infilling, depositing, dredging, excavation, removal or moving-

Name of activity	Applicable listing notice	Listed activity description
		(a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.
Storage of a dangerous good - diesel and oil storage facilities	NEMA Listing notice 1, activity 14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.
Activities which require an amendment or variation to a right or permit in terms of section 102 of the MPRDA	Listing Notice 1 (GNR 983, as amended) Activity 21D	Any activity including the operation of that activity which requires an amendment or variation to a right or permit in terms of section 102 of the Mineral and Petroleum Resources Development Act, and any other applicable activity contained in this Listing Notice or in Listing Notice 3 of 2014, required for such amendment.
Development of 15 - 20m wide access and haul roads	Listing Notice 1 (GNR 983, as amended), Activity 24	The development of a road- (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road- (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; (b) where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter.
Facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent – facilities requiring a Section 21(g) water use licence ("WUL") such as WRD, the co-disposal facility, pollution control dams & process water dam	Listing Notice 2 (GNR 984, as amended), Activity 6	The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding- (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or (iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.
Clearance of vegetation for infrastructure establishment, (mine residue facilities, topsoil stockpiles, open pits, processing plant, crusher, offices, workshops, pipelines, electrical lines, roads etc.)	Listing Notice 2 (GNR 984, as amended), Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.

Table 8: NEMWA listed activities triggered by the proposed project

Name of activity	Applicable listing notice	NEMWA listed activity description
Establishment of two WRDs and one co-disposal facility for the combined disposal of waste rock and tailings	GNR 921 – NEMWA Category B, Activity 10	The construction of a facility for a waste management activity listed in Category B of this schedule (not in isolation to associated waste management activity).
	GNR 921 – NEMWA Category B, Activity 11	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).

4.2.3. Water use licence application

A WUL will be required for the following water uses and facilities inter alia:

- Section 21(a):
  - Abstraction of dewatered groundwater from the open pits
- Section 21(b):
  - Storage of potable water in potable water tanks
- Section 21(c) & (i):
  - Activities within 500m from a wetland (ephemeral pan) and within 100m from a drainage line
- Section 21(g):
  - Disposal of overburden and tailings on mine residue facilities (one co-disposal facility for the combined storage of waste rock and tailings, and two WRDs)
  - Dust suppression using waste water
  - Storage of waste water in a process water dam/reservoir(s)
  - Storage of contact water in a pollution control dam
- Section 21(j):
  - Dewatering of open pits

4.3. Description of activities to be undertaken

4.3.1. Overview

The proposed project will mine iron ("Fe") and manganese ("Mn") ore. During the first two years of the life of mine ("LOM") the target will be to mostly mine high-grade ore sources (A+, A and B types) located to the south of the mining right area. The planned on-site processing plant (for the processing of lower C grade ores) is scheduled to be constructed during this time. The A+ grade ROM material will be crushed (on-site) and transported to Kolomela mine as direct shipping ore. All A and B grade ROM material will be crushed and transported to Sishen mine for further processing. All C grade material will be mined and stockpiled during the first two years and then processed at the on-site processing plant. The proposed beneficiation plant will be configured to process both Fe ore and Mn ore through the same facility and will allow for the processing of ore from external sources for toll processing.

The LOM is planned for 12 years, after which direct mine rehabilitation and closure activities is scheduled to be completed over a period of approximately two years.

4.3.2. Mining method

The mining method is based on conventional open pit mining (drill-blast-load-haul), specific activities include road construction, grubbing, topsoil removal, waste mining and hauling, ore mining and hauling, drilling of waste and ore material, ramp construction, road maintenance and rehabilitation earthworks activities.

4.3.2.1. Topsoil removal

Topsoil will be removed separately from other materials and stockpiled on dedicated stockpiles. Topsoil will be placed to form embankments to facilitate stormwater management and will eventually be used to cover rehabilitated areas to promote vegetation growth. Naturally occurring vegetation present at the site will be stripped along with the topsoil and loaded/ stockpiled as such. This allows for the biological material to ameliorate the soils and preserve the biological functions in the topsoil for longer periods.

4.3.2.2. Mine residue removal

The overburden (waste material) will be mined on completion of topsoil stripping. Once the topsoil is removed, the bench perimeters and drill holes are staked by the surveyor before drilling can commence. On completion of drilling, the drill holes are charged, primed and fired. The overburden waste is mined with excavators, loading into payload articulated dump trucks ("ADT"). The trucks will haul the waste to the dedicated waste dumps, where the material will be dumped and levelled as per mine design requirements.

4.3.2.3. Ore mining

The overburden, the ore (and potential overburden still present) will be drilled and blasted on benches. The bench will be drilled to elevation, normally on a 10m bench height, and blasted as a package. Blasted material will be selectively loaded with excavators, loading payload ADT's.

Some ore areas will require selective mining in such a way as to reduce, to a practical minimum, both the amount of dilution resulting from the presence of low-grade ore and waste material. Ore loading will generally be overseen by personnel from the grade control department. The grade control department will indicate the boundaries between ore and waste and provide the mining contractor with a "dig plan" indicating:

- The areas indicated as ore and waste

- The destination of the different material areas
- The direction of excavation required.

4.3.2.4. Stockpiling and dumping

The mined ore will be delivered to the ROM stockpile area, with the waste material stockpiled on the dedicated mine residue facilities. Waste material and any low-grade material (less than 40%Fe) will be dumped and formed into dedicated mine residue facilities. Where edge tipping is to be carried out, dumps and stockpiles will have a berm constructed and the dump or stockpile surface shall be inclined upwards towards the berm.

4.3.3. List of products

The Kameelhoek project will produce merchant Fe ore products as its primary source of revenue, however the product suite will in future be expanded to include Mn ore products. The high Fe content of the Mn ores at Kameelhoek makes it more suitable for the production of chemical-grade Mn concentrates targeting the markets for electrolytical manganese metal ("EMM") and high-purity manganese sulphate monohydrate ("HPMSM").

Fe ore concentrate and Mn ore concentrate will be produced through the same on-site beneficiation plant at Kameelhoek on a batch basis once sufficient feedstock per ore type is available for a continuous five-day production run.

4.3.4. Beneficiation

4.3.4.1. Iron ore beneficiation

4.3.4.1.1. Crushing and screening

A+-, A- and B-grade ROM ores are suitable as feedstocks to the Fe ore processing plants of existing local mining operations. These products will be crushed on-site at Kameelhoek to make it suitable for road logistics, with a maximum top size of 170mm, and transported to the following points of sale at the Northern Cape operations of Kumba Iron Ore:

- A^+- grade ROM will be sold as feedstock to the existing direct shipping out ("DSO") plant at the Kolomela mine
- A - grade ROM will augment the feedstock to the existing dense medium separation ("DMS") plant at Sishen mine
- B - grade ROM will be transported to Sishen mine but used as feedstock to the existing jig beneficiation plant.

4.3.4.1.2. On-site beneficiation

There is no existing regional beneficiation facility capable of commercially processing low-grade Fe ore feedstocks (40.0% Fe to 54.9% Fe). As this material comprises the bulk of the Kameelhoek Mineral Resource, the project will develop an on-site crushing, milling and magnetic separation plant to produce export-grade Fe ore concentrate from low-grade ore. This beneficiation plant will be capable of accepting Fe ore feedstocks for toll processing from external sources, or processing any unsold A+-, A and B-grade ROM to a 66% Fe export-grade concentrate.

Fe ore concentrate will be produced as follows:

- 66.0% Fe concentrate for the export market, or alternatively
- 64.5% Fe iron ore fines blending concentrate for the domestic market.

Whilst the primary focus is the production of export-grade concentrate, the option exists of producing a blending concentrate at a higher yield through the same beneficiation plant. This product will be sold to local producers of Fe ore, targeting primarily those with take-or-pay logistics agreements with Transnet on the Saldanha Iron Ore Export Channel, as a blending feedstock to augment their sinter-feed fines volumes and/or qualities. This niche market for the 64.5% Fe blending concentrates is expected to attract a price premium which will offset the lower Fe content revenue compared to the 66% Fe concentrate.

4.3.4.2. Manganese ore beneficiation

The low Mn:Fe ratio and high silicon dioxide ("SiO_2") content of the Kameelhoek Mn ores limit its use in ferroalloy production to the saturated market of silicomanganese ("SiMn"). However, the low-carbonate Mn ore is a suitable feedstock for the downstream leaching, solvent/ liquid extraction and electrowinning processes required for battery-grade HPMSM and EMM production. Strong growth in the HPMSM and EMM markets are foreseen, linked to the rising demand for electric vehicles, will drive future demand for chemical-grade Mn concentrate.

Economic Mn ore mined at Kameelhoek will be beneficiated post milling using high-intensity wet magnetic separation techniques. Whilst the mineralogy of the ore does not support any change in the Mn:Fe ratio through physical separation, a reduction in the SiO_2 product content will be achieved.

The proposed beneficiation plant is configured to process both Fe ore and Mn ore through the same facility on a batch basis without product cross-contamination. The facility allows for processing of Mn ores from external sources for toll processing.

4.3.5. Market for each specific product

4.3.5.1. Iron ore market

Fe ore will be sold as crushed ROM products to a local offtake client, and as a beneficiated concentrate product into the domestic and international markets, specifically:

- A+- grade (≥65% Fe) ROM, post primary crushing and prior to minerals beneficiation, is planned to be sold locally to the DSO operations of Kumba Iron Ore at the Kolomela mine
- A - grade (60.0% Fe to 64.9% Fe) and B-grade (55.0% Fe to 59.9% Fe) ROM, post primary crushing and prior to minerals beneficiation, is planned to be sold locally to the iron ore processing facilities of Kumba Iron Ore at the Sishen mine
- Concentrate product (66.0% Fe) and produced from low-grade ROM feedstock (40.0% Fe to 54.9% Fe) through an on-site minerals' beneficiation plant, will be sold to the seaborne export market.

In addition to the negotiated product offtake customers, local and regional market development opportunities will be pursued inclusive of:

- The provision of toll treatment capacity for externally mined lower-grade (≥40% Fe) ROM ore and for the coarse, fine and slimes tailings arising from the minerals beneficiation activities of existing local Fe ore mining operations
- The domestic supply of concentrates to
  - Domestic primary steelmaking operations (e.g., ArcelorMittal) as a high-grade sinter blending product
  - Existing local export mining operations (Kumba Iron Ore, Assmang, Afrimat) as a niche blending feedstock to augment their fine ore production volumes and qualities
  - Nascent greenfields Fe ore pellet producers, envisaged to emerge in South Africa by 2025 to 2030 to replace depleting domestic lump Fe ore reserves and to unlock the transition to metallic Fe production through environmentally friendly pyrometallurgical processing.

4.3.5.2. Manganese ore market

It is envisaged that chemical-grade Mn concentrate will be produced in the future by harnessing excess capacity in the on-site beneficiation plant at Kameelhoek. The Mn concentrate will target the domestic and international markets.

4.3.6. Surface infrastructure

The main infrastructure required to facilitate and sustain the planned mining and processing activities are:

- Open pits
- Access roads, internal roads and service roads
- Eskom power distribution lines and sub-station
- Pipelines
- Perimeter fencing and access control
- Administration offices, change houses, workshops and wash bays
- ROM crusher
- Process plant, including crushing, screening, grinding, milling and high-intensity magnetic separation circuits
- Topsoil stockpiles
- Mine residue facilities (two waste rock facilities and one combined co-disposal facility for tailings and waste rock)
- ROM and product stockpiles
- Pollution control dams
- Sewage treatment plant
- Salvage yard.

More information regarding the surface infrastructure proposed are provided in the sections below. A mine preliminary layout plan is provided in Figure 4. Note that this layout might still be altered based on specialist findings during the EIA phase.

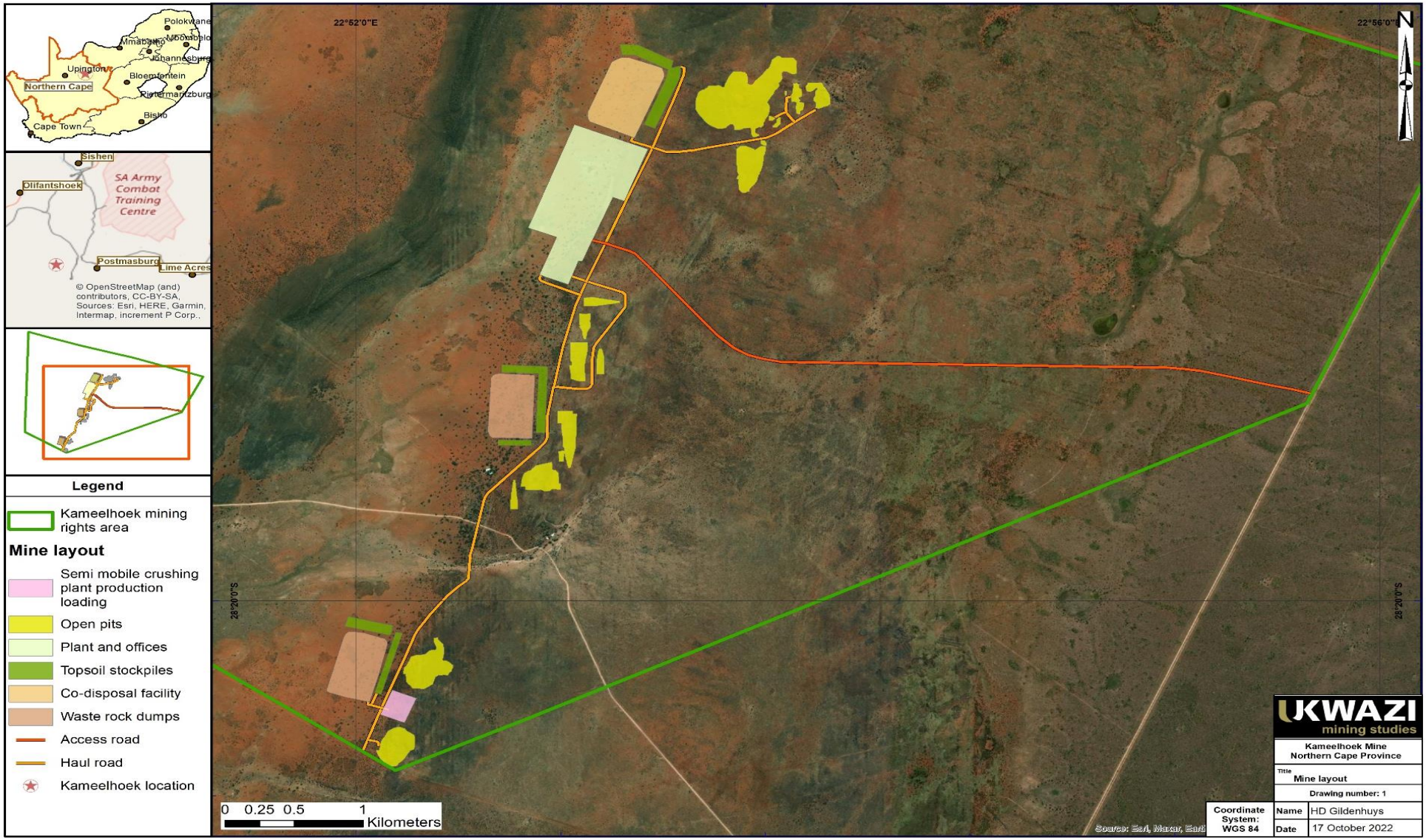

Figure 4: Proposed mine layout

4.3.6.1. Open pits

Seven target areas with Fe ore potential were investigated for the placement of open pits based on exploration holes that were previously drilled. Three areas in the centre of the mining rights area ("MRA") were selected for the placement of the open pits namely Areas 1, 3 and 5. For Area 1, two pits were designed, Area 3 consisted of nine pits, while Area 5 consisted of eight pits. Two open pits were however removed from Area 3 as they were located within a heritage buffer zone surrounding a graveyard and farmhouse.

The average pit dimensions for each pit of the three target areas are shown in Table 9.

Table 9: Pit design areas' average dimensions

Area	Pit no	Footprint [ha]	Dip width – W-E [m]	Strike length – N-S [m]	Max depth [m]
Area 1	1	5.1	300	230	50
	2	6.7	400	310	50
Area 3	1 *(Excluded from final plan due to heritage restrictions)*	1.12	230	70	20
	2	0.82	220	50	15
	3 *(Excluded from final plan due to heritage restrictions)*	0.15	60	30	3
	4	4.16	220	240	40
	5	3.92	440	125	40
	6	2.99	300	120	35
	7	0.89	200	50	15
	8	1.1	200	70	15
	9	1.18	230	70	15
Area 5	1	5.0	360	190	35
	2	0.14	40	40	2.5
	3	19.5	550	600	45
	4	0.13	40	40	2.5
	5	0.24	80	40	2.5
	6	0.1	50	15	2.5
	7	1.21	240	70	20
	8	1.94	200	140	20

Refer to Figure 5 and Figure 6 for the locations of the various pits in each area.

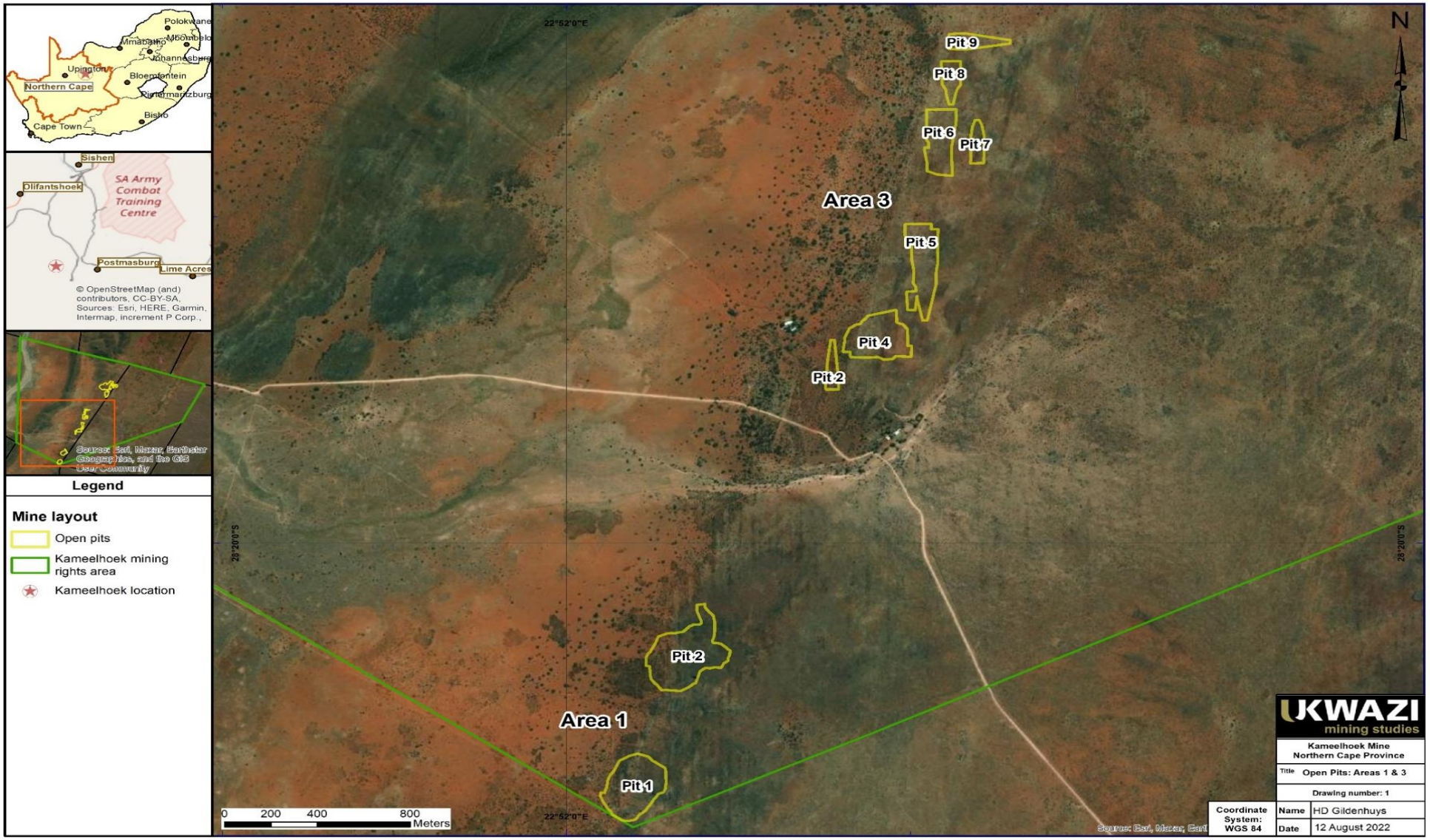

Figure 5: Area 1 and Area 3 pits

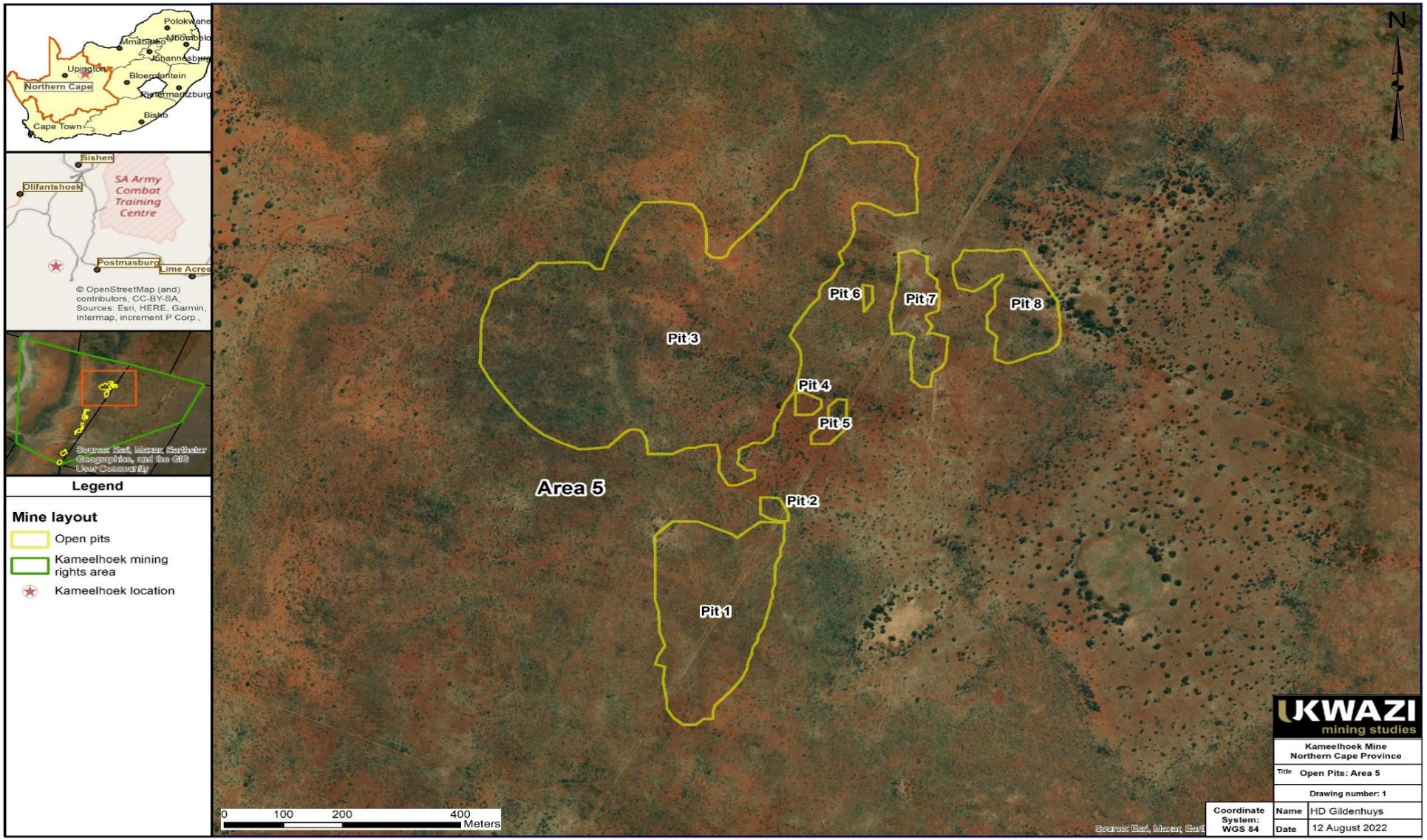

Figure 6: Area 5 pits

4.3.6.2. Mine residue facilities and topsoil stockpiles

Due to the substantial distances between the three mining areas, dedicated mine residue facilities were designed on a conceptual level for each mining area close to the designed pits. For the mine residue facilities, a bulking factor of 1.25 was assumed based on similar operations in the region. The designs were completed in accordance with the following guidelines:

- A face angle of 26°
- 10m high lifts
- Maximum height of 50m.

The southern and central mine residue facilities was designed to accommodate waste rock, while the northernmost facility will be a co-disposal facility, which is a combination of waste rock and tailings. Table 10 shows the mine residue volumes for the three facilities.

Table 10: Mine residue facility capacities

Area	Residue facility capacity [million LCM]	Footprint [ha]
Area 1	2.2	13.7
Area 3	2.4	13.8
Area 5	2.5	18.6
Total mine residue	**7.1**	**46.1**

Next to each mine residue facility, topsoil stockpiles were positioned with a maximum lift height of 3m. The proposed mine residue facilities and topsoil stockpile locations are shown in Figure 4. The facilities were designed on a conceptual level and a more detailed mine residue facility design study is currently underway.

4.3.6.3. Roads

The Kameelhoek mining rights area is proposed to be serviced by two access roads pending the necessary landowner agreements. For the first access route being considered the main plant access and primary product logistics route will be provided by a new 3km secondary mining road, feeding into the D3226 secondary provincial road via an existing privately-owned mining road running on the borders of Kolomela mine, Aucampsrus mine and the Transnet rail servitude. The D3226 intersects the main bitumen access road to Kolomela mine after a bridge crossing over the Transnet iron ore export rail line, from where access is attained near the Beeshoek mine to the provincial and national road network via the R385 road between Postmasburg and Olifantshoek.

With the exception of A+- grade ROM, all inbound and outbound logistics will be transported via the main access route, noting the following:

- A- and B-grade Fe ore ROM will be transported in 36t interlink road trucks to Sishen mine on the R385 to Postmasburg, turning north on the R325 to the N14 intersection, and then following the N14 to the Dingleton turn-off approximately 12km before Kathu. Access to Sishen mine is provided via the haul road between the Lyleveld South and North mining areas where it crosses the Dingleton road
- Fe ore concentrate will be transported in enclosed 25t bulk ore containers to Sishen mine using the same route, but will divert to the Transnet rail siding on the Fe ore export line directly south of the Lyleveld North mining area prior to entering Sishen mine
- Any Mn concentrate will be sold ex-mine and dispatched via the main access route
- Backhaul logistics will be prioritised for the inbound transportation of any external Fe and Mn ores for toll treatment at the Kameelhoek beneficiation plant as to minimise road logistics volumes.

It should be noted an agreement with the landowner will need to be obtained for the use of the existing privately-owned mining road running on the borders of Kolomela mine, Aucampsrus mine and the Transnet rail servitude. Should this option not be feasible, the second entrance road described below will also be used for inbound and outbound logistics.

The second entrance road to Kameelhoek mine will provide restricted direct access to Kumba Iron Ore's Kolomela mine situated directly to the south of the operations. Located at the southernmost point of the mine, this secondary mining road will be used for delivering A^{+}- grade Fe ore ROM to Kolomela mine, and potentially to return lower-grade Fe ore feedstocks for toll treatment through the concentrator plant. This road will also be used as the main access route for all inbound and outbound logistics in case an agreement with the private landowner cannot be reached.

The current access road to the MRA follows the existing farming access road on the western side onto a privately-owned secondary road and turning north before linking into the D3226 secondary provincial road. In future this access route will not be utilised for mining purposes, but exclusively for environmental (monitoring) and agricultural activities on the Kameelhoek MRA.

Access to the mining faces and access roads and haul roads must be constructed. Haul roads were designed to allow for the largest truck on site. Haul roads were designed around the mining pits on surface and followed the closest practical route to mine residue facility locations.

All access routes, dedicated haul roads and associated service roads must be constructed on the project area. Appropriate berms and water runoff positions will be constructed before production activities commence. All dedicated haul roads to the ROM stockpiles and WRDs requires two-way traffic, with a safety berm separating the two lanes. The haul road design was based on:

- 15m road width
- Safety berms of half the height of the largest wheel diameter on either side
- Safety dividing berm of 1.5m high in the centre of the haul road
- Dedicated two lane traffic
- Maximum inclination of 10%.

As part of the mining operation, various production ramps must be progressively cut from the pit wall as the mining horizon is lowered. The production ramps design was based on:

- 15m road width
- Safety berms of half the height of the largest wheel diameter on either side
- Safety dividing berm of 1.5m high in the centre of the ramp
- Dedicated two-lane traffic
- Maximum inclination of 10%.

Figure 7 shows a typical example of a haul road construction layout.

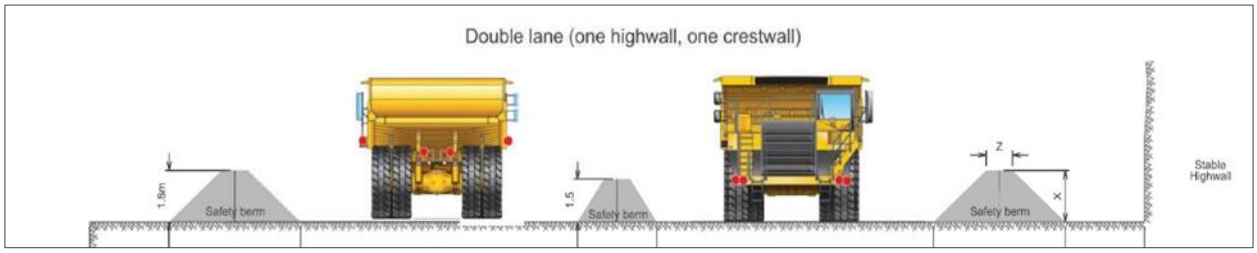

Figure 7: Typical haul road configuration

4.3.6.4. Rail

The product produced by the Kameelhoek beneficiation plant will be a 66% Fe concentrate that is destined for the export market. All other products (Fe ore ROM, Fe ore blending concentrate, chemical-grade Mn concentrate) will be sold locally to other mining operations or ex-mine to offtake clients using road-based logistics.

The seaborne Fe ore concentrate product will transported on road from the site and then by rail to:

- The existing Iron Ore Export Channel via the multi-purpose terminal at Saldanha, or
- The greenfields multi-commodity port facility envisaged to be developed at Boegoebaai in the Northern Cape.

The heavy-haul Fe ore export railway line from Sishen and Kolomela to Kenhart in the Northern Cape will be common to both logistical channels. The closest common-user railway siding on the Iron Ore Export Channel is located south of Lyleveld at the Sishen mine, approximately 96km per road from Kameelhoek.

Fe ore concentrates will be accumulated in 456 x 25t containers at the siding before train loading commences. A dust suppression surface coating will be applied to the loaded concentrates wagons. No fixed rail loading infrastructure is required for the containerised concentrate logistical operations; thus the rail loading siding can be relocated closer to Kameelhoek should a suitable facility on the Iron Ore Export Channel become available in the future.

4.3.6.5. Electricity

Beneficiation on site will consist of two sections: a semi-mobile in-pit crushing station and a fixed concentrator plant.

The in-pit crushing station will operate using electricity provided by a diesel generator. The genset and associated switchgear will be containerised to make it relocatable.
The fixed beneficiation plant, consisting of crushers, mills, high-intensity magnetic separators and filter-press dewatering systems, is an energy-intensive facility with a power consumption of around 12.9GWh per annum (21.5kWh/t feed). Combined with a limited five-day-per week operation on a two-shift production schedule, the power requirements of the fixed concentrator plant exceed the economical threshold for diesel self-generation.

A 32kVA Eskom power supply to the project area is required, augmented by a diesel genset to support critical process systems during unplanned power outages. The beneficiation plant will be designed to handle rolling planned power outages without negatively impacting the annual production throughput.

4.3.6.6. Water

The crushing, coarse screening and grinding circuits of the Kameelhoek beneficiation plant will be dry processes, with water requirements limited to dust suppression and plant washdown water only.

The fines screening, milling and high-intensity magnetic separation circuits will be full wet beneficiation processes producing Fe ore concentrate and slimes tailings streams. Both the concentrates and tailings streams will be dewatered separately through high-pressure filter press units to maximise process water recovery.

Water requirements for proposed mining and processing activities are planned to be extracted from suitable boreholes (pending regulatory applications and approvals) located at strategic positions across the MRA. Potable water will be used for change house facilities and other areas where high quality water is required. Mine water is used where possible for all industrial applications and general dust suppression.

A hydrogeological investigation is currently underway.

4.3.7. Life of mine scheduling

The LOM is planned for 12 years. The higher-grade ore in Area 1 will be mined first, followed by Area 5 and then Area 3 will be targeted later in the mine life. The C grade ore was scheduled to be stockpiled during the first two years of the LOM.

To achieve a sustainable and practical waste production profile, ore mining activities at Area 3 was delayed in the LOM schedule due to higher waste stripping requirements. Waste stripping activities in Area 3 was scheduled in conjunction with Area 5.

Figure 8 shows the total waste volume planned to be stripped per area.

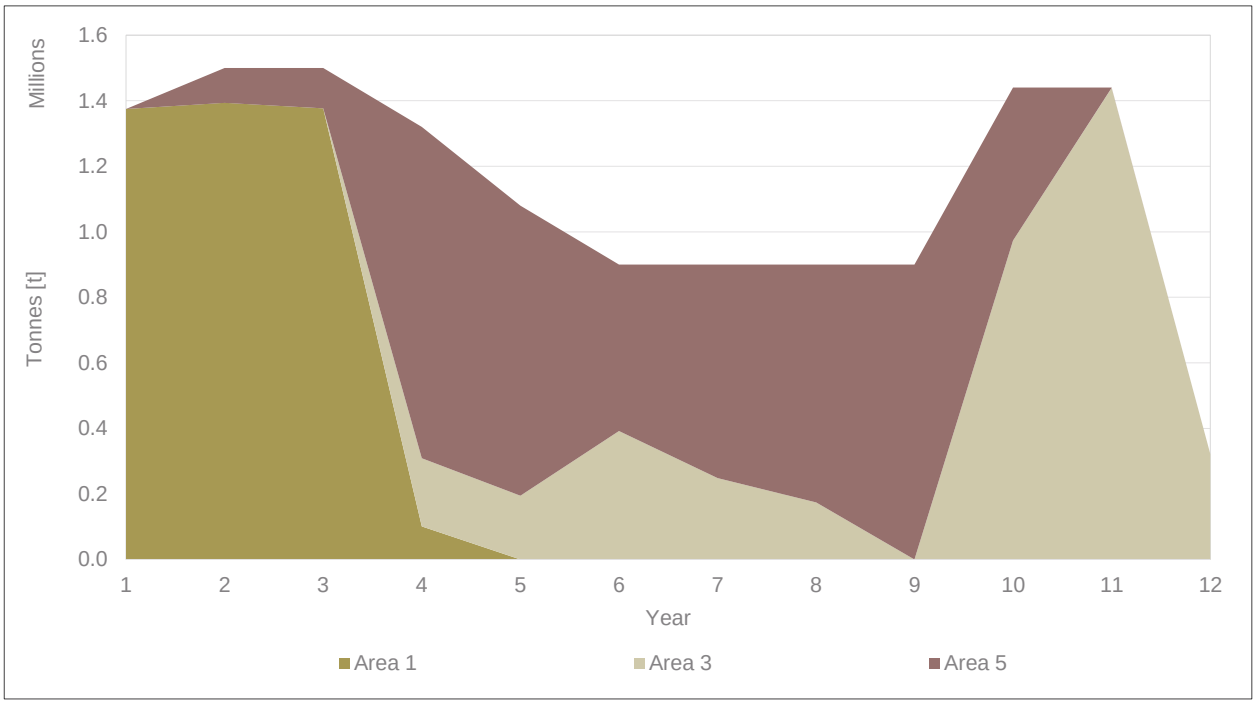

Figure 8: LOM waste stripping profile per area

The ore production per area is shown in Figure 9. Area 1 is proposed to be mined first, followed by Area 5. Area 3 is planned to be mined during the last four years of the LOM.

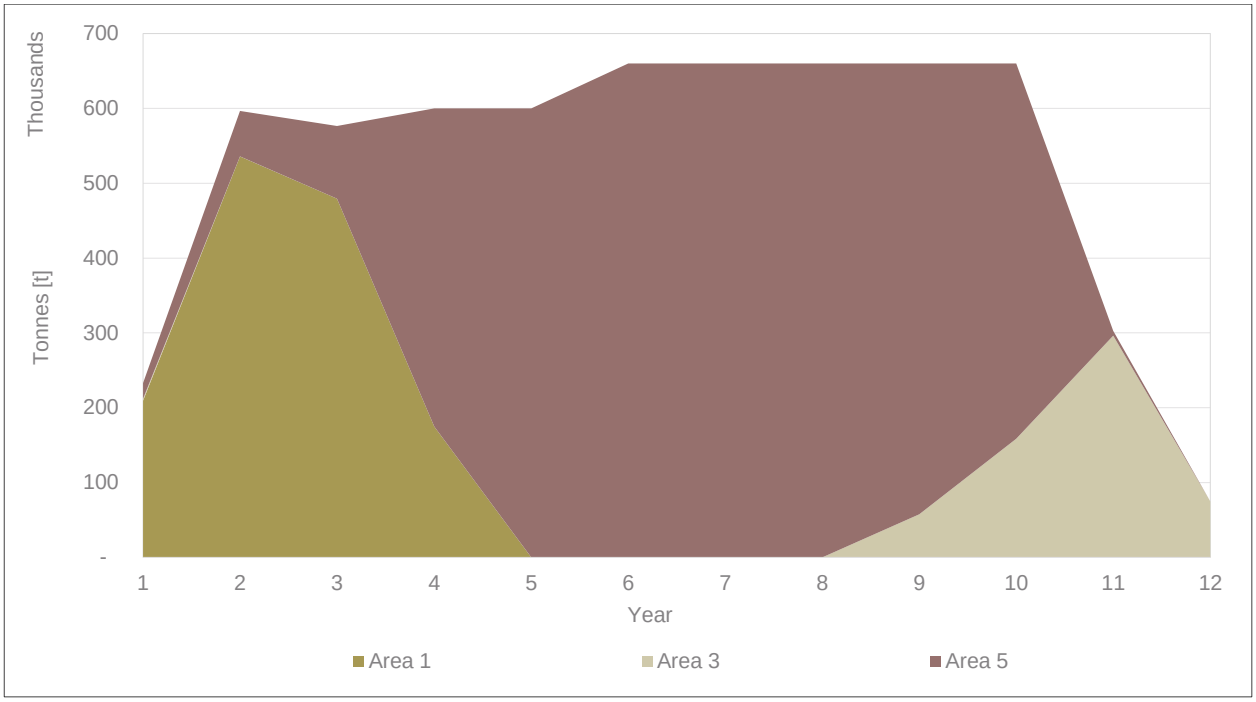

Figure 9: Scheduled LOM ROM tonnes per area

Figure 10 shows the ore types scheduled per annum. All the A+ ore is mined during the first two years, with most of the A grade ore planned to be mined during the first four years. From year 3 onwards the ore consists predominantly of the C-grade ore material.

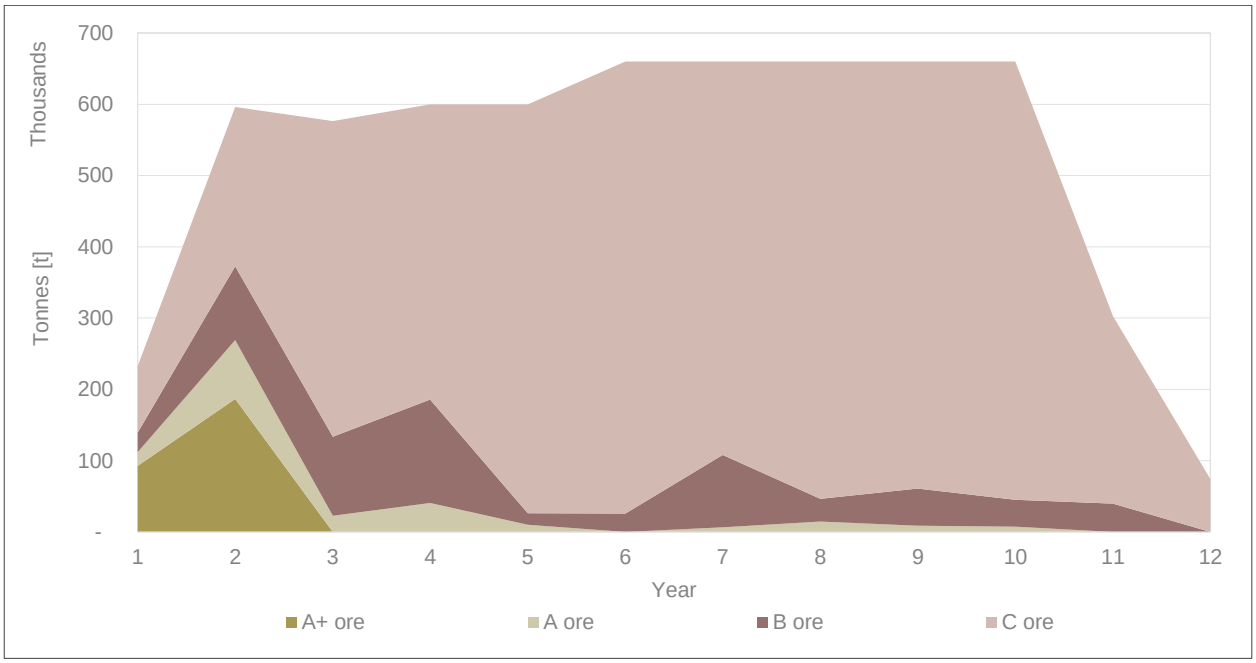

Figure 10: Ore production profile per ore type

The A+, A and B grade ore mined in Area 1 will be hauled to a nearby crusher. The C grade material will be hauled to the fixed plant located near Area 5. Area 5 ROM production accounts for more than 75% of the LOM C grade ROM ore. The process plant was located as close as possible to the mining activities of Area 5 to reduce hauling distances over the LOM.

4.3.8. Labour requirements

The mine's operating model consists of contractors conducting all mining activities. Processing operations was based on an owner operated model with an appropriate owner appointed management team overseeing the consolidated operations.

The mining contractors labour complement was estimated at 75 and the owner's team (mine management, engineering and processing) was estimated at 180, with a consolidated labour complement of 255.

5. Policy and legislative context

The following legislation, policies and guidelines were considered during the compilation of this report or will be considered with the compilation of the EIA and environmental management programme report ("EMPr"):

- The Constitution of the Republic of South Africa (Act No. 108 of 1996) ("The Constitution")
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) ("MPRDA")
- Minerals and Petroleum Resources Development Regulations, Government Notice Regulation ("GNR") 527 of 2004
- The National Environmental Management Act ("NEMA") (Act No. 107 of 1998) and Environmental Impact Assessment Regulations, 2014 (as amended) (GNR.983, GNR.984 and GNR.985, as amended)
- National Water Act (Act No 36 of 1998) ("NWA")
- Regulations on Use of Water for Mining and Related Activities aimed at the Protection of Water Resources (GNR. 704 of 1999)
- Regulations regarding the procedural requirements for Water Use Licence Application and Appeals, (GNR. 267 of 2017)
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) ("NEMAQA")
- The National Dust Control Regulations (GNR 827 of 1 November 2013)
- National Environmental Management: Waste Act (Act No. 59 of 2008) (NEMWA) and listed waste management activities (GNR 921 of 29 November 2013, as amended)
- National Norms and Standards for the Storage of Waste (GNR 926 of 29 November 2013)
- Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015 (GNR 632)
- Waste Classification and Management Regulations (GNR 634 of 23 August 2013)
- National Norms and Standards for the Assessment of Waste for Landfill Disposal (GNR 635 of 23 August 2013)
- National norms and standards for disposal of waste to landfill (GNR 636)
- National Environmental Management: Biodiversity Act (Act 10 of 2004) ("NEMBA")
- National Forests Act (Act No. 84 of 1998) ("NFA")
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003) ("NEMPAA")
- National Heritage Resources Act (Act No. 25 of 1999) ("NHRA")
- World Heritage Convention Act (Act No 49 of 1999) ("WHCA").

Refer to Appendix 6 for a more detailed description.

6. Need and desirability of the proposed activities

The legal, policy and administrative framework plays an important role in determining the potential impacts, need and desirability associated with a proposed development. The legal framework is addressed in Appendix 6 of this report. The strategic plans and frameworks relevant to the study area are evaluated below.

The need and desirability of the proposed development will be further evaluated in the socio-economic impact assessment to be compiled during the EIA phase.

6.1. Alignment with strategic plans and frameworks

6.1.1. National Development Plan

The National Development Plan 2030 ("NDP") aims to eliminate poverty and reduce inequality by 2030. The NDP outlines nine primary challenges and associated remedial actions. While South Africa's 'resource intensive economy' is listed as one of the primary challenges in the NDP, the NDP recognises the importance of mining as a key driver of

economic growth and a catalyst for economic transformation. Chapter 6 of the NDP furthermore highlights the need to activate rural economies through interventions such as a review of mining industry commitments to social investment. Capital investment in mining operations and related spin-offs associated with industries that supply the mining sector is recognised in the NDP as key driver of a diversified dynamic economy. Through employment, skills development, procurement, local economic development and other key social investment interventions outlined in its Social and Labour Plan ("SLP"), the Kameelhoek mine can contribute to the NDP goal of promoting an inclusive rural economy in Tsantsabane Local Municipality ("TLM").

6.1.2. The South African economic reconstruction and recovery plan

The outbreak of the COVID-19 pandemic in March 2020 highlighted many socio-economic vulnerabilities in South Africa. The pandemic reached South Africa during an already deepening economic crisis, leaving a trial of devastation in its wake. To address the dire effects of the pandemic, the South African Economic Reconstruction and Recovery Plan includes a programme for 'industrialization through localisation' which prioritises procurement of local goods and services. The programme prioritises support for … 'local beneficiation of minerals, the building of minerals value chains, strengthening broad-based industrialization … and identification of strategic minerals that will be designated for local beneficiation'. It will achieve this through the proposed beneficiation plant to be constructed that will be configured to process both iron and manganese. The proposed beneficiation plant will allow for the processing of ore from external sources for toll processing.

6.1.3. The DMRE Exploration Strategy for the Mining Industry of South Africa

In its Exploration Strategy for the Mining Industry of South Africa published on 14 April 2022, the DMRE identifies critical minerals and metals that are essential for responding to the shift towards a low carbon, green economy (e.g., batteries for electric vehicles, solar, wind) and digitisation amongst others. Both Mn and Fe ore are included on this list.

6.1.4. The DMRE Strategic Plan 2020-2025

The DMRE Strategic Plan recognises the critical role of the mining sector for South Africa's economic growth, job creation and transformation objectives. It notes that a lack of investment in mining, coupled with poor economic performance have impacted negatively on the mining and minerals value chain. To address the current downturn, and stimulate future growth in the sector, the DMRE, through interventions such as the Special Presidential Package, undertakes to promote revitalisation of mining towns and labour-sending areas. It recognises the importance of partnerships between the DMRE and mining companies to achieve this objective. In particular the DMRE proposes to focus on the delivery of human settlements and ensure better alignment of SLPs with the Integrated Development Plans ("IDPs") of municipalities.

The DMRE Strategic Plan furthermore recognises the role of the junior mining sector's contribution to total mining jobs and government transformation goals. The DMRE notes the importance of creating and enabling regulatory environment to support junior mining.

6.1.5. Northern Cape, Office of the Premier, Strategic plan 2020/25

To ensure alignment with various national and provincial strategic plans and goals, the Northern Cape Province Office of the Premier published a strategic plan for the 2020 to 2025 period. This strategic plan is aligned with and is intended to implement the following provincial strategic plans:

- Northern Cape Provincial Growth and Development Plan ("NCPGDP")
- Northern Cape Provincial Medium Term Strategic Framework Programme of Action ("MTSF POA") 2019-2024
- Provincial Government 5-year Implementation Plan ("5YIP").

The Northern Cape Office of the Premier Strategic plan recognises the contribution of the mining sector to the provincial economy and has therefore included mining and mineral beneficiation in its top ten list of economic drivers/ development paths.

6.1.6. Northern Cape Provincial Spatial Development Framework

The Northern Cape Provincial Development and Resource Management Plan/ Provincial Spatial Development Framework ("NCPSDF") approved 2012, is a statutory document intended to direct spatial land-use planning to promote environmental, economic, and social sustainability through sustainable development. It provides a legal basis to direct provincial government programmes and projects. It provides a framework for integrated land-use planning within the province. As noted in the NCPSDF, TLM falls within the Gamagara Corridor which is a mining belt spanning across John Taolo Gaetsewe and ZF Mgcawu (previously Siyanda) districts from Lime Acres and Danielskuil to Hotazel in the north. The primary focuses of the Gamagara Corridor is mining of Fe and Mn.

6.1.7. ZF Mgcawu District Profile 2020

The ZFMDM Profile 2020 recognised the continued contribution of the mining sector to the broader district development goals and future investment opportunities. In particular, the important contribution of mine SLPs is highlighted.

6.1.8. Tsantsabane Local Municipality Integrated Development Plan

The revised TLM Integrated Development Plan ("IDP") for the 2021/2022 period recognises the importance of mining within the municipality. The municipalities Spatial Development Framework ("SDF") and Land Use Management Scheme ("LUMS") was adopted by Council in 2015. The TLM IDP notes that the ZFMDM SDF envisions 'an exciting mix' of the following key sectors:

- Tourism, including cultural; wilderness; floristic; and river tourism ranging from the Kgalagadi International Transfrontier Park, the culture of the Riemvasmak Community, to river tourism on the mighty Orange River
- Mining and mining beneficiation
- Agriculture, including river bank vineyards and expansive stock and game farming in the Kalahari
- Renewable energy technology opportunities.

The SDF furthermore identifies the following development areas within TLM:

- Development nodes: CBD node, Sibilo shopping centre business node, Postdene business node, Boichoko/Newton Business node
- Primary movement corridors: N14 and Sishen Saldanha Railways
- Secondary movement corridors: R385 and R325
- Mining: Gamagara Mining Corridor.

As noted in the TLM IDP, the municipal area falls in the Gamagara Mining Corridor which is primarily focussed on mining of Mn and Fe ore. While the municipality is still in the process of developing and formalising its Local Economic Development ("LED") strategy, the TLM IDP notes the important role of economic (and by implication mining) activities within the Gamagara Corridor. The rich mineral wealth located within this region, and its potential for future growth in the area, is highlighted in the TLM IDP.

Strategic objectives of the TLM IDP and local priorities identified during the IDP review process are as follows listed below.

Table 11: Strategic objectives of the TLM IDP and local priorities

TLM strategic objective	IDP priority
Provision of quality basic services and infrastructure	Provision of electricity; water; sanitation; waste removal; housing; roads and storm water; public transport; municipal planning services; and infrastructure maintenance
Economic growth and development that leads to sustainable job creation	▪ Ensure a clear structural plan for the Municipality. ▪ Ensure planning processes function in accordance with set timeframes. ▪ Facilitate the use of labour-intensive approaches in the delivery of services and the building of infrastructure.
Fight poverty and build clean, healthy, safe and sustainable communities	▪ Effective implementation of the Indigent Policy. ▪ Working with the provincial department of health to provide primary health care services. ▪ Extending waste removal services and ensuring effective Municipality cleansing. ▪ Ensuring all waste water treatment works are operating optimally. ▪ Working with strategic partners such as SAPS, to address crime. ▪ Ensuring safe working environments by effective enforcement of building and health regulations. ▪ Promote viable, sustainable communities through proper zoning. ▪ Promote environmental sustainability by protecting wetlands and key open spaces.
Integrated social services for empowered and sustainable communities	Work with provincial departments to ensure development of community infrastructure such as schools and clinics is properly co-ordinated with the informal settlements upgrade programme
Foster participatory democracy and Tsantsabane principles through a caring, accessible and accountable service by	▪ Optimising effective community participation in the ward committee system. ▪ Implementing a revenue management strategy.
Promote sound governance	Publishing the outcomes of all tender processes on the municipal website
Ensure financial sustainability	▪ Review the use of contracted services. ▪ Continuing to implement the infrastructure renewal strategy and the repairs and maintenance plan.

TLM strategic objective	IDP priority
Optimal institutional transformation to ensure capacity to achieve set objectives	Review of the organizational structure to optimize the use of personnel

Drawing on research undertaken by Kumba Iron Ore Limited in 2014, amongst others, the TLM IDP records that mines in Postmasburg should do more to contribute to local procurement. The perceived lack of support for local, particularly Black African, businesses has led to mobilisation and establishment of various organisations such as the Emerging Contractors' Forum ("ECF"), Tsantsabane Black Business Chamber ("TBBC") and the Tsantsabane Local Business Forum ("TLBF").

The Kameelhoek mine will create employment opportunities for people living in TLM and the broader ZF Mgcawu District during all phases of the project. Opportunities for skills development and procurement of local goods and services will be generated as a result of the project. The project is furthermore aligned with strategic planning initiatives at a national, regional and local level.

6.1.9. National Development Plan

The National Development Plan 2030 ("NDP") aims to eliminate poverty and reduce inequality by 2030. The NDP outlines nine primary challenges and associated remedial actions. While South Africa's 'resource intensive economy' is listed as one of the primary challenges in the NDP, the NDP recognises the importance of mining as a key driver of economic growth and a catalyst for economic transformation. Chapter 6 of the NDP furthermore highlights the need to activate rural economies through interventions such as a review of mining industry commitments to social investment. Capital investment in mining operations and related spin-offs associated with industries that supply the mining sector is recognised in the NDP as key driver of a diversified dynamic economy. Through employment, skills development, procurement, local economic development and other key social investment interventions outlined in its SLP, the Kameelhoek mine can contribute to the NDP goal of promoting an inclusive rural economy in TLM.

6.2. Job creation

The proposed project will create short-term employment opportunities during the construction and decommissioning phases, and long-term employment during the operational phase. The construction phase is estimated to take approximately two years.

During the construction phase, most of the workforce will be employed by an Engineering, Procurement and Construction ("EPC") contractor. It is expected that the EPC workforce will consist primarily of unskilled, semi-skilled and skilled employees.

Procurement of local EPC and operations and maintenance ("O&M") contractors from TLM and ZFMDM will be prioritised to the extent possible. As such, employment and procurement opportunities for people already residing within TLM or the broader ZFMDM will be prioritised where practicable.

During the operational phase, the mine will operate for 24-hours per day, seven days a week, 365 days per year. The mine's operating model consists of contractors conducting all mining activities. Processing operations is based on an owner operated model with an appropriate owner appointed management team overseeing the consolidated operations. The mining contractors labour complement was estimated at 75 and the owner's team (mine management, engineering and processing) was estimated at 180, with a consolidated labour complement of 255.

7. Period for which the environmental authorisation is required

The EA is required for a period of 30 years in line with that of the MR.

8. Description of the process followed to reach the proposed preferred site

8.1. Details of alternatives considered

8.1.1. Process to assess alternatives

The EIA Regulations require that several possible proposals or alternatives for achieving the same objectives should be considered. According to Appendix 2 of the EIA Regulations 2014 (as amended), the objective of the scoping process is to (amongst others) through a consultative process:

- *identify and confirm the preferred activity and technology alternative through an identification of impacts and risks and ranking process of such impacts and risks*

- *identify and confirm the preferred site, through a detailed site selection process, which includes an identification of impacts and risks inclusive of identification of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment.*

According to Appendix 3 of the EIA Regulations the objective of the EIA process is to (amongst others), through a consultative process:

- *identify the location of the development footprint within the approved site as contemplated in the accepted scoping report 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,*
- *determine the nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives.*

Therefore, during the scoping phase the preferred development site must be identified and the activity and technology that is preferred. During the EIA phase of the project the alternatives identified during the scoping phase must be considered and assessed within the preferred site.

Various alternatives have been assessed for the project on scoping level and workshopped by means of input received from the EAP, specialists and the engineering team. The alternatives were influenced by means of discussions with authorities and considering the baseline environment.

The layout was developed using an opportunities and constraints analysis which included possible impacts on geology, terrestrial ecology, drainage lines, ephemeral pans and heritage features. Technology and layout alternatives were investigated, and the investigations will continue in the EIA phase. The alternatives will be compared to the No-Go alternative.

The following alternatives are being considered:

- Site location alternatives
  - Mine residue facility location alternatives
  - Beneficiation plant location alternatives
- Layout alternatives
  - Open pit layout alternatives
  - Haul and access road layout alternatives
- Technology alternatives
  - Tailings disposal alternatives
- No-go alternative

8.1.2. Details of all alternatives considered

8.1.2.1. Site location alternatives

8.1.2.1.1. Mine residue facility location alternatives

Two WRDs and one co-disposal facility for the joint disposal of waste rock and tailings are proposed. The initial layout placed the facilities on the eastern side of the open pits (Alternative 1). This area is however underlain by dolomitic limestone (in particular the WRD at Area 3), which from a geotechnical perspective was not ideal as further studies would be required to assess the risk of sinkhole formation and possible geotechnical instability.

The mine residue facilities are now proposed on the western side of the open pits (Alternative 2) away from the dolomitic limestone. The WRD at Area 1 and the co-disposal facility is proposed on wind-blown sand, while the WRD at Area 3 is proposed on surface limestone (Area 3). A geotechnical investigation will be undertaken during the EIA phase.

8.1.2.1.2. Beneficiation plant location alternatives

The beneficiation plant and offices were originally located on the dolomitic limestone (Alternative 1). For reasons explained above, an alternative location was sought. The layout of the plant and associated infrastructure was optimised and the footprint area was accordingly reduced from 110ha to 55ha, which allowed the infrastructure to be located in between the main haul road, the co-disposal facility, the drainage line and associated buffer zone to the west. The facility was accordingly moved to surface limestone and wind-blown sand geological formations (Alternative 2).

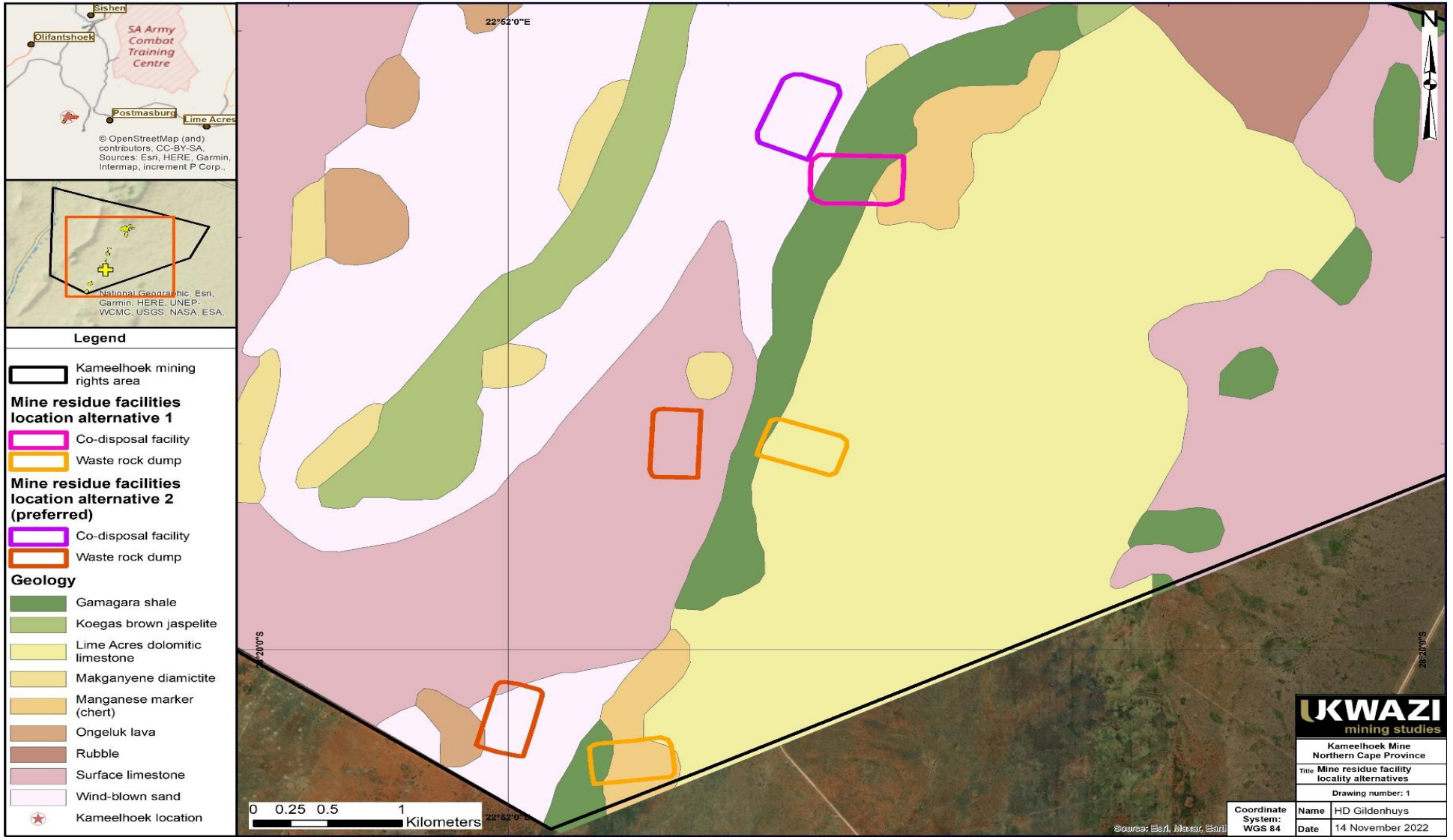

Figure 11: Mine residue facility location alternatives

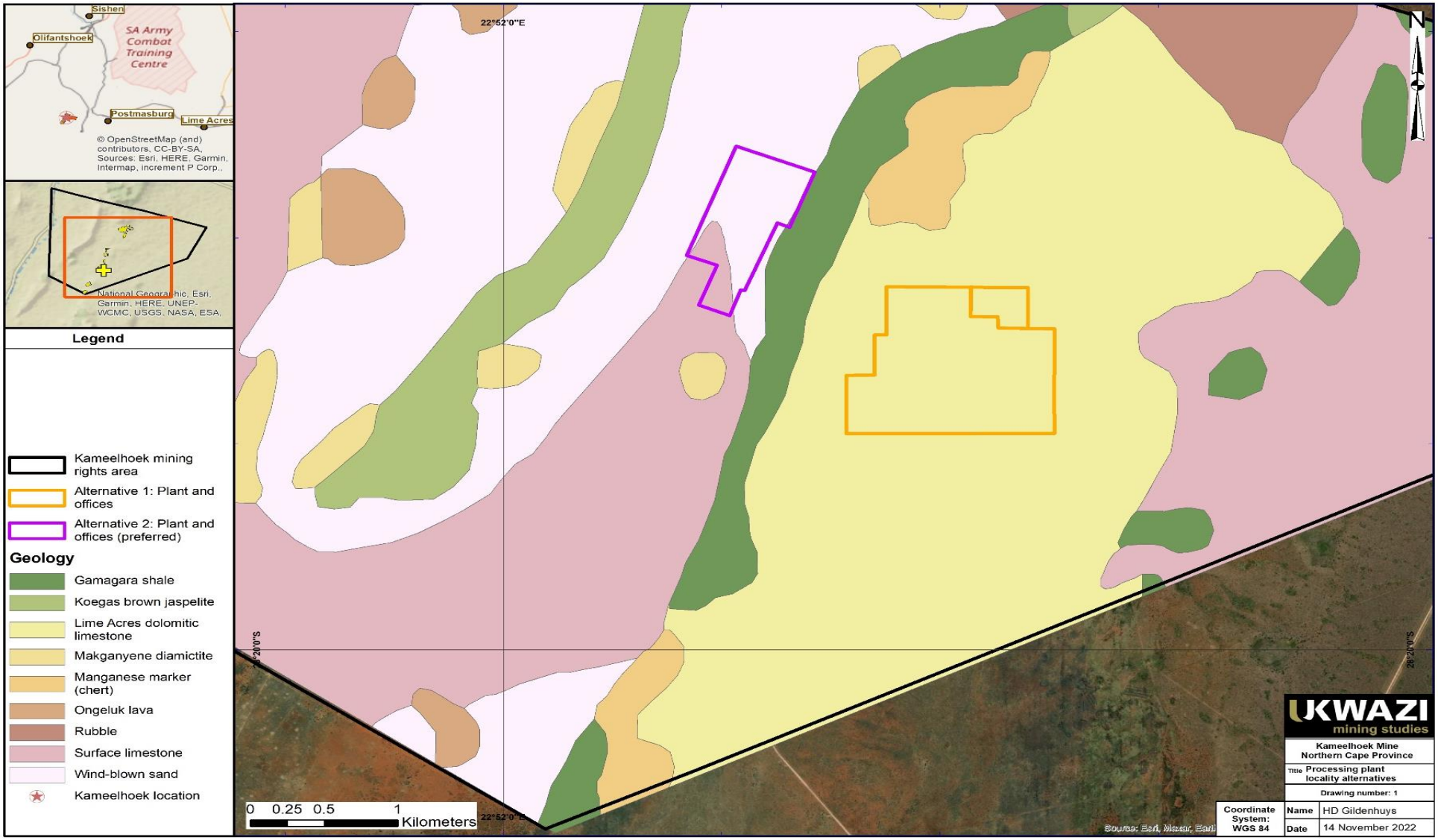

Figure 12: Processing plant location alternatives

8.1.2.2. Layout alternatives

8.1.2.2.1. Open pit alternatives

A historic farmhouse dating back to the late 1800s and associated graveyard are located just south of mining area 3 (refer to Section 10.1.1.11). A buffer zone of 200m were recommended around these features by the project archaeologist.

Open pits 1 and 3 at mining area 3 were located within this buffer zone and to mitigate against impacts on these heritage features, these two pits were removed from the mine plan. Refer to Figure 13 below.

8.1.2.2.2. Haul and access road alternatives

The initial mine layout plan did not account for environmental sensitivities and therefore the mine haul and access roads were planned to follow the shortest route possible. However, the layout of the roads on site were adjusted when the ecological and heritage sensitivities came to light once the specialists had been to site.

The haul road between Areas 1 and 3 originally followed a route to the east of the historic homestead and graveyard (Alternative 1). This route however crossed over two drainage lines and were within 500m from a number of ephemeral pans which would have triggered a WUL.

The haul road was consequently moved to the west of the historic homestead. This meant that only one drainage line crossing would be required. The road was much further away from the homestead and the graveyard, and the ephemeral pans (refer to Figure 14).

Two alternatives were considered for the mine access road. The original access road (Alternative 1) passed over a drainage line and its associated 30m buffer zone (Figure 15). This road was however re-aligned to ensure that it would not cross any drainage lines, while taking into account the 200m buffer zone surrounding the ephemeral pans in this area (Alternative 2).

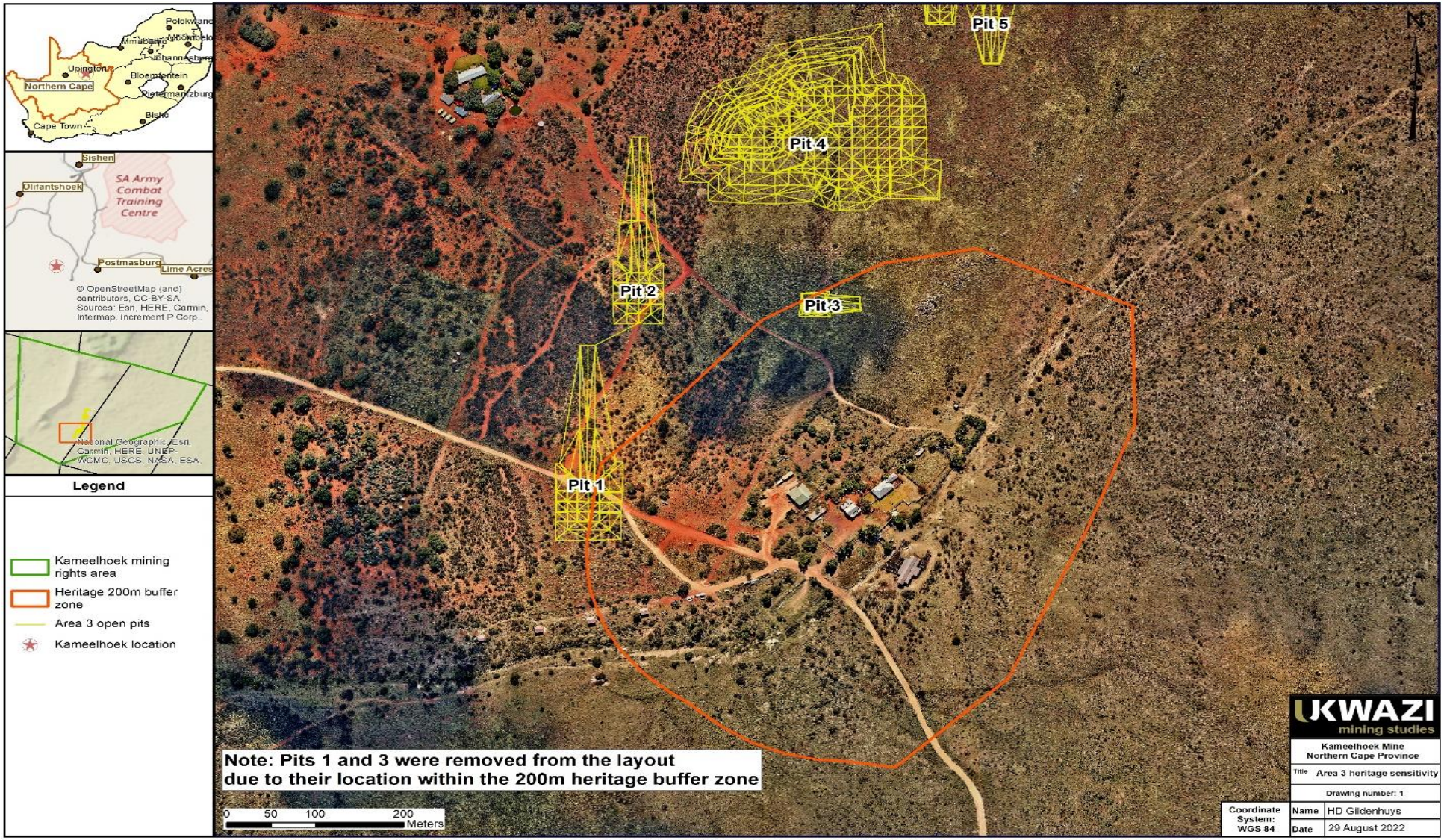

Figure 13: Area 3 heritage sensitivity

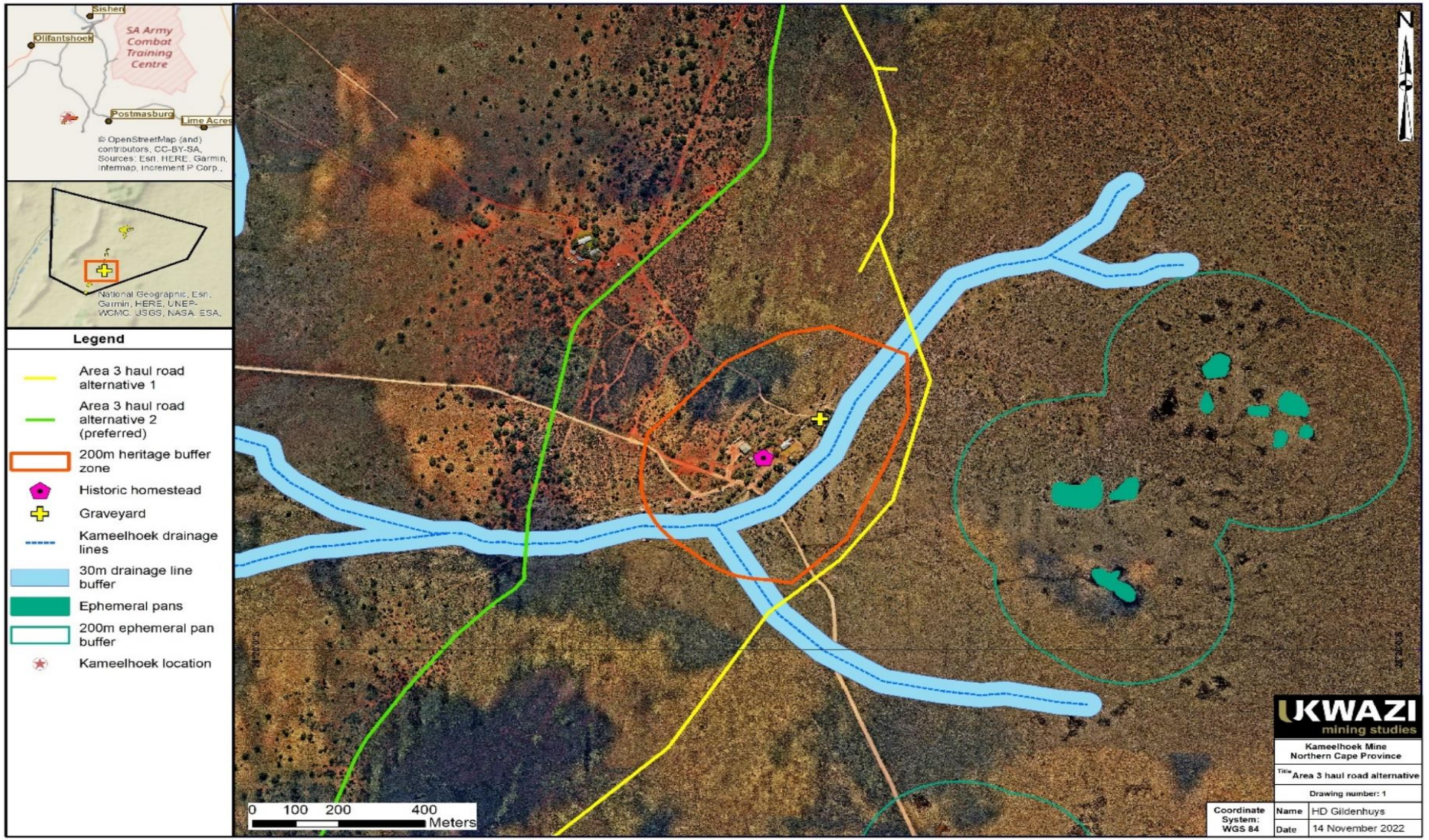

Figure 14: Haul road alternatives

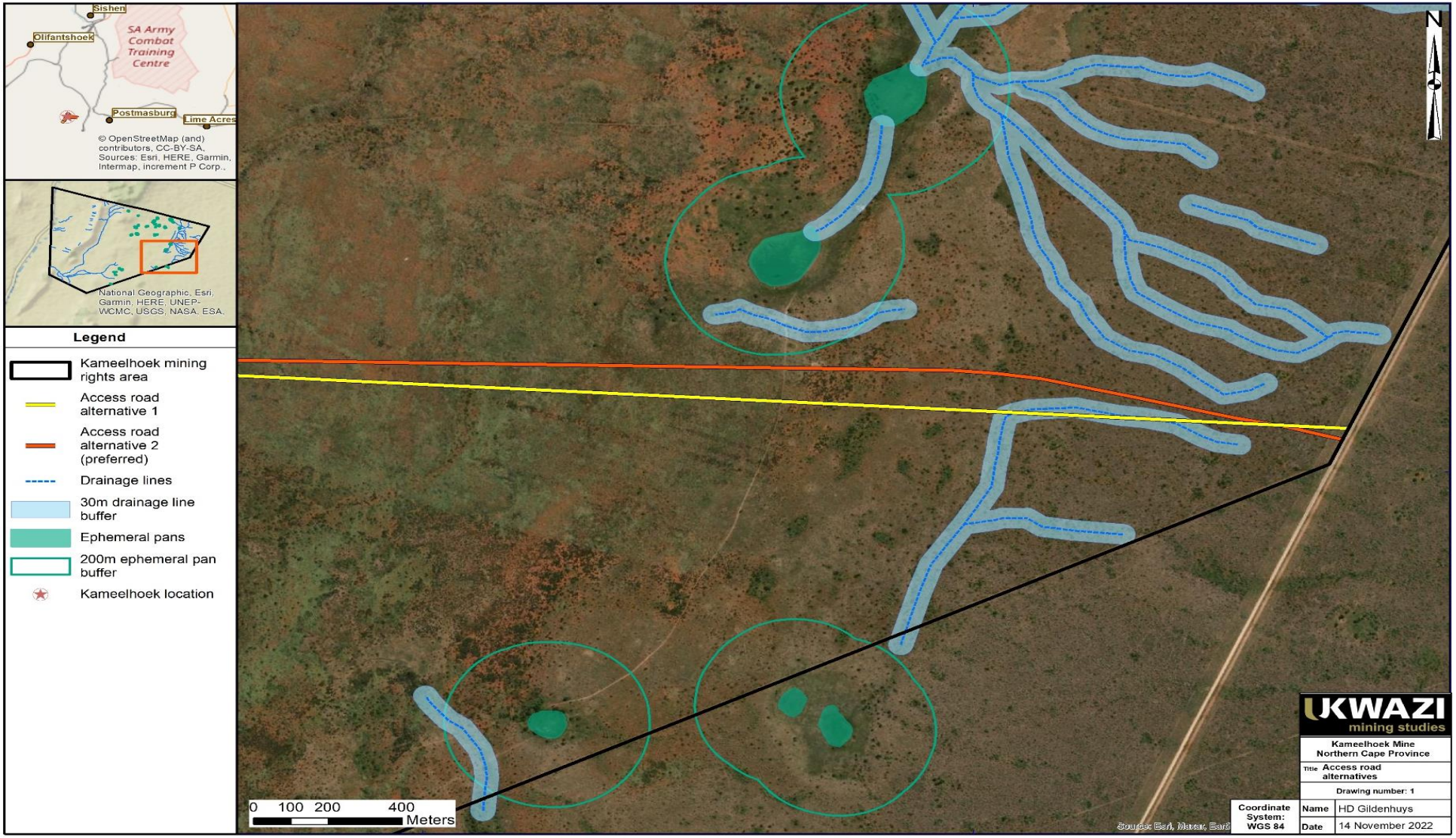

Figure 15: Access road alternatives

8.1.2.3. Site and layout selection matrix

To summarise the above, the original layout (Alternative 1) is compared to the preferred layout (Alternative 2) in a matrix that highlights the specialist recommendations and other practical considerations of the various sites and layouts considered (refer to Table 12 below). The two layout shows alternative locations for the beneficiation plant and mine residue facilities as mentioned above. The two layouts are illustrated in Figure 16 and Figure 17.

Table 12: Site and layout selection matrix

Site / layout selection matrix	Soil and land capability	Air quality	Ecology	Surface and groundwater	Heritage	Palaeon-tology	Noise	Socio-economic	Visual	Geology
Layout alternative 1	No preference. Land capability very low to low throughout	No preference. Potential sensitive receptors are similar distances from the various layout components	Not preferred. Larger footprint area of beneficiation plant and additional drainage line crossings by the haul and access roads will result in higher impacts.	Not preferred. Two additional drainage line crossings	Not preferred. Two open pits are located within the buffer zone from historical homestead and cemetery	Not preferred. Beneficiation plant and infrastructure area to be located on dolomitic limestone that may harbour fossils	No preference. Potential sensitive receptors are similar distances from the various layout components	No preference. Potential sensitive receptors are similar distances from the various layout components	Not preferred. Beneficiation plant located at a high point in the landscape	Not preferred. Waste rock dump (Area 3) and beneficiation plant located on dolomitic limestone
Layout alternative 2	No preference. Land capability very low to low throughout	No preference. Potential sensitive receptors are similar distances from the various layout components	**Preferred.** Lower ecological impact due to avoidance measures mentioned above.	**Preferred.** Fewer drainage line crossings	**Preferred.** No infrastructure within recommended 200 m buffer zone from historical homestead and cemetery	**Preferred.** Beneficiation plant avoids dolomitic limestone	No preference. Potential sensitive receptors are similar distances from the various layout components	No preference. Potential sensitive receptors are similar distances from the various layout components	**Preferred.** Beneficiation plant located approximately 20 m lower in the landscape compared the alternative 1	**Preferred.** Waste rock dumps, beneficiation plants and infrastructure area moved off the dolomitic limestone unto surface limestone and wind-blown sand

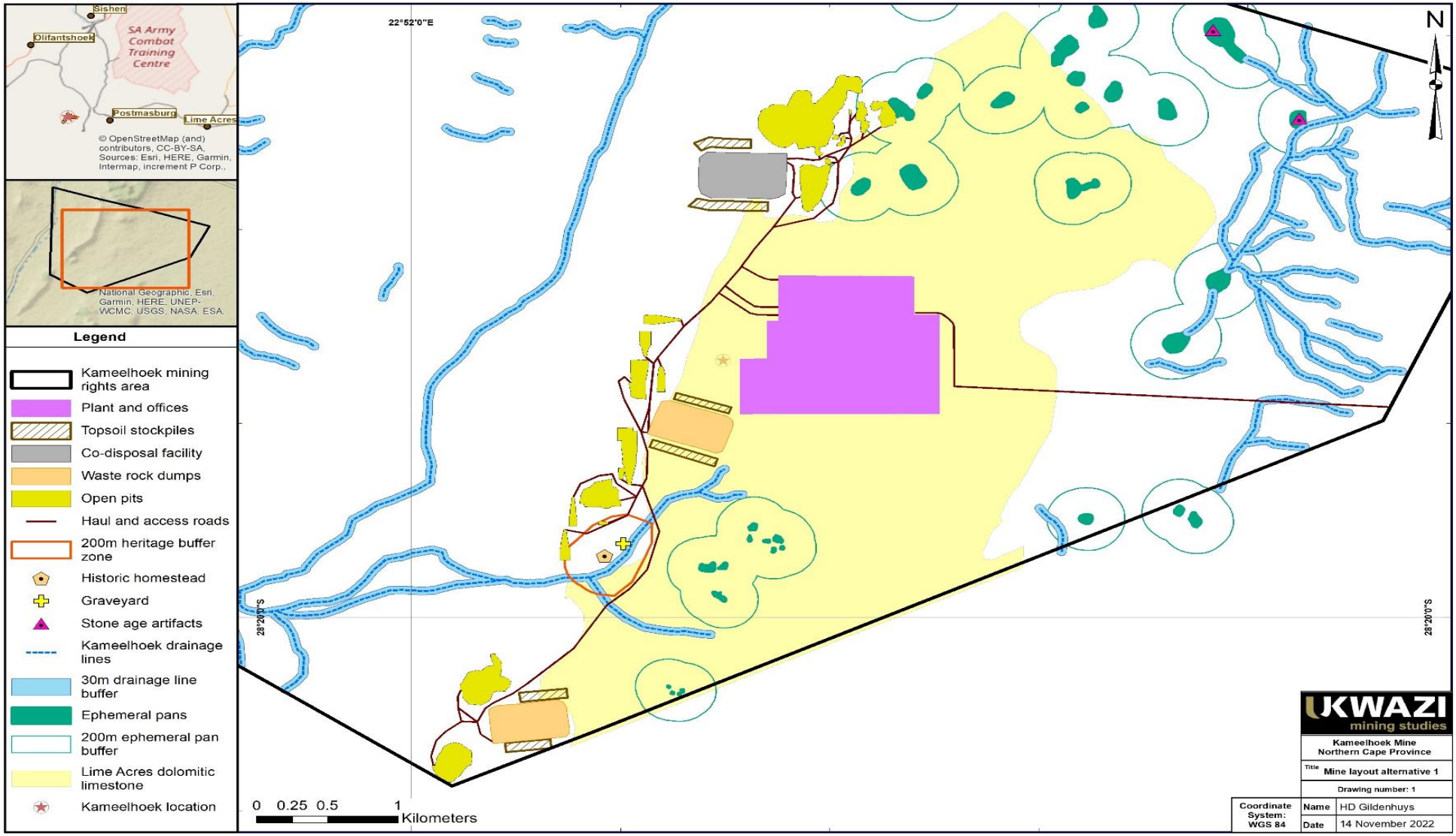

Figure 16: Layout alternative 1

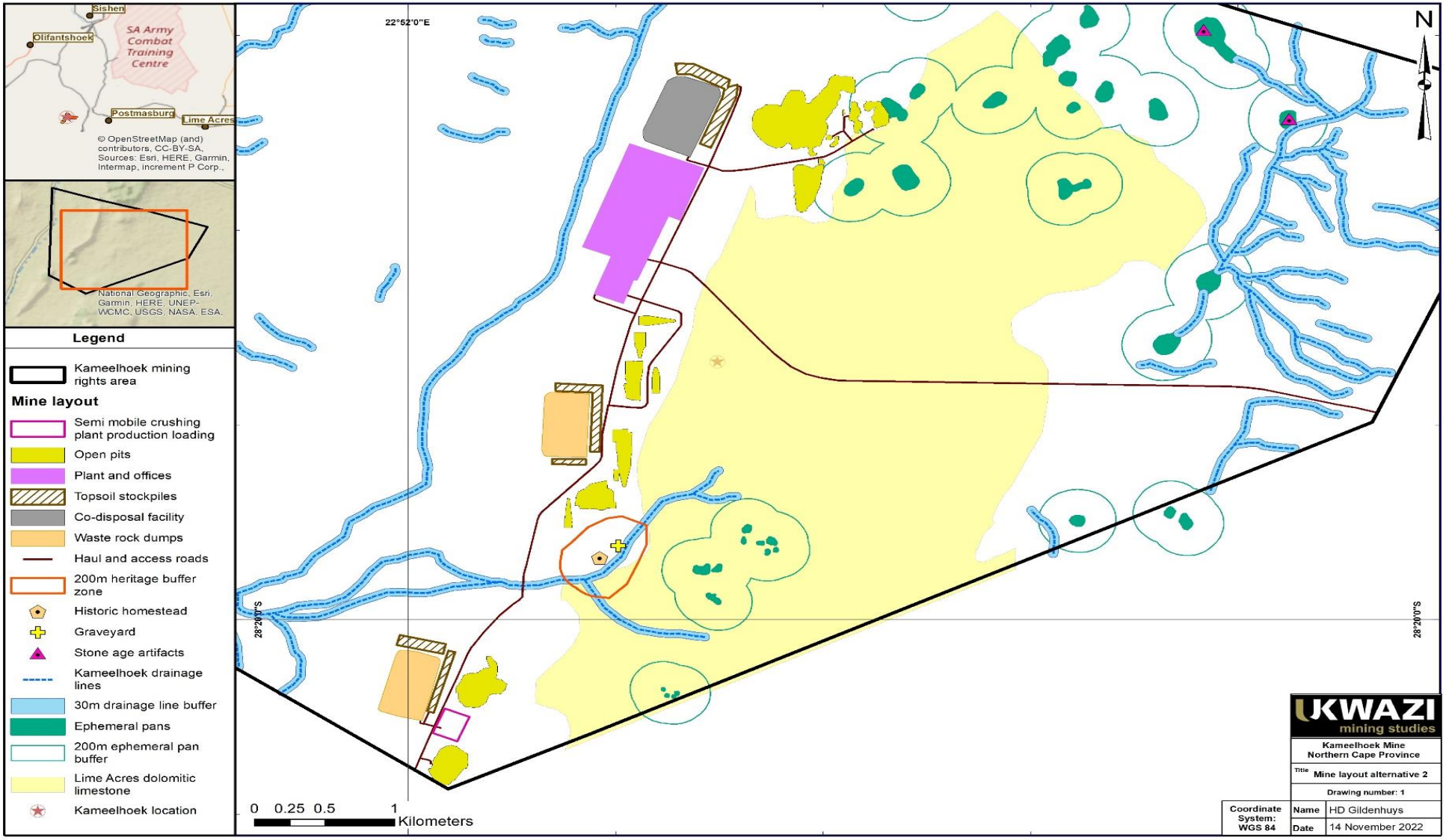

Figure 17: Layout alternative 2

8.1.2.4. Technology alternatives

8.1.2.4.1. Tailings disposal alternatives

Two alternatives with regards to tailings disposal were considered:

1. Tailings disposal alternative 1: conventional tailings dam and separate waste rock facility, and
2. Tailings disposal alternative 2: facility for the combined co-disposal of tailings and waste rock (preferred)

Co-disposal is the mixing of fine and coarse mine waste to produce a single waste stream that is stored together. Co-disposal of waste rock and tailings has the following advantages over a conventional tailings dam (Leduc & Smith, 2003; Leduc *et al*. 2004; Wickland & Wilson, 2005; Wickland *et al*. 2006; INAP, 2009; Habte & Bocking, 2012):

- Mixing the fine and coarse waste reduces the empty void space primarily associated with coarse mine waste, which simultaneously increases the strength of the fines
- Increases in the physical stability (shear strength) diminishes the risk of liquefaction
- The strength and rapid stabilisation of the co-disposal waste allows early access onto the tailings for rehabilitation and reduces the risk and consequences of static and dynamic loading
- Retention embankments are not required, which removes the risk of breach and transportation of tailings outside the deposition area
- Minimise the footprint of the mine residue facilities which in turn reduces land disturbance (lower ecological impact), reduces closure costs, reduces construction costs and reduces maintenance costs
- Reduces dust generation and erodibility of tailings
- Reduces water losses and water consumption, and simplifies water management
- The material is a better substrate for vegetation establishment, which in turn may facilitated earlier closure.

A co-disposal facility would therefore be a less expensive option to construct, operate and close, but will be more stable compared to a conventional tailings dam. The smaller footprint area is an important advantage in an ecologically sensitive environment, especially considering the large number of protected trees present on site. Together with the filter press the lower water consumption and water losses of the co-disposal facility is an important consideration in a water scares area such as the Northern Cape.

Due to the reasons mentioned above the co-disposal facility was chosen as the preferred alternative.

8.1.2.5. No-go alternative

The assessment of the “no-go” alternative is a legal requirement according to NEMA and the EIA Regulations. In this scenario no development would take place. The environment would be left as is and the impact on the area and potential benefits would remain unchanged.

The no-go alternative will imply that virtually none of the identified impacts of proceeding with the project will be incurred. In addition to the global socio-economic benefits associated with the mine, the Kameelhoek mine will provide the local communities with various benefits relating to job creation and skills development. Without the implementation of this project, the mentioned benefits would not be realised. The studies to be undertaken during the impact assessment phase will provide reference to the no-go alternative.

The no-go alternative will be assessed in the EIA phase against the following categories, inter alia:

- Ecological impacts
- Soil and agricultural potential impacts
- Heritage impacts
- Air quality impacts
- Surface and groundwater impacts
- Palaeontology impacts
- Traffic impacts
- Noise impacts
- Visual impacts
- Socio-economic impacts.

9. Details of public participation process followed

At the time of writing the draft scoping report the public participation process ("PPP") had not yet commenced. The draft scoping report will be made available to interested and/or affected parties ("I&APs") to review and the PPP for this project will satisfy the requirements stipulated in Chapter 6 of GNR 982 of the NEMA EIA Regulations 2014 (as amended), promulgated in terms of the NEMA. I&APs will be notified of the PPP by newspaper advertisement, site notices, direct notification by email and registered mail. The draft Scoping Report will be placed out for review for a period of at least 30 calendar days.

The proof of correspondence and notification will be attached to Appendix 5 of the final scoping report.

9.1. Site notices

Notice boards will be erected at key locations surrounding the project site and within key locations in Postmasburg.

9.2. Newspaper advertisement

An advertisement, notifying the public of the environmental authorisation process and the draft scoping report being available for review will be placed the Kathu Gazette and the Noordkaap Bulletin. The advertisement will state the authorisations to be applied for, the process to be followed and will request I&APs to register their comments with Ukwazi. The date and time of the public open day will be advertised.

Noordkaap Bulletin is a local weekly newspaper that appears in Afrikaans and English. It is distributed free of charge every Thursday in Danielskuil, Dyasonklip, Groblershoop, Kakamas, Kathu, Keimoes, Kimberley, Kuruman, Lime Acres, Olifantshoek, Postmasburg, Upington, Hotazel, Barly West, Bloemhof, Britstown, Christiana, De Aar, Douglas, Hartswater, Hopetown, Jacobsdal, Jan Kempdorp, Prieska, Ritchie, Strydenburg and Warrenton. The newspaper is available online. An advertisement will appear in the Noordkaap Bulletin on 17 November 2022.

The Kathu Gazette is a weekly newspaper that appears on a Friday bearing Saturday's date. Advertisements appears on newspaper's website the week in which it appears in the newspaper. The newspaper has a certified print run of 5 000 and gets distributed in the towns of Kathu, Postmasburg, Kuruman, Danielskuil, Lime Acres, Olifantshoek, Lohatlha, Kimberley, Wrenchville, Mothibistad, Hotazel, BlackRoc and Batlharos. It is distributed at Sishen mine, Kolomela mine and Beeshoek mine. The publication appears in Afrikaans, English and/ or Setswana. An advertisement will appear in the Kathu Gazette on 19 November 2022.

9.3. Direct notification of identified interested and affected parties

Identified stakeholders will be directly informed by post, email, fax or short message service ("sms"). The following stakeholders will be informed:

- The owners and occupiers of the site where the activity is proposed
- The owners and occupiers of land adjacent to the site where the activity proposed
- ZFMDM
- TLM
- Councillor for Ward 7
- Northern Cape Department agriculture, environmental affairs, land reform and rural development
- South African Heritage Resources Agency ("SAHRA"): Northern Cape
- Department of Human Settlements, Water and Sanitation ("DHSWS"): Northern Cape
- Department of Agriculture, Forestry and Fisheries ("DAFF"): Northern Cape
- South African Roads Agency SOC Limited ("SANRAL") Western Region
- Northern Cape Department of Roads and Public Works
- Eskom
- Tshiping water user association
- Sedibeng water
- Other stakeholders.

9.4. Public meetings/ open days

One public open day will be held at the Postmasburg Inn at 1 Kromme Street in Postmasburg from 12h00 to 18h00 on 30 November 2022.

The open day will be held to provide I&APs with the opportunity to raise issues and comments and ask specific questions in the presence of the relevant consultants on the project and to explain the authorisation process and associated timelines. The public open days were advertised in the newspapers as per section 9.2 above. All issues

raised by the I&APs during the public open day will be included in the final scoping report to be submitted to the DMRE.

9.5. Draft and final scoping report

The draft scoping report will be subject to a public review process of at least 30 days. The availability of the draft scoping report will be distributed for comment as follows:

- A hard copy will be made available at the Postmasburg library in Bo Street
- Electronic copies to be made available on the following website: https://publicdocs.ukwazi.com/
- Electronic copies and hard copies will be made available to stakeholders if requested.

Once the comment period is concluded the report will be updated with the comments received from I&APs and the final scoping report will be submitted to the DMRE.

9.6. Draft and final EIA and EMPR

The draft EIA and EMPr report will be made available to I&APs for a period of at least 30 days, whereafter the report will be updated with the comments received, finalised and submitted to the DMRE as the competent authority for consideration.

9.7. Summary of issues raised by interested and affected parties

By the time of compiling the draft scoping report the public participation period had not yet commenced. A record of the issues raised by I&APs will be attached to the final scoping report to be submitted to the DMRE.

Table 13: Table summarising comments and issues raised, and reaction to those responses.

Table to be included in final report to be submitted to the DMRE once comments have been received.

10. The environmental attributes associated with the sites

10.1. Baseline environment

10.1.1. Type of environment to be affected by the proposed activity

10.1.1.1. Climate and air quality

10.1.1.1.1. Rainfall and evaporation

The Northern Cape experiences low levels of rainfall and is largely classified as a semi-desert. Around the Kameelhoek project area, rainfall is most likely to occur in the summer months. Typical of semidesert regions, temperature fluctuations are pronounced between day and night, and winters are relatively warm. Postmasburg is located within a low rainfall area (see Figure 18) with a mean annual rainfall of approximately 285mm. Rainfall is highly unpredictable with most rainfall occurring between November and April. The rainfall usually falls as a result of thunderstorms when tropical thunderstorm activity extends southwards over the Kalahari. Mean annual evaporation (2 450mm) is higher than annual rainfall, which results in a major net moisture deficit of almost 2 000mm throughout the year (Steyn *et al*., 2022).

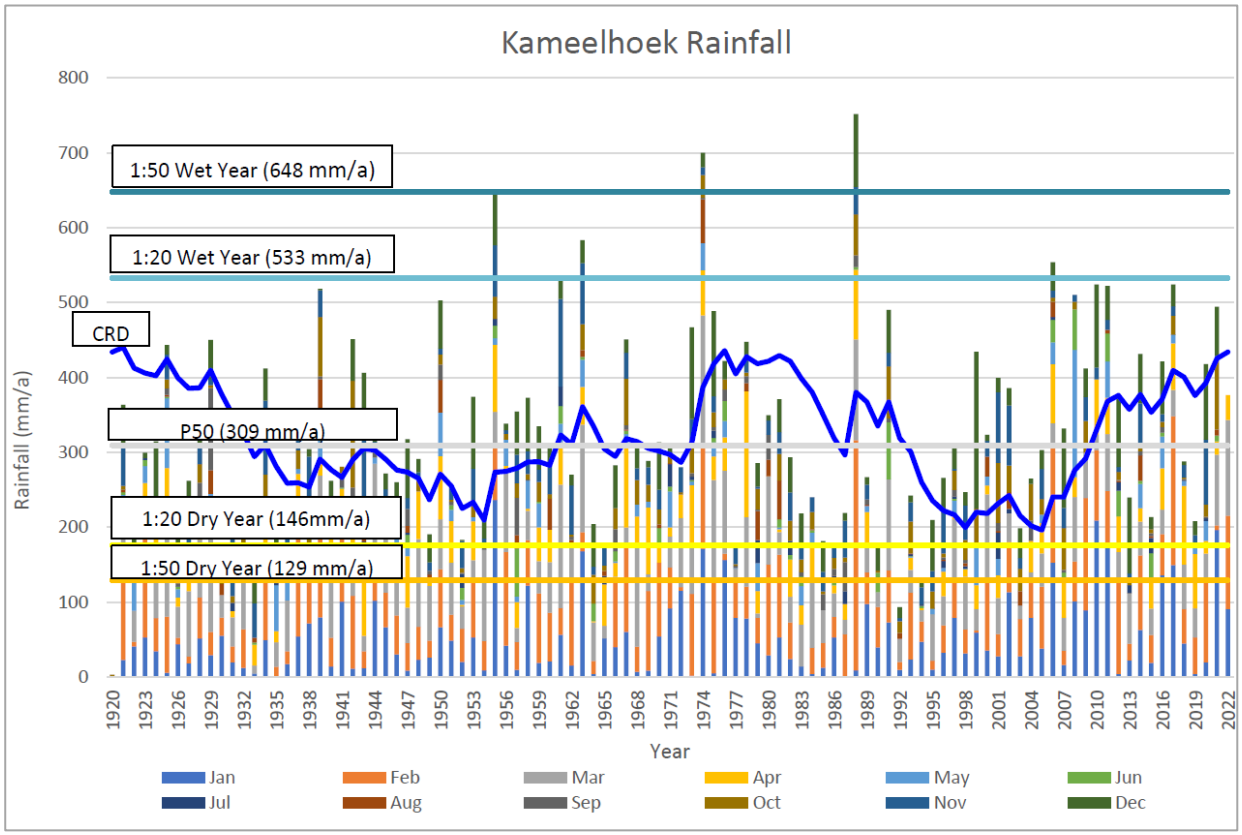

Figure 18: Kameelhoek rainfall (Steyn *et al*., 2022)

10.1.1.1.2. Temperature

Measured temperature data were obtained from the Kapstevel monitoring station for the period 2019 to 2020. The meteorological station is located approximately 8.5km south of the project area.

The monthly temperature pattern from the Kapstevel monitoring station is provided in Table 14. Temperatures ranged between -7°C and 38°C. The highest temperatures occurred in December and the lowest in July. During the day, temperatures increase to reach maximum at around 14:00 in the afternoon. Ambient air temperatures decrease to reach a minimum at around 06:00 i.e., just before sunrise (Von Gruenewaldt, 2022).

Table 14: Monthly average temperature summary (Kapstevel monitoring station 2019 to 2020) (Von Gruenewaldt, 2022)

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Minimum	10.7	12.4	6.5	3.0	-2.3	-7.1	-4.9	-4.5	-0.3	2.2	6.8	8.4
Maximum	37.9	37.1	36.0	32.2	29.4	26.3	25.9	29.0	34.3	36.9	38.1	36.3
Average	27.4	25.2	24.1	19.0	16.2	11.6	11.5	12.7	18.0	21.7	24.0	24.9

10.1.1.1.3. Wind

Period and diurnal wind roses drawn from the Kapstevel monitoring station data are shown in Figure 19 and Figure 20. During the 2019 to 2020 period, the wind field was dominated by winds from the north. Calm conditions occurred 10.5% of the time, with the average wind speed of 2.7m/s. Wind speeds decreased during night-time conditions with an increase in calms to 21.4%.

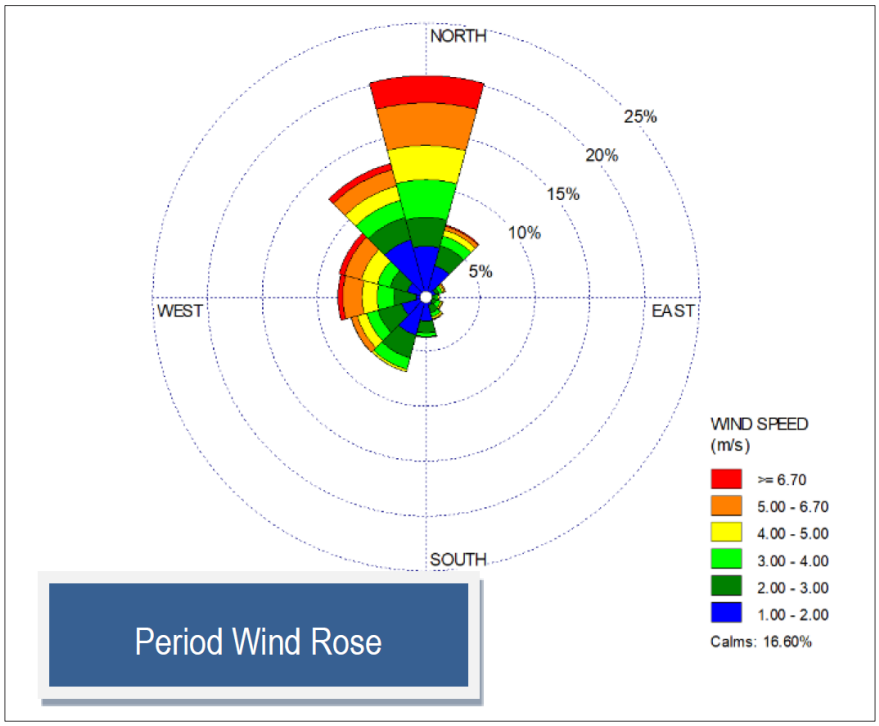

Figure 19: Period average wind rose for the Kapstevel monitoring station 2019 to 2020 (Von Gruenewaldt, 2022).

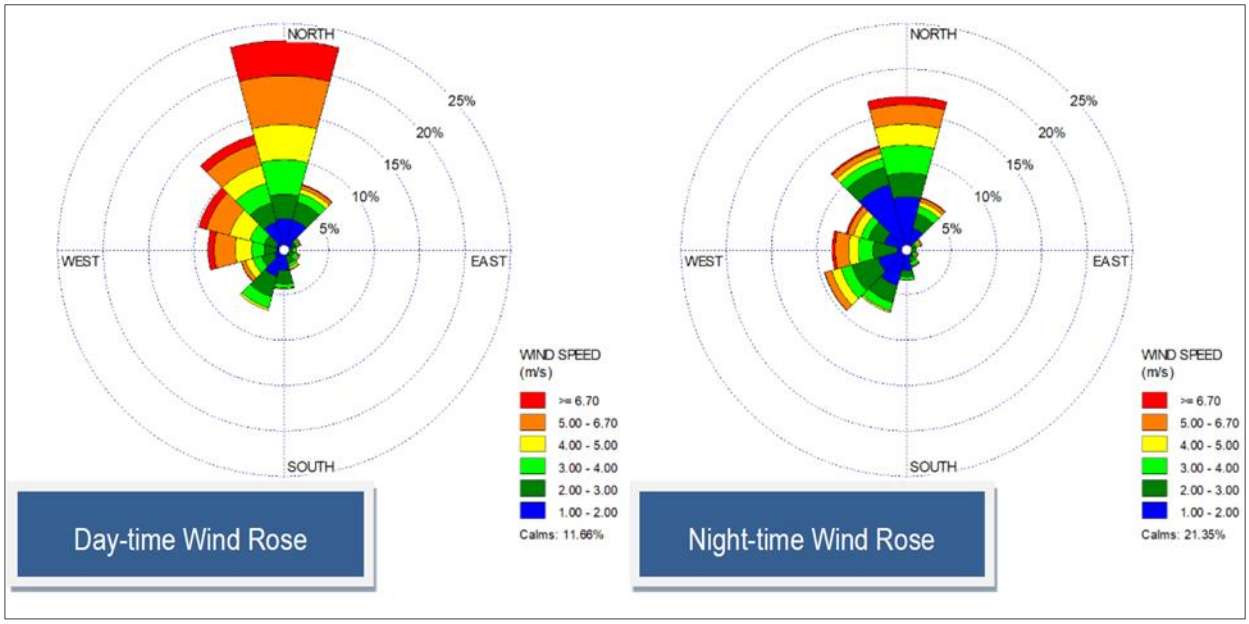

Figure 20: Daytime and night-time wind roses for the Kapstevel monitoring station 2019 to 2020 (Von Gruenewaldt, 2022).

10.1.1.2. Topography

The topography of the study area is characterised by level plains with some relief, and hills or ridges. The study area comprises mostly plains with north south orientated hilly terrain in the central and western parts. The altitude ranges from 1 200m to 1 270m above sea level on the plains, to 1 290m to 1 300m on the hill tops. The terrain is indicated by a very gentle slope of <1 % across the plains but the hills and ridges are indicated by steeper slopes of 7% to 24% (Milne, 2022; Young, 2022). The mining rights area drains from the north to the south with a prominent ridgeline in the western part of the site (DSA, 2022).

10.1.1.3. Land types, soil and land capability

The land capability classes of the area according to DAFF (2016) are presented in Figure 21. The land capability of the site and surrounds predominantly consist of very low to low land capability and is only suitable for wilderness or grazing.

The mining rights area falls mainly into land type Ag110 and Ag111 (Land Type Survey Staff, 1972 – 2002). A land type is an area which can be demarcated at a scale of 1:250 000 with similar soil forming factors and therefore soil distribution patterns. A land type does therefore not represent uniform soil polygons, but rather information regarding the occurrence of various soils on various terrain units can be obtained from the land type inventory. These land types are dominated by shallow soils of the Mispah and Hutton forms or bare rock (DSA, 2022).

The infrastructure is almost entirely proposed on land type Ag111 that is found in the centre of the MRA. The dominant soil forms of land type Ag111 and the percentage coverage of a soil on the specific Terrain morphological unit ("TMU") is provided in Table 15 below.

Table 15: Dominant soil forms of land type Ag111 (DSA, 2022).

Terrain morphological unit ["TMU"]	Percentage coverage [%]	Soil forms
TMU 1	3	Rock (60%) Mispah (40%)
TMU 3	5	Rock (40%) Mispah (60%)
TMU 4	85	Rock (10%) Mispah (30%) Hutton (50%)
TMU 5	7	Hutton (70%) Mispah (24%)

Grazing capacity is defined as a homogeneous unit of vegetation expressed as the area of land required (in hectares) to maintain a single animal unit ("LSU") over an extended number of years without deterioration to vegetation or soil.

Where an LSU = an animal with a mass of 450kg and which gains 0.5kg per day on forage with a digestible energy of 55% (Trollope *et. al*., 1990). The unit used in expressing grazing capacity is hectares per large stock unit (ha/LSU). The site falls in a low grazing capacity of 14ha/LSU. Most of the site is low shrubland that is sparsely vegetated with a low grazing potential (DSA, 2022).

DSA (2022) conducted various site soil surveys between 2019 and 2022. The soils were found to consist of windblown sands overlying fractured rock or hard carbonate. In selected areas in the west of the farm there are portions of land where the sands accumulations exceed 1 000mm. These areas fall out of the development footprint, are very isolated and will not be impacted by the proposed development. Most of the site is, however, marked by shallow sand deposits or rock on the surface. Glenrosa, Hutton and Coega soil forms are dominant with large areas occupied by rock outcrops (DSA, 2022).

The generally level to gently sloping land of the plains produces low water erosion risk, but due to shifting sands being present here, it is highly susceptible to wind erosion and compaction. Soils of the ephemeral river and drainage lines are highly susceptible to water erosion. Erosion risks on the hills are moderate in terms of water- and wind erosion. If badly eroded, the soils on Kameelhoek have a very low potential to regenerate (Milne, 2022).

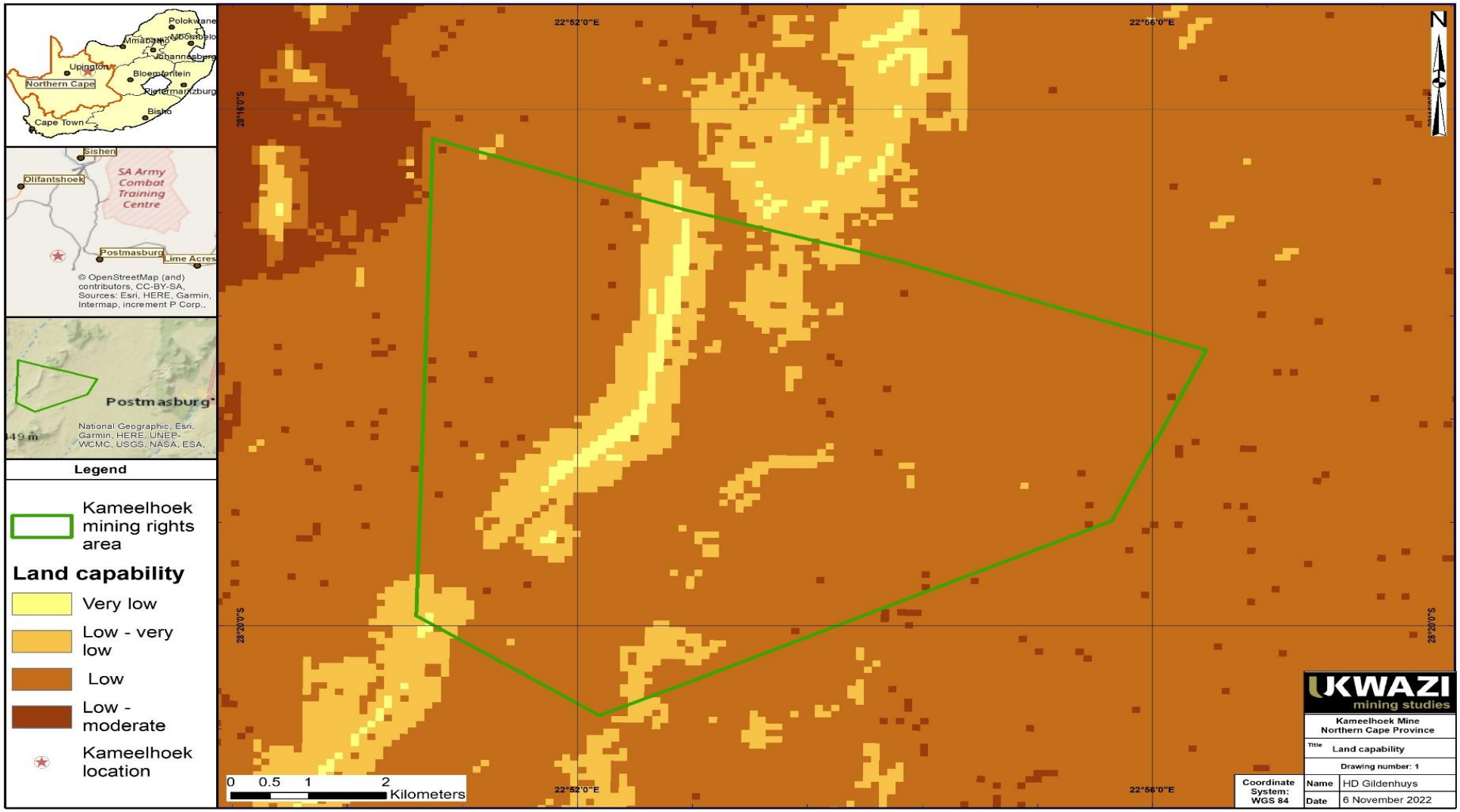

Figure 21: Land capability map

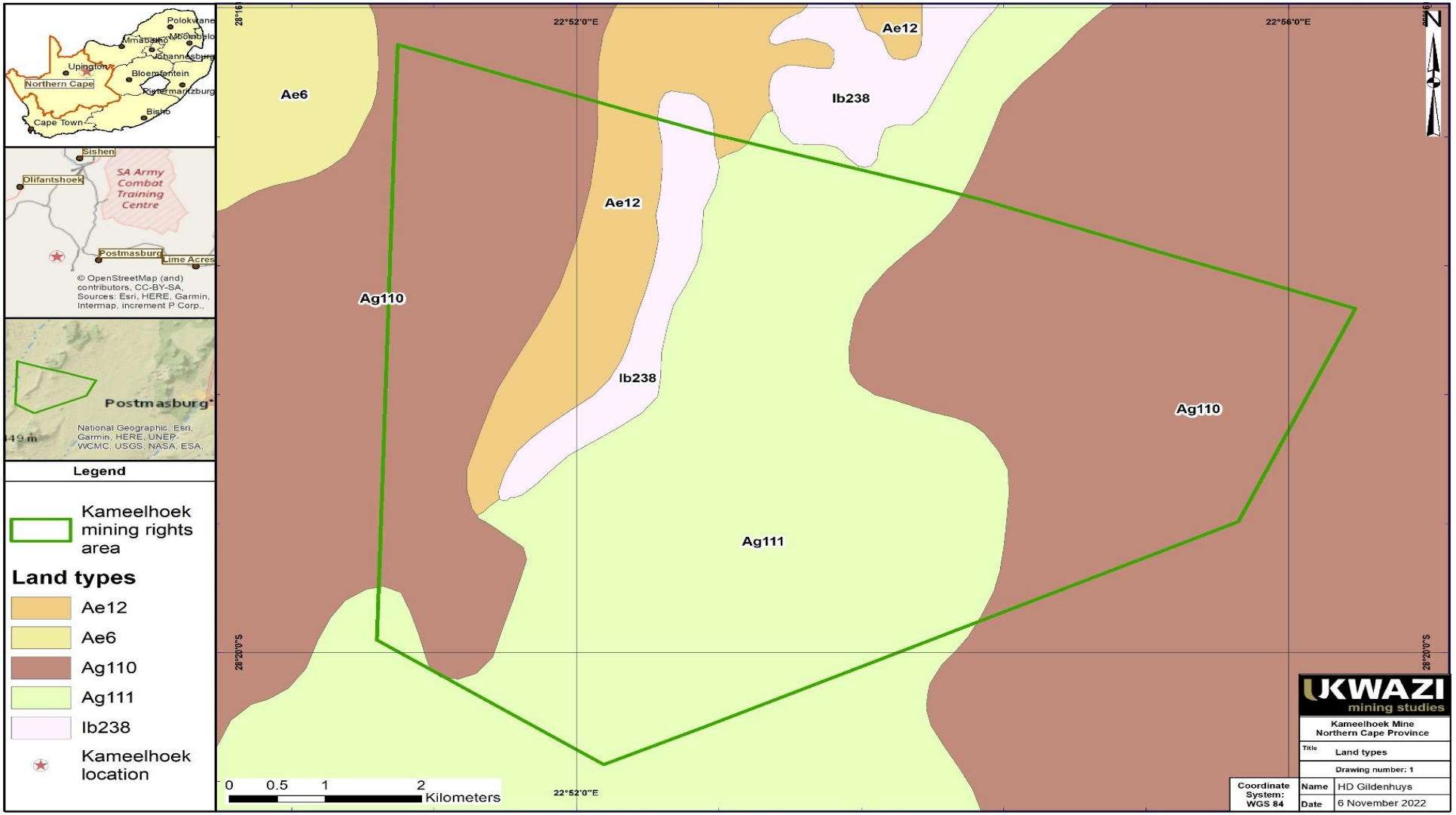

Figure 22: Land types map

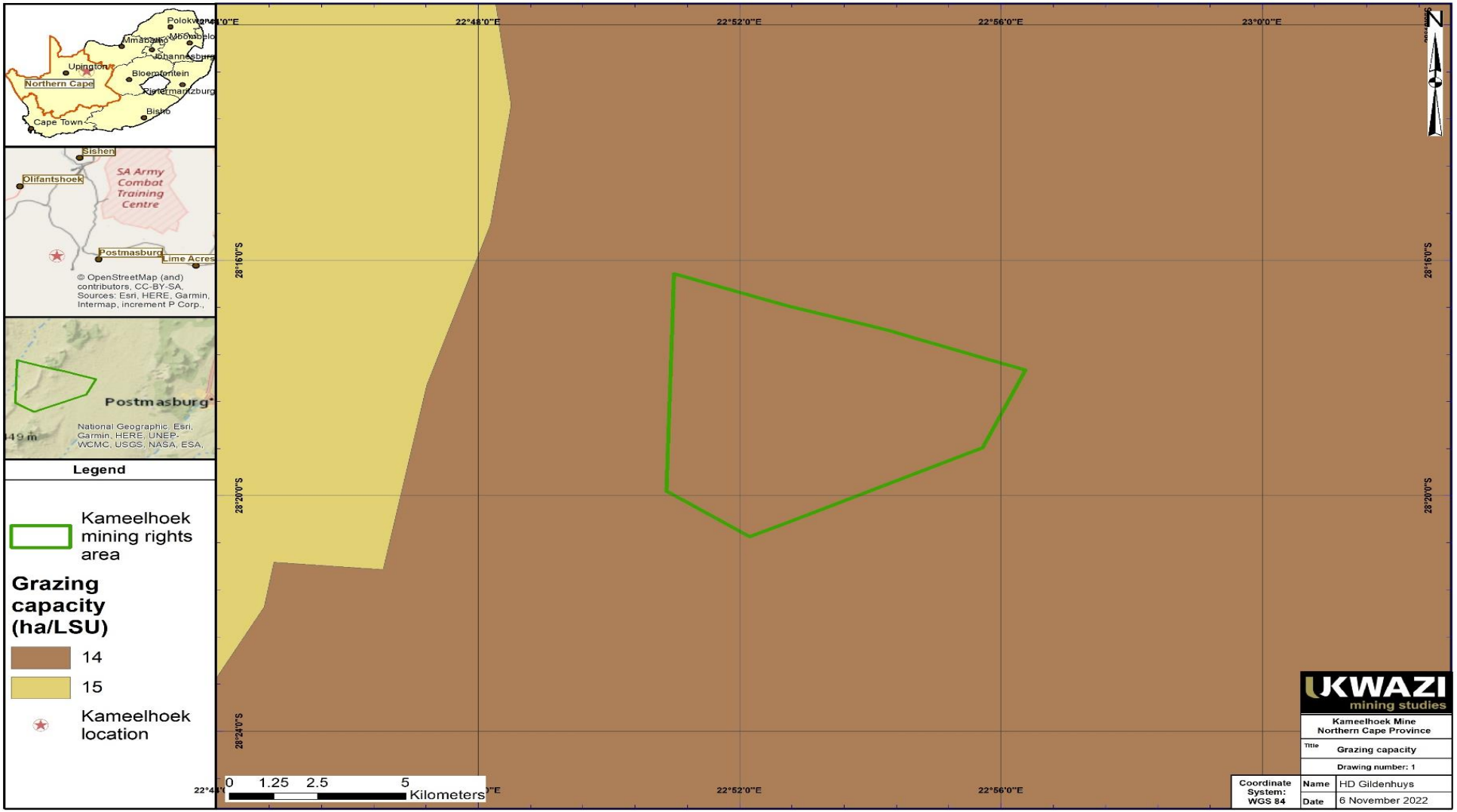

Figure 23: Grazing capacity map

10.1.1.4. Biodiversity

Boscia Ecological Consulting was appointed to conduct an assessment and provide an ecological and wetland assessment report. The study comprised a combination of field and desktop surveys for data collection on fauna and flora. The initial fieldwork component was conducted on 7 and 8 September 2015, followed by a second survey on 19 and 20 April 2022. To verify the presence of branchiopods, dry sediment was collected from the ephemeral pans on site and sub-samples were later hatched under simulated habitat conditions and identified under a microscope. Wetland and riparian areas were assessed and delineated by a combination of fieldwork and by using satellite imagery and topographical maps (Milne, 2022).

10.1.1.4.1. Critical biodiversity areas and broad-scale processes

The Northern Cape Critical Biodiversity Areas Map (Holness & Oosthuysen, 2016) identifies Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"), which, together with protected areas, are seen as important for the persistence of a viable representative sample of all ecosystem types and species and the long-term ecological functioning of the landscape as a whole.

The Soutloop in the west of the MRA and its associated buffer comprise of Critical Biodiversity Areas One ("CBA1"). Much of the central parts of Kameelhoek comprise of ESAs, while the remainder of the study area comprise of Other Natural Areas (Figure 24). No protected areas occur in or near the study site.

Similarly, the Mining and Biodiversity Guidelines (DENC *et al*. 2013) classifies the Soutloop to have Highest Biodiversity Importance (infrastructure is not proposed in this area). No other area on Kameelhoek has been classified with biodiversity importance. These guidelines were developed to identify and categorise biodiversity priority areas sensitive to the impacts of mining, to support mainstreaming of biodiversity issues in decision making in the mining sector.

According to the ZF Mgcawu (previously Siyanda) Environmental Management Framework Report ("SEMF") the Kameelhoek study area falls within one of the proposed conservation areas for the district municipality. This is brought about by its high vegetation conservation priority and therefore assigned to "Environmental Control Zone 3: Potential high to very high vegetation conservation areas". The SEMF states that this zone has the potential to become core parts of conservation areas that may be necessary to meet national conservation targets. However, the SEMF classified the majority of study area to have an overall Environmental Sensitivity of 0 (lower), but the watercourses and drainage lines have been classified to have a sensitivity of 2 (moderately low).

The study area falls within the core area of the Griqualand West Centre ("GWC") of Endemism (Frisby *et al*. 2019). A centre of plant endemism is an area with high concentrations of plant species with very restricted distributions, known as endemics (Van Wyk & Smith, 2001).

10.1.1.4.2. Broad-scale vegetation patterns

The study area falls within the Savanna Biome (Mucina and Rutherford 2006). According to the vegetation map of Mucina and Rutherford (2012), the site is represented by two broad- scale vegetation units, i.e., Postmasburg Thornveld and Kuruman Mountain Bushveld (Figure 25). This vegetation map however does not reflect the true character of the site, because it has not been mapped at a very fine scale. Therefore, field-based classification of small-scale vegetation patterns are discussed in the next section.

Postmasburg Thornveld is only found in the Northern Cape Province, restricted to areas around Postmasburg and lies at altitudes between 1 180m and 1 440m. It is represented as flats surrounded by mountains supporting open, shrubby Thornveld characterised by a dense shrub layer, where trees and grasses are sparse. Shrubs are often low and of a karroid affinity. Postmasburg Thornveld is classified as being least threatened with very low erosion and very little transformation. It is not currently conserved within any formal conservation areas and no endemic plant species is known from this unit.

Kuruman Mountain Bushveld is distributed in the Northern Cape and North-West Provinces at altitudes between 1 100m and 1 800m. It stretches from the Asbestos Mountains southwest and northwest of Griekwastad, along the Kuruman Hills north of Danielskuil, passing west of Kuruman and re-emerging as isolated hills. The unit is typically presented as rolling hills with gentle to moderate slopes and hill pediment areas with an open shrub veld. Here, *Calobota cuspidosa* is conspicuous within a well-developed grass layer. The Hills consist of banded iron formation, with jasper, chert and riebeckite-asbestos of the Asbestos Hills Subgroup of the Griqualand West Supergroup. Soils are shallow, sandy and of the Hutton form. The most common land types are Ib, followed by Ae, Ic and Ag. The unit is considered to be least threatened and very little is transformed and with little erosion being present. It is not currently conserved within any formal conservation areas and the succulent *Euphorbia planiceps* is the only endemic species known from this unit.

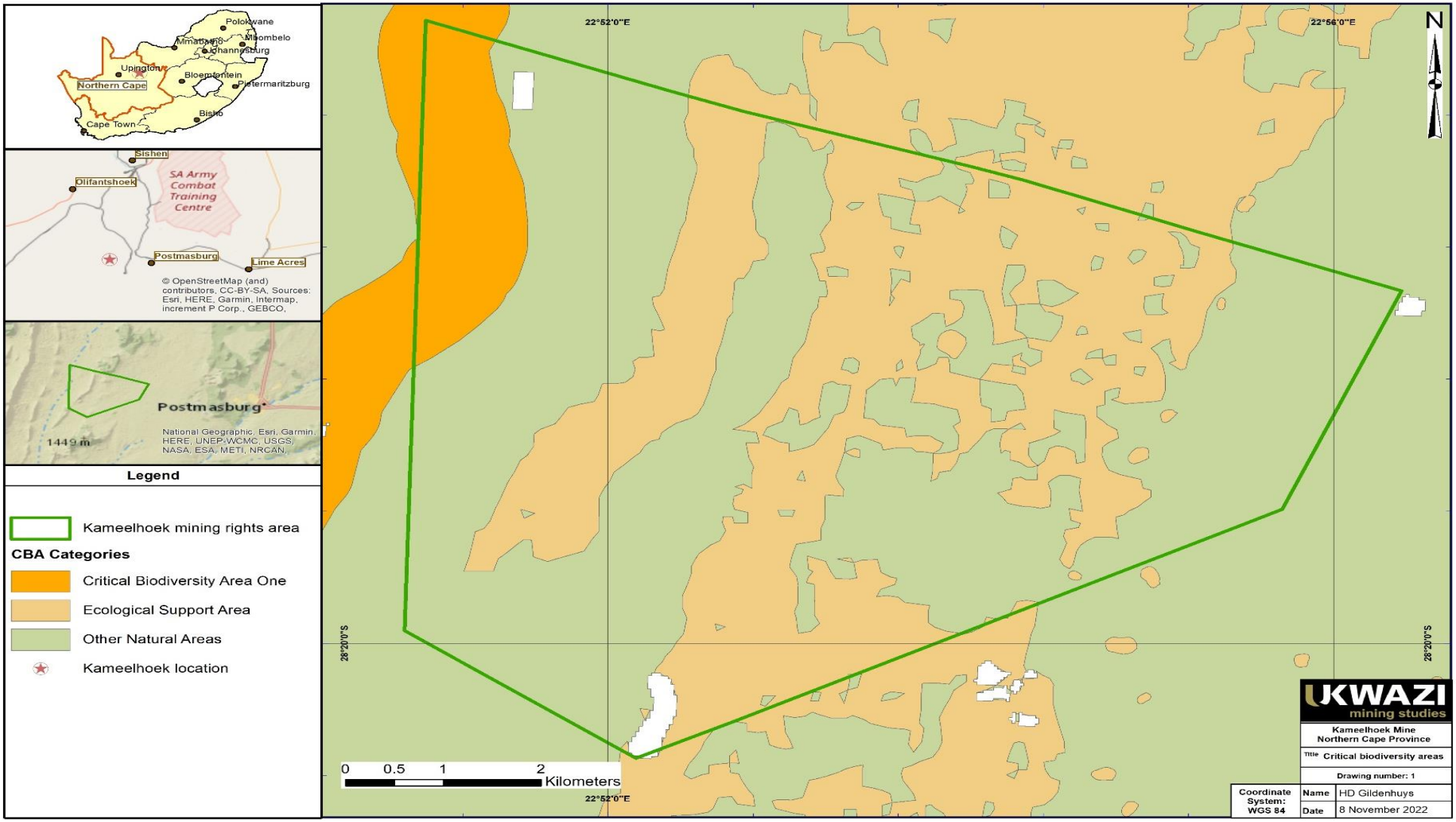

Figure 24: Extract from Northern Cape CBA map

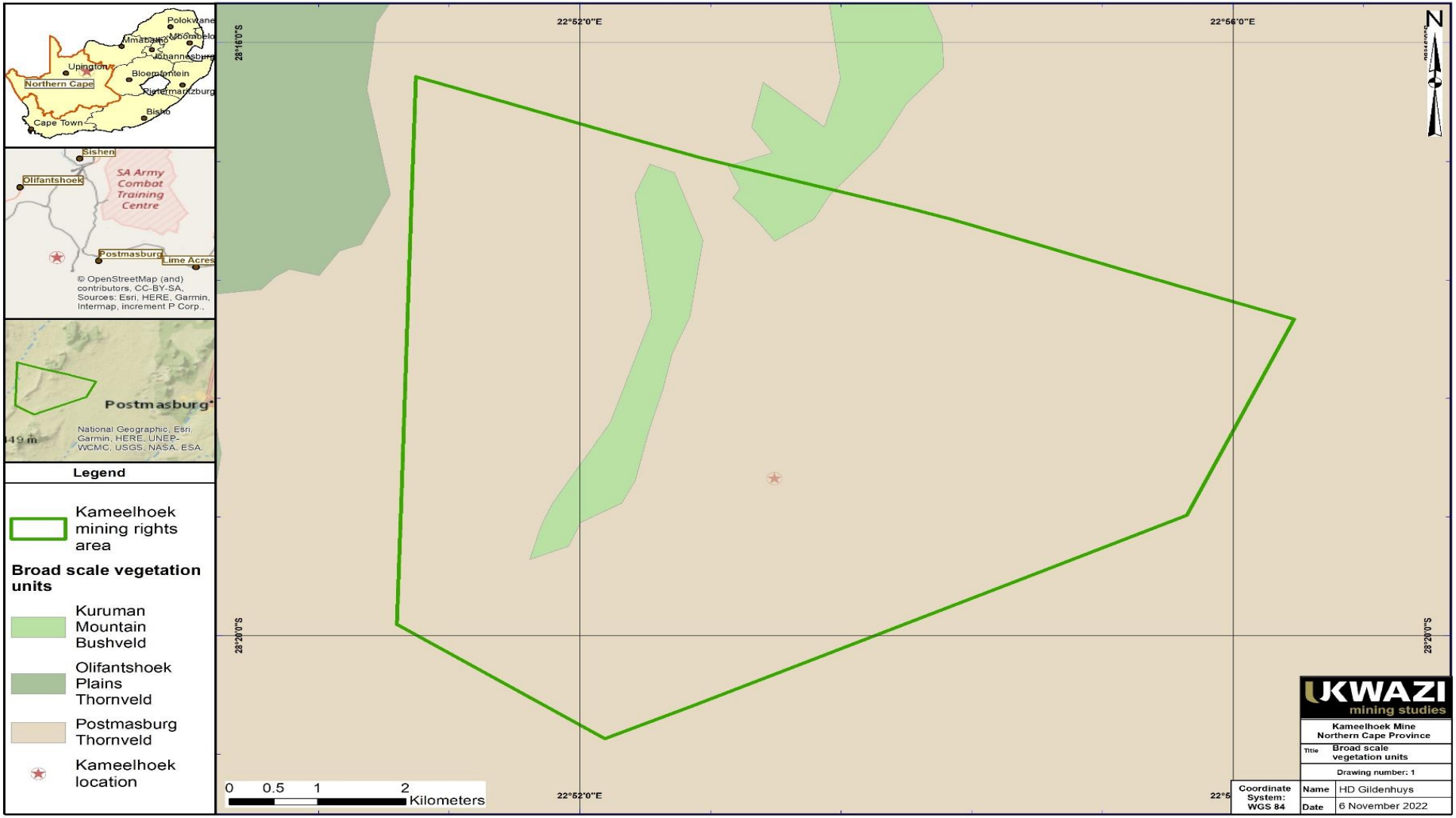

Figure 25: The broad-scale vegetation units (Mucina and Rutherford 2012) present in the study area.

10.1.1.4.3. Fine-scale vegetation patterns

The proposed finer scale vegetation communities delineated by Milne (2022) can be divided into six distinct units as described below and indicated in Figure 33.

1. *Vachellia erioloba - Stipagrostis uniplumis* open woodland on red sand
This plant community is restricted to red sandy soils in the western half of the property (Figure 33). The vegetation cover is well developed, and bare soil only constitute approximately 5% of the overall ground cover. The woodland is typically represented by tallshrubs and trees that are scattered in a grassland matrix (
Figure 26).

The protected tree *Vachellia erioloba* dominates the tall woody layer in this community, but two other protected trees namely *V. haematoxylon*, and *Boscia albitrunca* are common. The community consists of a tall shrub layer and a well-developed grass layer. Apart from the protected tree species mentioned above, the following plant species of conservation concern were found in this vegetation community *Gymnosporia buxifolia, Oxalis lawsonii and Kalanchoe brachyloba*.

Figure 26: The open woodland on sand is represented by *Vachellia erioloba* trees that are scattered in a grassland matrix

2. Senegalia mellifera - Aristida diffusa open shrubland on rocky soil
This plant community is restricted to the Ghaapplato and Gamagara Formations and constitutes a large area in the eastern half of the study area (Figure 33). The vegetation occurs on rather shallow rock-strewn soil, which constitutes approximately 10% of the ground cover. Senegalia mellifera is the most dominant shrub and occurs scattered across an extensive grassy matrix, intermixed with low shrubs.

Common trees and tall shrubs scattered across this unit include *Boscia albitrunca, Vachellia erioloba, V. hebeclada, Tarchonanthus camphoratus, Diospyros lycioides subsp. lycioides, Ziziphus mucronata, Ehretia alba, Searsia tridactyla, Rhigozum trichotomum* and *Kleinia longiflora*. The grass layer is well developed. *Aristida diffusa* dominates, but *Pogonarthria squarrosa* and *Stipagrostis uniplumis* are very common.

Plant species of conservation concern include *Boscia albitrunca, Vachellia erioloba, Gomphocarpus tomentosus subsp. Tomentosus, Moraea polystachya and Gladiolus permeabilis, Aloe grandidentata, A. hereroensis* and *A. claviflora.*

Figure 27: The vegetation community on the rock-strewn soils of the Ghaapplato and Gamagara Formations are dominated by *Senegalia mellifera*.

3. Pentzia incana - Enneapogon desvauxii dwarf shrubland on calcrete

This community occurs on shallow calcrete soils in the far west and east of the study area. Patches in the centre of the property, east of the hills, are present, but here it primarily transitions between the typical calcrete plant community, the adjacent vegetation communities and associated geological features. Rocky soil constitutes approximately 20% of the ground cover but is well protected by biological soil crusts. In the west and parts in the east, where the soils are very shallow, the plant community is dominated by the low-growing vegetation, but taller shrubs and grasses gradually increase to dominate communities in the far east, where deeper soil overlay the calcrete (Figure 28).

Pentzia incana dominate the low shrub layer, but other common low shrubs include P*. calcarea, Oedera humilis, Zygophyllum lichtensteinianum, Aptosimum albomarginatum, A. marlothii, Ruschia griquensis, Eriocephalus ericoides subsp. griquensis* etc. Taller shrubs include *Hertia pallens* and *Rhigozum trichotomum*. The tall shrub layer in the east is dominated by *Tarchonanthus camphoratus*, but other trees and tall shrubs include *Boscia albitrunca, Vachellia erioloba, Ziziphus mucronata, Diospyros lycioides, Grewia flava* and *Searsia tridactyla*.

Herbs include *Salvia disermas, Lessertia pauciflora, Senna italica, Indigofera alternans, Indigastrum niveum, Geigeria ornativa, Portulaca quadrifida, Oxalis lawsonii, O. depressa, Hermannia coccocarpa* and *Kewa salsoloides*.

Figure 28: The typical plant community on calcrete is dominated by low-growing vegetation shallow soil

4. Senegalia mellifera - Euclea crispa shrubland on rocky hills

This plant community is found on the hills of the study area and occurs on very shallow soils, scattered among rocks from the Koegas Formation. Rock constitutes approximately 30% of the ground cover. The slopes of the hills are typically dominated by dense stands of *Senegalia mellifera* scattered in a sparse grass layer, but *Euclea crispa var. crispa* becomes dominant on the crests (Figure 29).

Other common shrubs on the hills include *Boscia albitrunca, Searsia burchellii, S. tridactyla, Tarchonanthus camphoratus, Ehretia alba, Ziziphus mucronata, Calobota cuspidosa, Grewia flava, Rhigozum trichotomum, Cadaba aphylla* and *Kleinia longiflora. Nymania capensis, Putterlicka saxatilis, Euclea undulata and Rhigozum obovatum* are characteristic on the crests.

Figure 29: The vegetation found on the hills of the study area are scattered among the rocks.

5. Eragrostis truncata dominated ephemeral stream beds

This community occurs in the ephemeral stream bed of the study area where whitish, calcareous sandy soil covered by a dense biological soil crust constitute approximately 10% of the ground cover. Here, *Eragrostis truncata* dominates the floristic composition with an estimated cover of 60% to 80%. Low shrubs include *Pentzia incana, Oedera humilis, Thesium hystrix* and *Felicia fascicularis*. The herbs *Sisymbrium turczaninowii* and *Indigastrum niveum* were recorded here.

Figure 30: The ephemeral stream beds are dominated by a high density of *Eragrostis truncate*.

6. Ephemeral pans

Thirty-two ephemeral pans have been identified in the study area (Figure 31 and Figure 32). Of these, only one pan was inundated and contained a mixture of aquatic, obligate- and facultative wetland components. The floristic composition of the remaining pans comprised obligate, facultative, and terrestrial components, which included two main variations, i.e., dominant tall grassland vegetation and dominant low-growing vegetation with a high density of sprawling herbs. In general, trees and tall shrubs lined the periphery of the pans. This peripheral woody layer comprises *Diospyros lycioides subsp. lycioides, Ziziphus mucronata, Boscia albitrunca, Searsia lancea, Gymnosporia buxifolia, Tarchonanthus camphoratus, Grewia flava, Lycium hirsutum* and *Prosopis glandulosa*. The grass *Setaria verticillata* is common below the canopies of this woody layer. The aquatic component of the pan that was fully inundated was defined by algae and the macrophytes *Aponogeton desertorum and Marsilea sp.*

The floristic composition of pans with tall grass pans was monotonous, typically being dominated by *Leptochloa fusca*, but *Sporobolus fimbriatus and Eragrostis rotifer* were common. Pans characterised by low growing vegetation were dominated by *Chloris virgata and Aristida congesta*. Here, the sprawling herb *Cullen tomentosum* formed dominating dense mats. The terrestrial low shrub *Aptosimum spinescens* was encountered frequently in these pans.

Chloris virgata and *Cullen tomentosum* were present in all pans, along with *Alternanthera sessilis, Schoenoplectus muricinux* and *Oxalis depressa*. Terrestrial low shrubs *Pentzia calcarea* and *P. incana* were common throughout. The weeds *Datura ferox* and *Bidens pilosa* were abundant in pans disturbed by overgrazing and trampling.

Figure 31: A wet pan in the study area that comprised of macrophytes, obligate- and facultative wetland species

Figure 32: A dry pan in the study area dominated by low-growing vegetation

10.1.1.4.4. Population of sensitive, threatened and protected plant species

The SANBI Red List provides information on the national conservation status of South Africa's indigenous plants, while the National Forests Act (No. 84 of 1998) ("NFA") and the Northern Cape Nature Conservation Act (Act No. 9 of 2009) ("NCNCA") restricts activities regarding sensitive plant species. Section 15 of the NFA prevents any person to cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister. Section 49 (1) and 50 (1) of the NCNCA states that no person may, without a permit pick, transport, possess, or trade in a specimen of a specially protected (Schedule 1) or protected (Schedule 2) plants. Furthermore, Section 51(2) states that no person may, without a permit, pick an indigenous plant (Schedule 3) in such manner that it constitutes large-scale harvesting.

Species protected in terms of the NFA include *Vachellia erioloba, V. haematoxylon* and *Boscia albitrunca* (Table 2). Boscia albitrunca is particularly abundant on the hills where it was found at high densities of approximately 4 to 6 individual per hectare as saplings of 20cm (height ("h")) x 30cm (diameter ("d")) to stunted shrubs of 1.5m (h) x 2m (d). In the open shrubland on rocky soil (earmarked for mining) it occurred widespread at moderate densities of 1 - 4 individuals per hectare, primarily as large adult trees of up to 2.5m (h) x 5m (d). It occurred in the open woodland on red sand, primarily as adult trees scattered at low densities of < 1 per hectare. Opportunistic individuals were recorded around some pans and in the dwarf shrubland on calcrete.
Vachellia erioloba occurred at high densities (3 to 10 individuals per hectare) in the open woodland on red sand and it was widespread at low densities (1 individual per hectare) across the open shrubland on rocky soil. In both

communities they were found from saplings (15cm (h) x 30cm (d)) to large adult trees of up to 4m to 5m (h) x 8m to 12m (d).

Vachellia haematoxylon was restricted to the open woodland on red sand, where it occurred at very low densities (< 1 individual per hectare) as medium-sized (1m to 2m (h) x 0.5m to 2m (d)) shrubs and trees.

Protected species in terms of Schedule 1 and 2 of the NCNCA are listed in Table 16. Species protected under the NCNCA most likely to be affected by the mine footprint are those associated with the shrubland on rocky soil. Apart from *Boscia albitrunca* already discussed above, these include the three Aloe spp., and the bulbs *Gladiolus permeabilis* and *Moraea polystachya.*

Table 16: Plant species from the region that are of conservation concern

FAMILY	Scientific name	Status	NFA	NCNCA
AIZOACEAE	*Ruschia griquensis**			S2
AIZOACEAE	*Ruschia uncinata*			S2
AMARANTHACEAE	*Salsola kalaharica*	DDT		
APOCYNACEAE	*Cynanchum viminale* subsp. *viminale*			S2
APOCYNACEAE	*Gomphocarpus fruticosus* subsp. *fruticosus*			S2
APOCYNACEAE	*Gomphocarpus tomentosus* subsp. *tomentosus**			S2
APOCYNACEAE	*Pachypodium succulentum*			S2
APOCYNACEAE	*Tridentea gemmiflora*			S2
ASPHODELACEAE	*Aloe claviflora**			S2
ASPHODELACEAE	*Aloe grandidentata**			S2
ASPHODELACEAE	*Aloe hereroensis**			S2
ASPHODELACEAE	*Bulbine abyssinica*			S2
ASTERACEAE	*Pentzia stellata*	NT		
BRASSICACEAE	*Boscia albitrunca**		X	S2
CARYOPHYLLACEAE	*Dianthus micropetalus*			S2
CELASTRACEAE	*Gymnosporia buxifolia**			S2
CRASSULACEAE	*Crassula corallina* subsp. *corallina*			S2
CRASSULACEAE	*Crassula lanceolata* subsp. *lanceolata*			S2
CRASSULACEAE	*Kalanchoe brachyloba**			S2
EUPHORBIACEAE	*Euphorbia gariepina* subsp. *gariepina*			S2
EUPHORBIACEAE	*Euphorbia spartaria*			S2
FABACEAE	*Lessertia pauciflora* var. *pauciflora**			S1
FABACEAE	*Vachellia erioloba**		X	
FABACEAE	*Vachellia haematoxylon**		X	
IRIDACEAE	*Gladiolus permeabilis**			S2
IRIDACEAE	*Moraea polystachya**			S2
MELIACEAE	*Nymania capensis**			S2
OXALIDACEAE	*Oxalis depressa**			S2
OXALIDACEAE	*Oxalis lawsonii**			S2
SCROPHULARIACEAE	*Jamesbrittenia integerrima*			S2
SCROPHULARIACEAE	*Jamesbrittenia tysonii*			S2

those recorded in the study area are indicated with *.

10.1.1.4.5. Mammals

As many as 53 terrestrial mammals and seven bat species have been recorded in the region. Species that were encountered by Milne (2022) during the site visit include Steenbok and Ground squirrel. Signs of activities from fossorial mammal species were observed, including mounds created by the African Mole Rat.

Six listed terrestrial mammal species and two listed bat species potentially occur in the area. The mammal species that are specially protected according to Schedule 1, 2 or 3 of NCNCA are indicated in Table 17. Each species'

conservation concern in terms of the international ("IUCN") Red List and the 2016 Mammal Red List of South Africa Lesotho and Swaziland (EWT 2016) is indicated.

Table 17: A list of mammal species of conservation concern that are likely to be found in the study area.

Scientific name	Common name	IUCN status	EWT 2016
Eidolon helvum	African Straw-coloured Fruit-bat	NT	
Rhinolophus denti	Dent's Horseshoe Bat		NT
Orycteropus afer	Aardvark		
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU
Parotomys littledalei	Littledale's Whistling Rat		NT
Atelerix frontalis	South African Hedgehog		NT
Proteles cristatus	Aardwolf		
Felis silvestris cafra	African Wild Cat		
Felis nigripes	Black-footed cat	VU	VU
Vulpes chama	Cape Fox		
Hyaena brunnea	Brown Hyena	NT	NT
Otocyon megalotis	Bat-eared Fox		
Ictonyx striatus	Striped Polecat		
Mellivora capensis	Honey Badger		

Aardvark burrows were observed in the open woodland on red sand. The African Straw-coloured Fruit-bat, Aardwolf, Cape Fox, Bat-eared Fox, African Striped Weasel, African Wildcat, Black-footed cat, Honey Badger, Striped Polecat and South African Hedgehog all have a high chance of occurring on site, given their wide habitat tolerances and preference for savanna habitats, which resembles the open woodland found on site.

The Littledale's Whistling Rat has a low potential to occur on site. It prefers shrublands in coastal hummocks, sand dunes, gravel plains and dry riverine systems. Dent's Horseshoe Bat has a low potential to be found on site, because no suitable roosting sites have been observed on site. Furthermore, Temminck's Ground Pangolin and Brown Hyaena is not expected to occur on site. Although their habitat requirements and natural distribution ranges overlap with that of the study area, they are both rather sensitive to anthropogenic habitat disturbances. Farm fences and the neighbouring mining activities are most likely restricting their occurrences across their natural distribution range in the area. Problem animals listed in Schedule 4 of the of NCNCA with a high likelihood to occur on site include Black-backed Jackal and Caracal.

10.1.1.4.6. Reptiles

The Kameelhoek MRA lies within the distribution range of at least 37 reptile species. No listed species are known to occur in the area, but most reptiles of the study area are protected either according to Schedule 1 or 2 of NCNCA. Specially protected species include *Karusasaurus polyzonus* (Southern Karusa Lizard) and *Chamaeleo dilepis* (Common Flap-neck Chameleon). The Karusa Lizard is a rock- dwelling species and may potentially be associated with the hills. The Common Flap-neck Chameleon is typically found high up in bushes or trees and is expected to occur in the open shrubland and open woodland on site. The Western Ground Agama was frequently encountered during the field survey. The remaining common reptile species of the region are expected to occur in the terrestrial habitats on site, while the Marsh Terrapin is expected to be associated with the ephemeral pans. It survives drought by burrowing into moist soil and then emerges after good rains.

10.1.1.4.7. Amphibians

Ten amphibian species are known from the region. The Giant Bull Frog (*Pyxicephalus adspersus*) is listed as Near Threatened in the Southern African Frog Atlas and is protected according to Schedule 1 of the NCNCA. They prefer seasonal shallow grassy pans, vleis and other rain-filled depressions in open flat areas of grassland or savanna, but mainly remain buried up to 1m underground until conditions become favourable. The site lies within the known distribution of this species and the ephemeral pans provide ideal habitat for it on site.

All other amphibians of the study area are protected according to Schedule 2 of NCNCA. No natural permanent water occurs on site that would represent suitable breeding habitats for most amphibian species, but the ephemeral stream and pans will be very important during wet periods.

10.1.1.4.8. Avifauna

The study site does not fall within or near (<150km) any of the Important Bird Areas ("IBA") defined by Birdlife South Africa. A total number of 255 bird species have been recorded from the region, of which as many as 25 are listed and classified as Vulnerable, Near Threatened, Endangered or Critically Endangered (Table 18). Furthermore, all birds are protected either according to Schedule 1, 2 or 3 of NCNCA (Appendix 2). Those that are specially protected (Schedule 1) are listed in Table 18.

Table 18: Bird of conservation concern that are likely to occur on site

Scientific name	Common name	IUCN	SA Red Data Book	NCNCA (S1)
Accipiter badius	*Little Banded Goshawk*			X
Anthropoides paradiseus	Blue Crane	VU	NT	
Anthus crenatus	Rock Pipit	NT	NT	
Aquila rapax	Tawny Eagle	VU	EN	X
Aquila verreauxii	Black Eagle		VU	X
Ardeotis kori	Kori Bustard	NT	NT	X
Bubo africanus	Spotted Eagle Owl			X
Bubo lacteus	Giant Eagle Owl			X
Buteo rufofuscus	Jackal Buzzard			X
Buteo vulpinus	Steppe Buzzard			X
Caprimulgus europaeus	Eurasian Nightjar			X
Caprimulgus rufigena	Rufouscheeked Nightjar			X
Caprimulgus tristigma	Freckled Nightjar			X
Charadrius pallidus	Chestnutbanded Plover	NT	NT	X
Ciconia abdimii	Abdim's Stork		NT	
Ciconia nigra	Black Stork		VU	X
Circaetus pectoralis	Blackbreasted Snake Eagle			X
Circus maurus	Black Harrier	EN	EN	X
Circus pygargus	Montagu's Harrier			X
Circus ranivorus	African Marsh Harrier		EN	X
Coracias garrulous	Eurasian Roller		NT	
Cursorius rufus	Burchell's Courser		VU	
Elanus caeruleus	Black-shouldered Kite			X
Falco biarmicus	Lanner Falcon		VU	X
Falco chicquera	Red-necked Falcon	NT		X
Falco naumanni	Lesser Kestrel			X
Falco peregrinus	Peregrine Falcon			X
Falco rupicolis	Rock Kestrel			X
Falco rupicoloides	Greater Kestrel			X
Gallinula chloropus	Common Moorhen			X
Glareola nordmanni	Blackwinged Pratincole	NT	NT	X
Glaucidium perlatum	Pearlspotted Owl			X
Gyps africanus	White-backed Vulture	CR	CR	X
Gyps coprotheres	Cape Vulture	EN	EN	X
Haliaeetus vocifer	African Fish Eagle			X
Leptoptilos crumeniferus	Marabou Stork		NT	X
Melierax canorus	Pale Chanting Goshawk			X
Melierax gabar	Gabar Goshawk			X
Milvus migrans	Black Kite			X
Neotis ludwigii	Ludwig's Bustard	EN	EN	X
Oxyura maccoa	Maccoa Duck	VU	NT	
Phoenicopterus minor	Lesser Flamingo	NT	NT	X
Phoenicopterus ruber	Greater Flamingo		NT	X

Scientific name	Common name	IUCN	SA Red Data Book	NCNCA (S1)
Polemaetus bellicosus	Martial Eagle	EN	EN	X
Polihierax semitorquatus	Pygmy Falcon			X
Polyboroides typus	Gymnogene			X
Ptilopsis granti	Southern White-faced Owl			X
Sagittarius serpentarius	Secretarybird	EN	VU	X
Torgos tracheliotus	Lappet-faced Vulture	EN	EN	X
Tyto alba	Barn Owl			X

10.1.1.4.9. Fish

No fish are expected to occur in the ephemeral stream or pans, even when filled, mainly due to their ephemerality. Therefore, no fish species are expected to occur on site.

10.1.1.4.10. Invertebrates

Eight invertebrate species of the Northern Cape appear on the IUCN Red Data list of threatened species and are listed in Table 19. However, none of these species' distribution ranges overlap with that of the study area. In addition, those species that are specially protected according to Schedule 1 of the NCNCA include all Velvet Worms and some Baboon Spider species, Stag Beetles and the Flightless Dung Beetle (Table 19). So far, none of these taxa have been formally recorded from the region, but it is possible for some of the Baboon Spiders to occur on site.

All Rock- Creeping- and Burrowing Scorpions are protected according to Schedule 2 of the NCNCA, along with several beetles, butterflies and moths (Table 19). Of these, Burrowing and Rock Scorpions and some Gossamer-winged Butterflies, Skippers, Brush-footed Butterflies and Satyrs have the highest likelihood to be found on site.

All other invertebrates from the class Insecta and Arachnida are protected according to Schedule 3 of the NCNCA.

Table 19: Invertebrate species found in the Northern Cape that are of conservation concern.

Class	Order	Scientific Name	Common name	Status
Arachnida	Mygalomorphae	*Ceratogyrus* spp.	Horned Baboon Spiders	S1
		Harpactira spp.	Common Baboon Spiders	S1
		Pterinochilus spp.	Goldenbrown Baboon Spiders	S1
	Scorpiones	*Hadogenes* spp.	All Rock Scorpions	S2
		Opistacanthus spp.	All Creeping Scorpions	S2
		Opistophthalmus spp.	All Burrowing Scorpions	S2
Insecta	Coleoptera	*Circellium bacchus*	Flightless Dung Beetle	S1
		Colophon spp.	All Stag Beetles	S1
		Dromica spp.	Tiger Beetles (all species)	S2
		Graphipterus assimilis	Velvet Ground Beetle	S2
		Ichnestoma spp.	All Fruit Chafer Beetles	S2
		Manticora spp.	All Monster Tiger Beetles	S2
		Megacephala asperata	Tiger Beetle	S2
		Megacephala regalis	Tiger Beetle	S2
		Nigidius auriculatus	Stag Beetle	S2
		Oonotus adspersus	Stag Beetle	S2
		Oonotus interioris	Stag Beetle	S2
		Oonotus rex	Stag Beetle	S2
		Oonotus sericeus	Stag Beetle	S2
		Platychile pallida	Tiger Beetle	S2

Class	Order	Scientific Name	Common name	Status
		Prosopocoilus petitclerci	Stag Beetle	S2
		Prothyma guttipennis	Tiger Beetle	S2
	Lepidoptera	*Lepidochrysops penningtoni*	Pennington's Blue	DD
		Lycaenidae	All Gossamer-winged Butterflies	S2
		Hepialidae	All Swift Moths	S2
		Hesperiidae	All Skippers	S2
		Nymphalidae	All Brush-footed Butterflies	S2
		Satyridae	All Satyrs	S2
	Orthoptera	*Africariola longicauda*	Richtersveld Katydid	VU
		Alfredectes browni	Brown's Shieldback	DD
		Brinckiella serricauda	Serrated Winter Katydid	DD
		Brinckiella arboricola	Tree Winter Katydid	EN
		Brinckiella aptera	Mute Winter Katydid	VU
		Brinckiella karooensis	Karoo Winter Katydid	VU
		Brinckiella mauerbergerorum	Mauerberger's Winter Katydid	VU
Onychophora			All Velvet worms	S1

Two major habitats delimit possible invertebrate communities in the study area:

1. Terrestrial vegetation classified as bushveld for insect preference
Species associated with this habitat type are diverse and are widely distributed and Kameelhoek is expected to host high invertebrate richness and density, due to the diverse micro-habitat opportunities on site. Common Lesser-Thicktail Scorpions (*Uroplectes carinatus* and *U. gracilior*), dung beetles (*Onthophagus*) and the dark blue pansy butterfly (*Junonia oenone*) have been recorded in the vicinity and Termitaria, most likely belonging to *Trinervitermes trinervoides*, and Darkling Beetles (*Tenebrionidae*), Seed bugs (*Lygaeidae*), Toad Lubbers (*Phrynotettix*) and Painted Lady (*Vanessa cardui*), a brush- footed butterfly, were recorded during the field survey.

2. Ephemeral pans
Three pans had water during the field survey and were sample using a plankton net. Only generalist insects were recorded, including beetle larvae (*Coleoptera*), *Odonata* nymphs, Backswimmers (*Notonectidae*) and Water boatmen (*Corixidae*).

Gondwanalimnadia costata (spinicaudatan clam shrimps), *anostracans* (fairy shrimp), *Macrothricidae* (cladoceran, water fleas) and calanoid copepods hatched from sediment collected on site. These species usually co-occur with the apex predator *Triops namaquensis* (tadpole shrimp) and ostracods (seed shrimp).

10.1.1.5. Surface water

The MRA is located within the D73A endorheic quaternary catchment (Figure 34). The non-perennial Soutloop tributary drainage runs through the north-western corner of the MRA and originates ±13km to the north, with its main tributaries coming from drainage lines originating in the adjacent hills. From Kameelhoek it flows southwards where it connects with the Groenwaterspruit and Skeifonteinspruit ±21km downstream. The Soutloop then meanders further south-west for ±100km, where it flows into the Orange River (Milne, 2022).

The site drains towards a south-south-west direction (Steyn, *et al*, 2022). The drainage lines flow from the hills and ridges, downwards towards the plains of which a total combined length of ±45km occurs within the study area. Thirty-two depressional wetlands (ephemeral pans) and several drainage lines were identified on site (Milne, 2022).

All watercourses on the Kameelhoek MRA are indicated in Figure 35.

10.1.1.6. Watercourse delineation and classification

The wetlands (all are ephemeral pans) are classified as natural endorheic depressions and altogether cover a total area of ±29ha, with an average size of 0.9ha per pan. Water enters the depressions primarily through direct precipitation and overland inflow. The wetlands are only filled after substantial summer rainfall events and are therefore intermittently and rarely inundated. The depressions have clear (turbidity <100 NTU) and fresh (average EC = 18.7µS/cm) water, with neutral (6.5) pH. The soils are intermittently saturated, and the soils do not show any soil wetness indicators. The substrata comprise sandy loam soils.

The depression floors are vegetated with two variants namely tall grass pans and short grass pans. Tall grass pans comprise monotonous cover of species, especially *Leptochloa fusca*, but *Sporobolus fimbriatus* and *Eragrostis rotifer* are common. Pans dominated by low-growing vegetation are dominated by *Chloris virgata* and *Aristida congesta*, but the herb *Cullen tomentosum* form dominating dense mats. Sedges and dwarf shrubs are found in all pans.
An aquatic component was only present in the single inundated pan during the field survey, but it is expected that the pans on Kameelhoek will host similar species once fully inundated for sufficient periods. Here, free-floating algae and floating macrophytes dominated the water column, but vegetation associated with the above-mentioned variants were present, which typically defines the pans during their desiccated phase. In general, the pans were dominated by indigenous vegetation, but the creeping weed *Alternanthera sessilis* was especially common in Pan Variant 2, dominated by low-growing vegetation.

10.1.1.7. Wetland health, ecological importance and sensitivity assessment

A Present Ecological State (“PES”) assessment was conducted to establish baseline health for wetlands in the study area, based on WET-Health Version 2 (Macfarlane et al. 2020). The WET-Health tool is designed to assess the PES of a wetland by scoring the perceived deviation from a theoretical reference condition.

Most of the depressional wetlands on Kameelhoek is considered to be unmodified (PES A), while two wetlands are considered to be largely natural (PES B), i.e., a small change in natural habitats and biota may have taken place but the ecosystem functions are still predominantly unchanged (Figure 36). One wetland is however considered to be largely modified (PES D), i.e., a large loss of natural habitat, biota and basic ecosystem functions has occurred.

The pans, their buffer zones and catchment areas are primarily still in pristine condition, with only a few impact sources. The most significant direct modifications have occurred through the excavation and deposition of material in one of the pans in the north (PES D), assumingly to create a small dam to retain rainwater for livestock. Alien weeds and invasive species have infested two pans in the centre of the property (PES B), which specifically affected their vegetation impact score, due to the loss of indigenous vegetation. Minor surface disturbances occur through farm roads that cut through four of the wetlands, altering their surface roughness and flow regime. However, these low-level modifications do not have a significant effect on the overall PES of the pans.

An Ecological Importance and Sensitivity (“EIS”) assessment was conducted by using methodology adapted from Duthie (1999). For this assessment procedure, a series of determinants are considered using a ranking scale of 0 to 4, i.e., Very high = 4; High = 3, Moderate = 2; Marginal/Low = 1; None = 0

All wetlands on site, except one, were rated as having a High EIS and is considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. The wetland mentioned above that had been excavated to form a small dam was rated to have a Moderate EIS and is considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of this wetland is no longer considered to be sensitive to flow and habitat modifications. Refer to Figure 37.

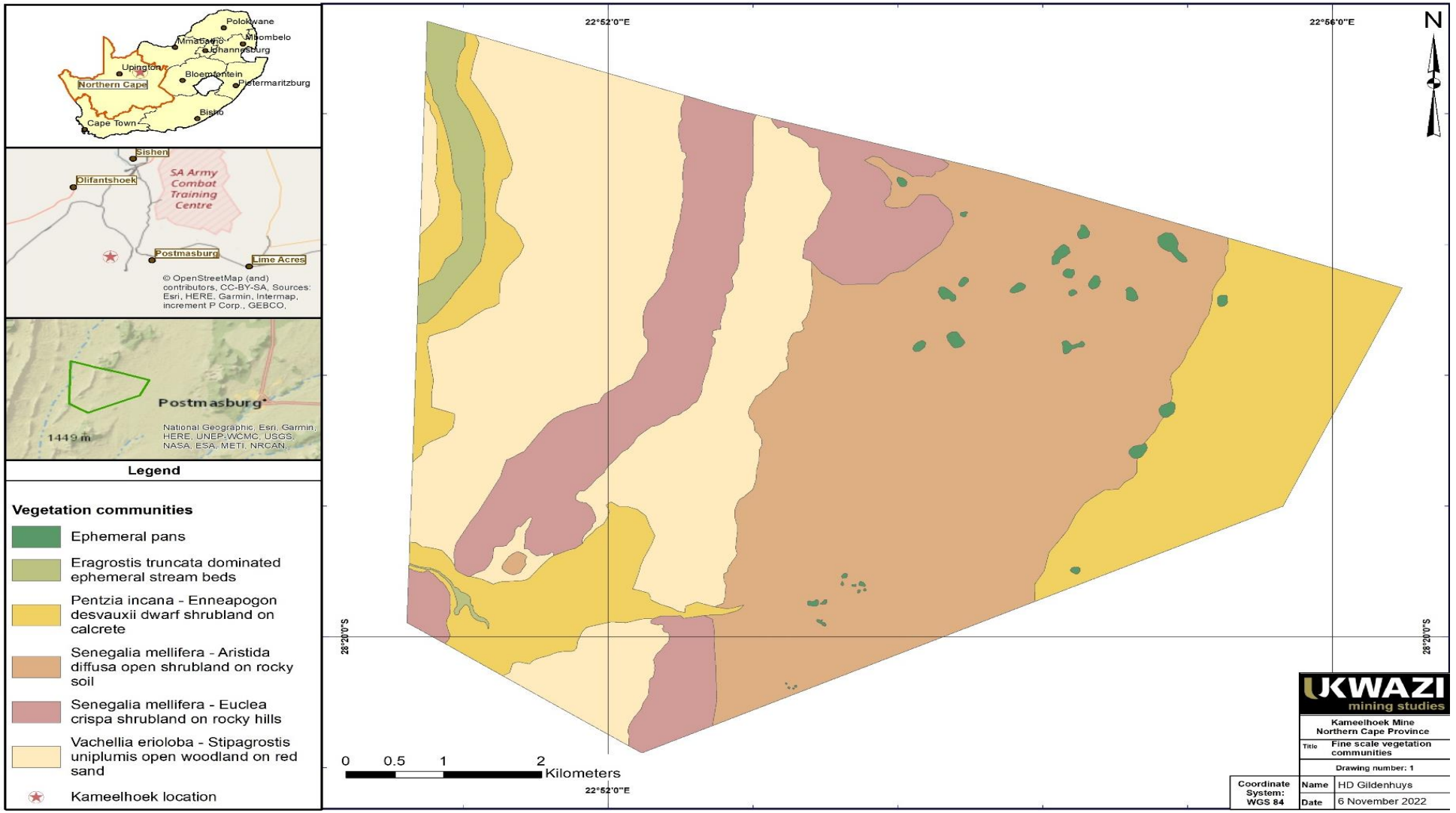

Figure 33: The distribution of fine-scale plant communities in the study area.

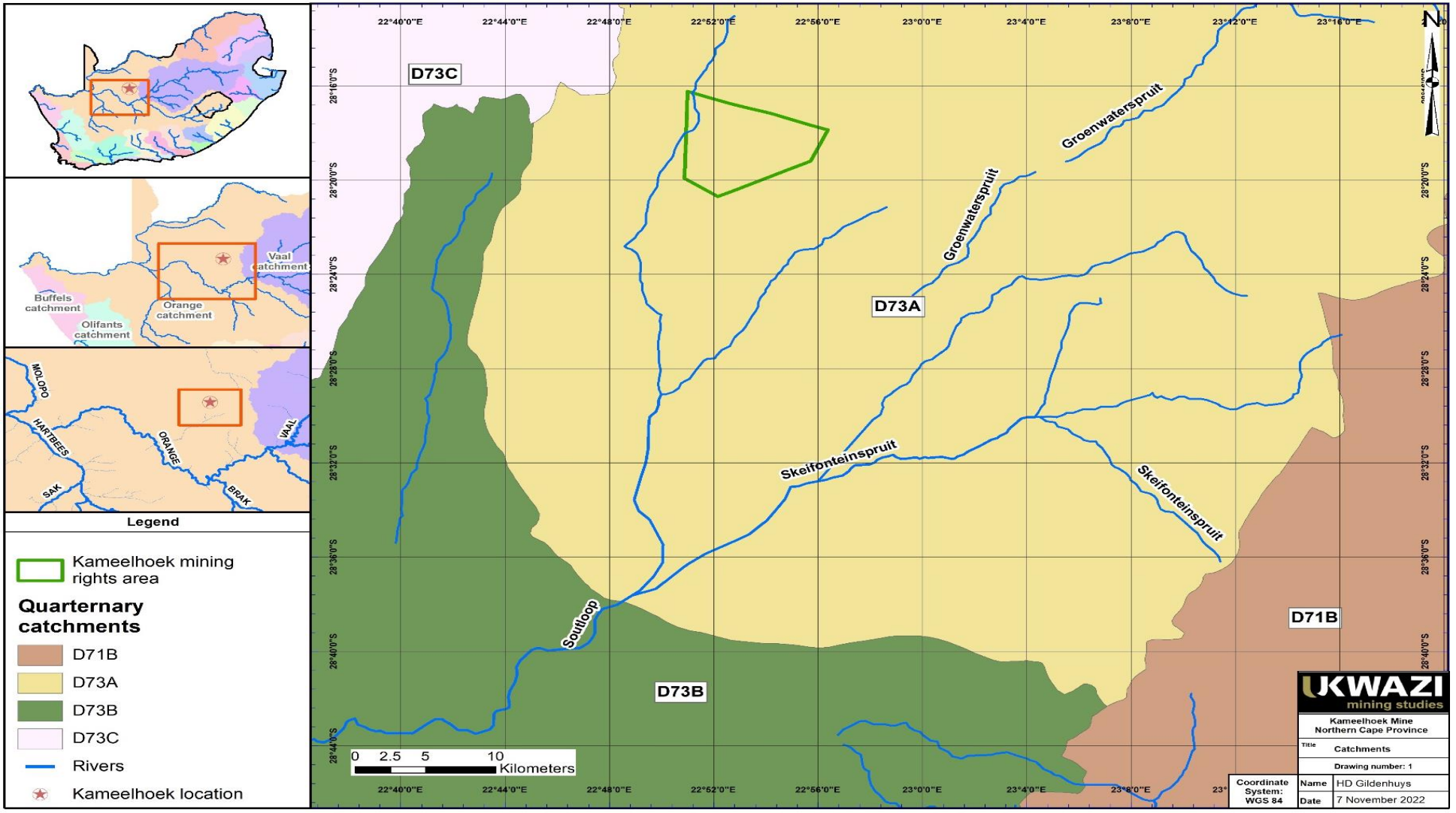

Figure 34: Quarternary catchment map

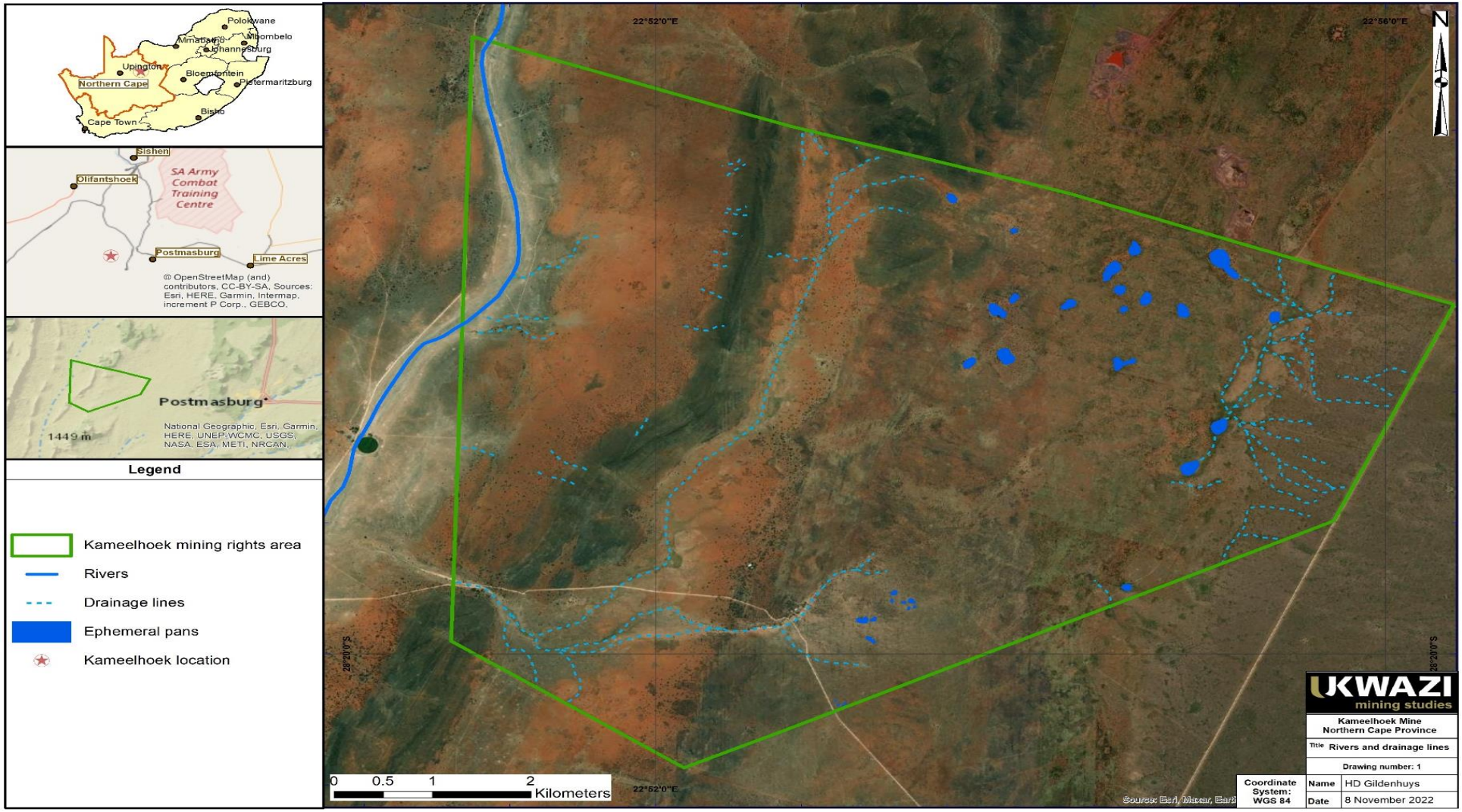

Figure 35: Mining right area drainage map

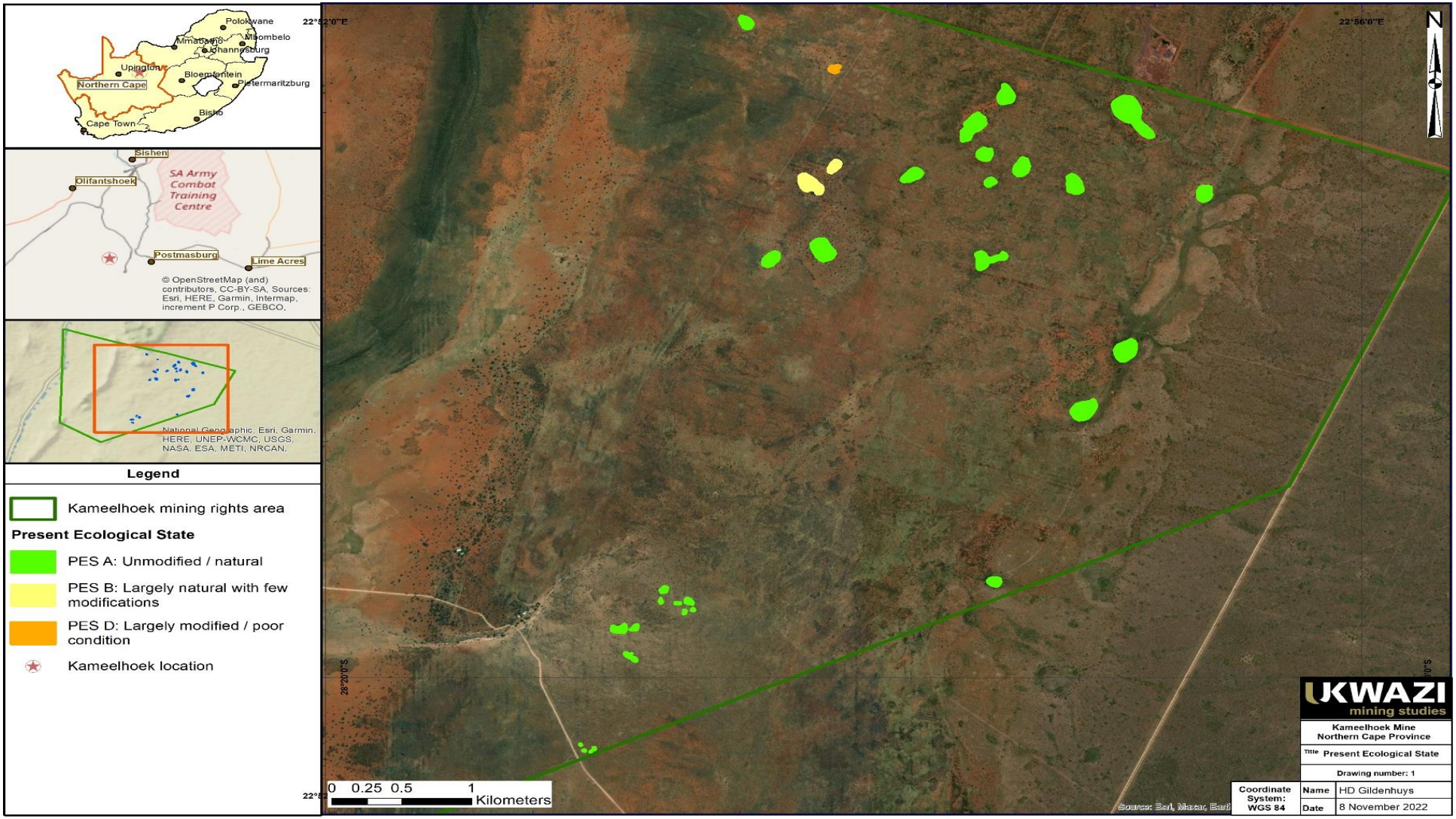

Figure 36: The distribution of wetlands on Kameelhoek, according to their PES.

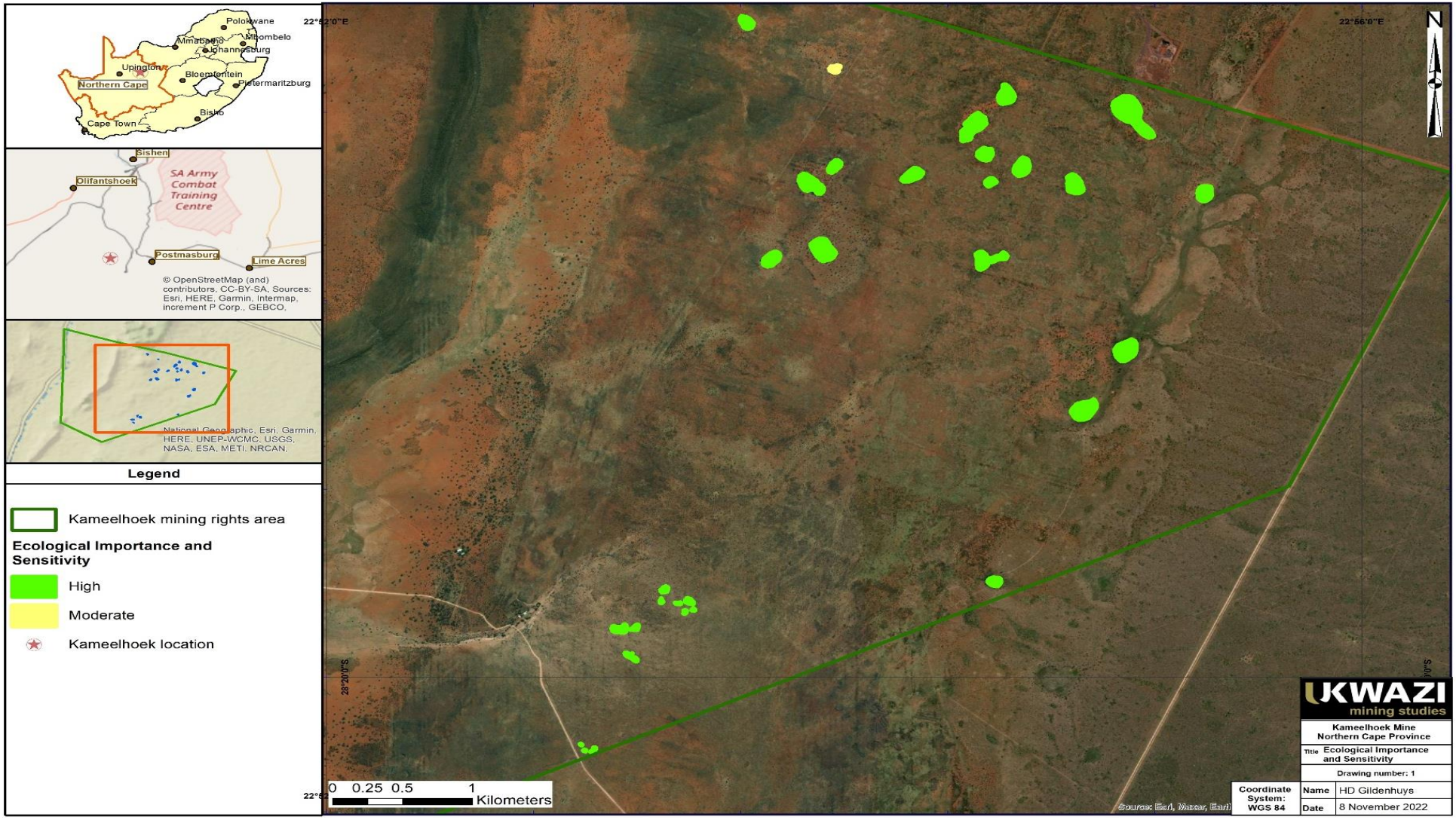

Figure 37: The distribution of wetlands on Kameelhoek, according to their EIS.

10.1.1.8. Geological Setting

10.1.1.8.1. Regional geology

The Farm 477 extent of the site is mainly underlain by older rocks of the Lime Acres Member of the Ghaap Plateau Formation, which in turn forms part of the Campbell Group. These rocks consist mainly of dolomitic limestone and chert with a prominent chert breccia (manganese marker) at the top. This Member outcrops along a broad north-south striking band that covers most of Farm 477 and the far eastern part of Farm 478. Some outcrops of younger shale, with subordinate flagstone, quartzite and conglomerate of the Gamagara Formation, Postmasburg Group occur immediately east and west of the Lime Acres Member. These outcrops are the result of faulting and/or collapsed sinkhole structures. Surface limestone and windblown sand cover the far eastern and western parts of the site, and an area in the centre. These recent deposits are generally thin and seldom exceed 10m in vertical thickness (Loubser, 2021).

Prominent hills and ridges are formed by younger ferruginised and brecciated banded ironstone (known as the Blinkklip Breccia) of the Asbestos Hills Formation which overlays the Campbell Group. These rocks are more resistant to weathering than the surrounding dolomitic rocks and therefore result in the prominent hills. Large sinkholes were formed along the Maremane Anticline, catalysed by leaching of rainwater. Overlying banded iron formations (“BIF”) of the Asbestos Hills Formation have slumped into these palaeo-karst structures in the dolomitic rocks. Simultaneously, the Fe formations were supergene enriched to form massive iron ore deposits such as Sishen and Beeshoek.

The prominent north-south striking hills along the centre of Farm 478 are formed by weathering resistant rocks of the Kwakwas Member of the Koegas Formation which overlies the Asbestos Hills Formation. These rocks consist mainly of jaspilite, banded ironstone, quartzite and dolomite.

Limited outcrops of diamictite of the Makganyene Formation and andesitic lava of the overlaying Ongeluk Formation occur on the far western part of the site. These are the youngest bedrocks at the site. The Makganyene diamictite generally forms a good water bearing formation underneath the Ongeluk lava.

The Mn ores of the Postmasburg Mn field are subdivided into ferruginous ores of the Western Belt and siliceous ores of the Eastern Belt (von Plehwe-Leisen & Klemm, 1995).

Several lineaments, faults and dykes are present in the area. Several unmapped or partially mapped linear structures were mapped by Kolomela geological surveys. These lineaments are normally difficult from areal images due to weak outcrops and scattered trees obscuring identification. Normally, these structures are associated with dolerite dykes, but this could not be confirmed in this area due to lack of outcrops. However, the regional structures are exclusively dolerite dykes, which in many cases can be linked to fault zones. Some structures may extend beyond the mapped occurrences due to surface covering (Thomas & Basson, 2016).

10.1.1.8.2. Local geology

Kameelhoek is located on the Wolhaarkop Anticline in the Campbellrand Group dolomites (Figure 38). The Wolhaarkop Anticline lies to the southwest of the Maremane Anticline, trending sub-parallel to this anticline. The Maremane Anticline hosts the Fe and Mn deposits of the Postmasburg metallogenic province. Dolomites and limestones of the Lime Acres Formation are exposed in the anticline with the Wolhaarkop breccias overlying this sequence in the east and west. The Wolhaarkop breccia Fe and Mn mineralisation on Kameelhoek project, which is situated on the anticline, appears to be controlled by northeast parallel trending structures. The breccia is overlain by the Manganore Fe formation (Blinkklip Breccia). The Blinkklip Breccia has a potential strike of 1.5km to the southeast of the project and dips to the east. The Blinkklip Breccia is overlain by the Gamagara Formation. Economic Fe mineralisation is known to occur in the Doornfontein conglomerate at the base of the Gamagara Formation. Hence, the potential from this unit should be investigated on the Kameelhoek project (Loubser, 2021; Thomas & Basson, 2016).

Figure 38: Kameelhoek local geology

10.1.1.9. Hydrogeology

10.1.1.9.1. Aquifers

Groundwater at the site occurs in two main aquifer systems, namely, the unconfined to semi-confined primary aquifer system consisting of calcrete and windblown sands, and the secondary (or fractured rock) aquifer system.

The primary aquifer (e.g., Soutloop tributary and alluvial/ weathered calcretised sand) is usually developed on the contact between the calcrete and underlying clay formations or localised pebble horizons within the calcrete. Although relatively low yields occur in this aquifer, it is developed throughout the area and is the sole reliable source of water supply to most of the farms in the area. Here the groundwater levels are shallow at less than 10m below ground level ("mbgl").

According to the 1:500 000 hydrogeological map sheet of Kimberley, most of the site is situated on an intergranular and fractured aquifer with expected yields of successful boreholes ranging between 0.1L/s to 0.5L/s. A longitudinal N-S striking area in the centre of the site (western part of Farm 477 extent) is underlain by a Karst aquifer with expected yields of successful boreholes drilled in this aquifer ranging between 0.5L/s to 10L/s (Steyn, et al. 2022).

10.1.1.9.2. Dewatering

Dewatering in the vicinity of Kameelhoek takes place to the east at Kolomela and Beeshoek mines. The impact of the dewatering can be seen in Figure 39 these specific contours were determined by Vermeulen (2011). Kolomela dewaters open pits from boreholes to allow for the continuation of mining activities. A portion is used for operational purposes. The remaining portion is provided to the Vaal- Gamagara Water Scheme. However, the water abstracted exceeds the water requirements of the Water Scheme and must be managed to prevent discharge into the environment. Kolomela is authorised to artificially recharge the remaining portion of the water into an aquifer associated with the Groenwaterspruit catchment. The average dewatering rate for 2018 through 2020 was 1 351 cubic meters per hour (m^3/h) for Leeuwfontein and 267m^3/h for Kapstevel North and Kapstevel South. The maximum current total dewatering rate over the LOM is predicted to be 1 300m^3/h for Leeuwfontein and Klipbankfontein and 750m^3/hr for Kapstevel North and Kapstevel South. Kolomela abstracted 13.4 million m^3 groundwater in 2020 of which 8.7 million m^3 was supplied to the Vaal-Gamagara Water Scheme and 4.8 million m^3 was artificially discharged into the aquifer.

The dewatering operation at Kolomela (and Beeshoek) is conducted at a higher rate than the aquifer recharge, which influences the aquifer(s) in the area. The area influenced by the abstraction and associated water level decline/ impact is referred to as the cone of depression. The depth and extent of the cone of depression is determined by the type, geometry and hydraulic properties of the aquifer. A geohydrological impact assessment will be conducted as part of this application to determine the extent of the cone of depression and assess impacts (if any) on water users in the area. The main aquifer of the area is a secondary fractured rock system with a high heterogeneity that is very much structurally (geologically) controlled. In the secondary, fractured rock aquifers, flow occurs by preference through open, transmissive fractures among the solid rock matrixes. The major structures in the Kolomela area trends roughly north south and follows the trend of the Maremane dome (anticline) (Loubser, 2021).

10.1.1.9.3. Site characterisation and baseline assessment

Kameelhoek has been subdivided into three significant groundwater regions/ zones namely the Kolomela impacted zone, the area outside the impacted zone and the Soutloop (refer to Figure 40) (Steyn, et al. 2022).

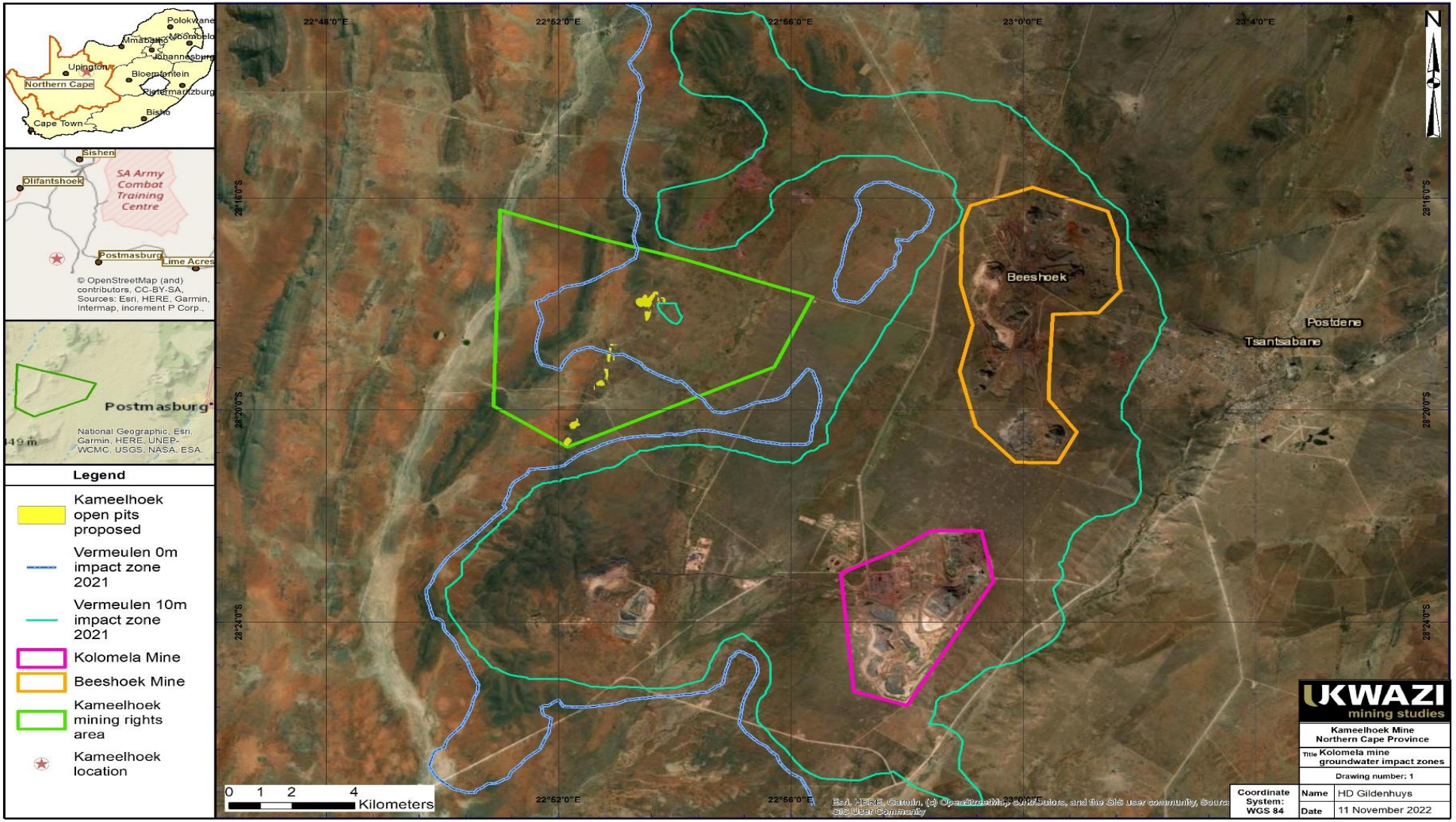

Figure 39: Kolomela impact zones by Vermeulen (2011)

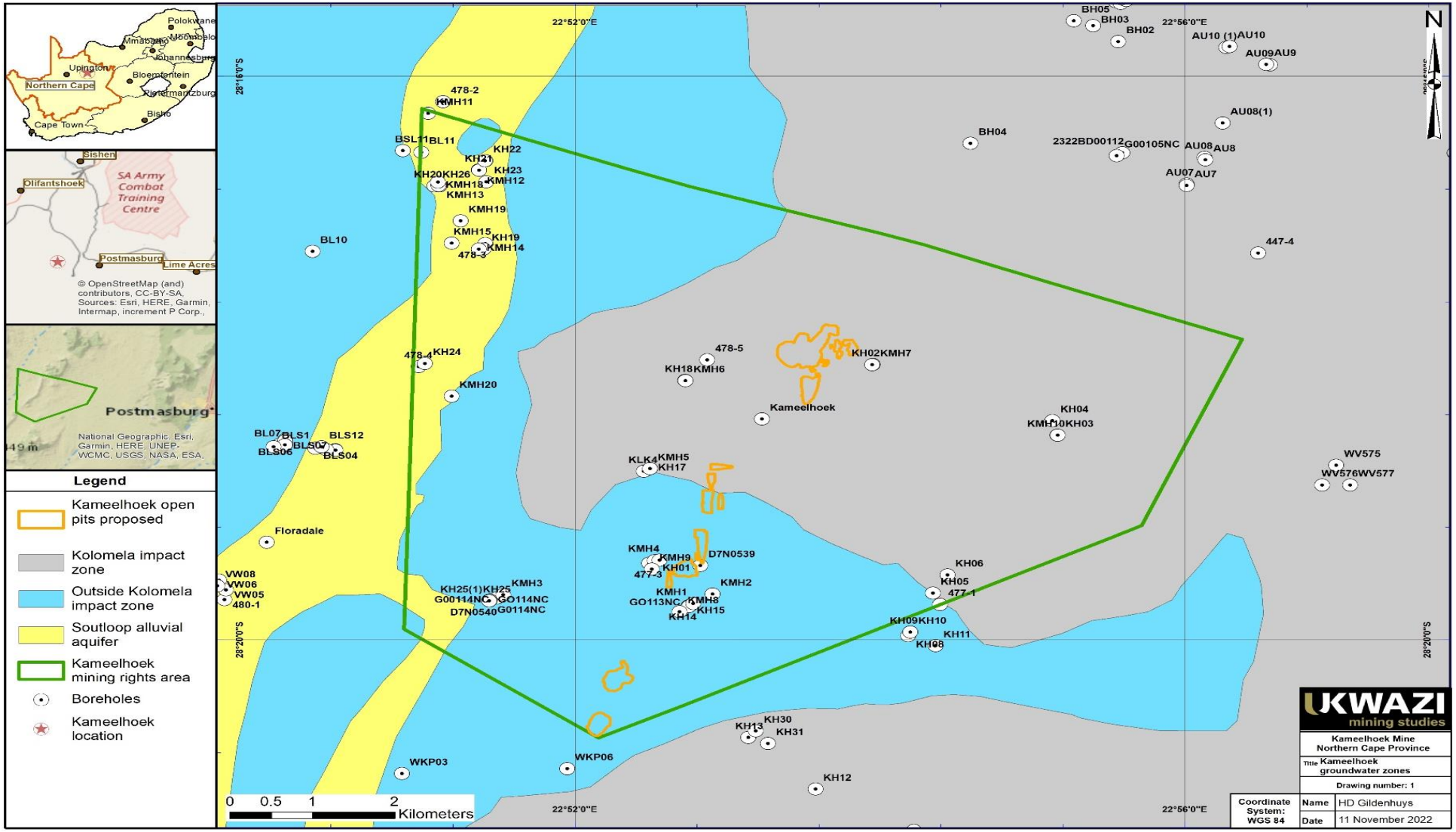

Figure 40: Groundwater zones at Kameelhoek.

The Kolomela delineated impacted zone can primarily be regarded as a dolomite aquifer/ compartment. The area outside the impacted zone is mainly situated on a banded iron formation/ fractured aquifer and the Soutloop is a shallow alluvial aquifer (Steyn, et al. 2022).

During April 2022, a site wide hydrocensus was conducted to verify borehole locations and monitoring points across all three regions mentioned above. Samples from groundwater were collected to determine the baseline conditions. Additional groundwater information was received from the Tshiping GMU's which forms part of a larger regional project (Vivier, 2018). Kameelhoek is situated within three Tshiping groundwater management units namely D73A-08; D73A-07 and D73-06 (Steyn, et al. 2022).

10.1.1.9.4. Hydrocensus and groundwater use

Regionally (quaternary catchment scale), the following conclusions could be drawn regarding the groundwater use on Kameelhoek:

- The site is generally characterised by shallow groundwater, with levels ranging between 5mbgl and 18mbgl, especially in the Soutloop and non-impacted dolomitic aquifer zone
- A relatively strong linear relationship between the groundwater levels and surface topography exists except for the Kameelhoek borehole which has a shallow water level in the vicinity of the ridgeline
- The only groundwater levels on site deeper than 18mbgl were measured near the north- south striking ridge and at a borehole located in the far north-eastern part of Kameelhoek
- The deeper north-eastern water level is most likely due to dewatering operations currently present at Beeshoek mine, evident within the impacted dolomitic aquifer zone
- No irrigation practices were identified during the hydrocensus.

During the April 2022 hydrocensus water levels and water samples could not be collected at all the sites that were visited due to access and physical restrictions. The hydrocensus revealed the following:

- 23 boreholes were surveyed
- Nine boreholes were closed for water level measurements
- 14 groundwater levels were measured, and
- Ten groundwater samples were collected; of which six were analysed.

Of the 23 boreholes surveyed, two are used for domestic use, seven for agricultural (livestock) purposes. A total of three boreholes are used for monitoring purposes and ten boreholes were abandoned/ no current use could be identified (Steyn, et al. 2022).

10.1.1.9.5. Baseline groundwater levels

Baseline groundwater levels that were obtained during the April 2022 hydrocensus (Figure 41) for the whole Kameelhoek farm and additional delineated Soutloop alluvial aquifer were compared to baselines that were available in the Tshiping GMU datasets (Steyn, et al. 2022).

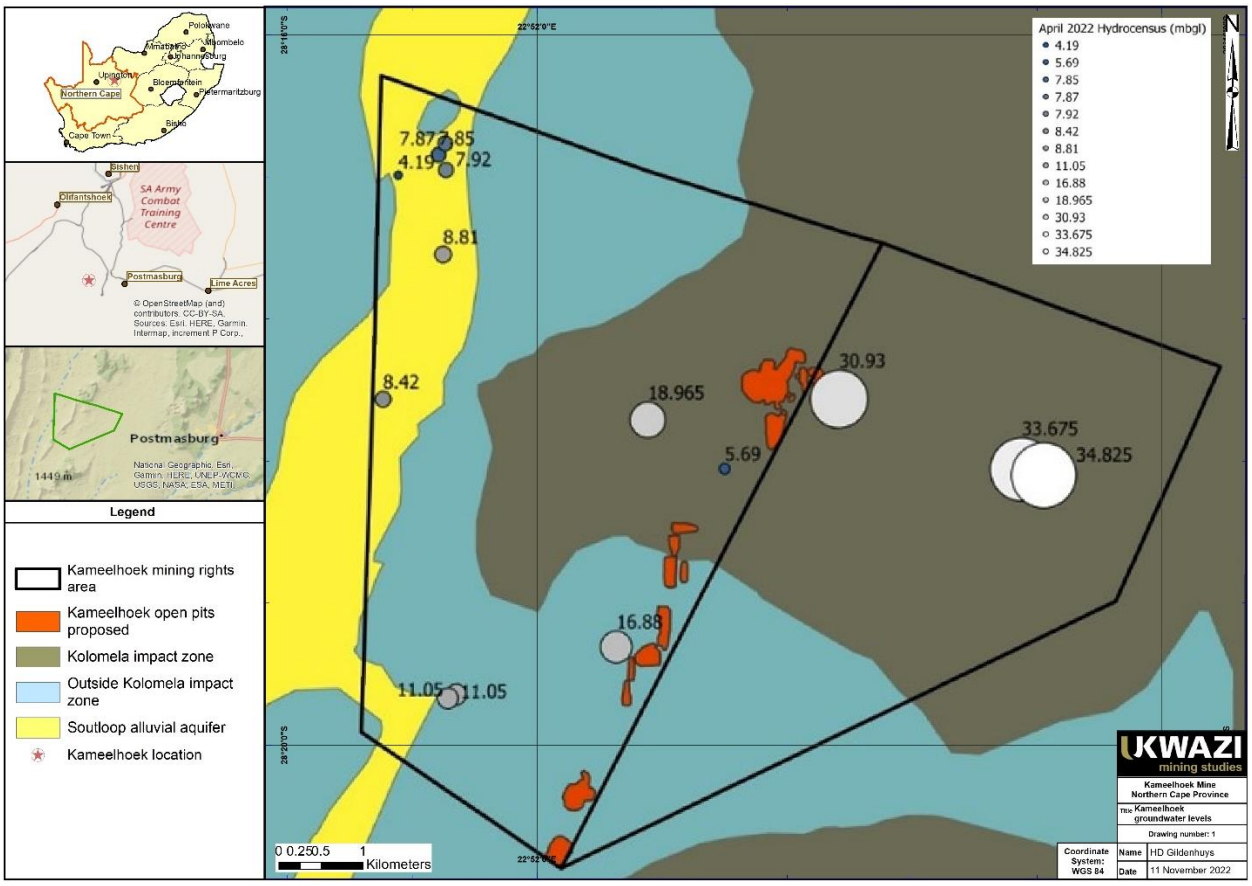

Figure 41: Groundwater Levels during April 2022 hydrocensus

Fourteen groundwater levels were recorded that showed an average groundwater depth of 7.5mbgl at the Soutloop, 13.1mbgl outside the impacted zone and 33.1 mbgl within the impacted groundwater zone. The P5[1] for the Soutloop being 5.1mbgl, 6.5mbgl for outside the impact zone and 31.2mbgl within the impacted zone. P95 levels are as follows: 8.7mbgl at the Soutloop, 18.7mbgl outside impacted zone and 37.7mbgl within impacted zone.

The pre-mining and current groundwater depths per area were as follows:

i. Pre-mining (1994 to 2008): 19.4mbgl
ii. Pre-mining (1994 to 2008) Soutloop: 8.36mbgl
iii. Current (2022 extreme wet) Kameelhoek site inside impacted zone: 31.2mbgl
iv. Current (2022 extreme wet) Kameelhoek site outside impacted zone: 14mbgl
v. Current (2022 extreme wet) Soutloop site: 7.9mbgl.

A noticeable trend is recognised that groundwater levels are affected by the dewatering practices, this confirmed by the declining groundwater levels within the vicinity of the operating mines following a wet season.

It can be confirmed that Kameelhoek is situated in a drought prone area. With the P5 (146mm/a) rainfall values being much closer to the P50 (309mm/a) value that the P95 (546mm/a) value.

The groundwater levels within the impacted zone are dynamic, with the water levels fluctuating accordingly with rainfall events over the wet season (summer versus winter) and dewatering practices at Kolomela and Beeshoek. Groundwater levels within the Soutloop and outside the impacted zones are much more static in comparison to the area within the impacted zone. Other baselines were acquired from the Water Information Management System ("WIMS") database containing the Tshiping Groundwater Management Unit ("GMU") baselines. WIMS is the online data base that is used by the Tshiping water user's association. WIMS baselines cover pre-mining and current mining periods across extreme dry seasons and wet seasons (Steyn, et al. 2022).

[1] P5 (5th percentile) means that 5% of the water level data points are shallower, and 95% of the water level data points are deeper.

10.1.1.9.6. Baseline groundwater quality

Samples taken during the April 2022 hydrocensus was used to evaluate the groundwater baseline chemistry. The baseline assessment consisted of 6 groundwater samples. The samples were analysed for micro and macro chemical constituents at a South African National Accreditation System ("SANAS") accredited laboratory. The samples were evaluated based on the South African National Standards (("SANS") 241, 2015) for drinking water, and previous baseline groundwater conditions.

Table 20 indicate the constituents that exceeded SANS limits. Limits were only exceeded for NO_3, NH_4 and Mn in three boreholes, Kameelhoek (Inside Impact Zone), G0114NC (Outside Impact Zone) and KH19 (Soutloop). In general water quality at Kameelhoek is of good quality especially in the vicinity of the dolomite aquifer.

Nitrate (NO_3-N) most likely originates from agricultural practices present upstream of borehole KH19 situated within the Soutloop. Ammonia (NH_4) originating from the decay of organic matter in a stagnant Kameelhoek borehole. High Mn originating from the naturally occurring manganese deposits, these boreholes are in close vicinity to the planned open pit areas (Steyn, et al. 2022).

Table 20: Constituents exceeding SANS during April 2022 hydrocensus (Steyn, et al. 2022)

	SANS [mg/l]	11	1.5	0.1
Borehole	Groundwater Zone	NO_3		Mn
Kameelhoek	Inside Impact Zone		6.84	0.225
G0114NC	Outside Impact Zone			0.207
KH19	Soutloop	12.2		

Hydrochemistry trends identified from hydrochemistry data including Kumba Iron Ore data indicate that the constituents exceeding SANS limits are nitrate (NO_3-N (Soutloop vicinity), ammonia (NH_4) and Mn. More specifically the Soutloop as the name suggest consists of naturally occurring higher total dissolved solids ("TDS"), Na and Cl concentrations than any of the other two groundwater zones as seen in Figure 42. Only one borehole exceeds the SANS TDS limit and is present within the Soutloop. High NO_3 only exists within proximity to the agricultural practices present on the Soutloop.

Piper diagram (Figure 43) clearly indicates the cations that are present identifies with the dolomitic groundwater with Calcium Magnesium dominance in samples collected within the Impact Zone (eastern area of Kameelhoek) with facies plotting within the Magnesium bicarbonate zone. The samples taken from the Soutloop plots on the no dominant type facies, mixed type but still leans towards the Magnesium Bicarbonate type.

In general, the groundwater on Kameelhoek is in a good state from a groundwater quality perspective with the exceeding constituents in the specified boreholes being outliers over an extended period. All the exceeding constituents are either the P95 or maximum value (Steyn, et al. 2022).

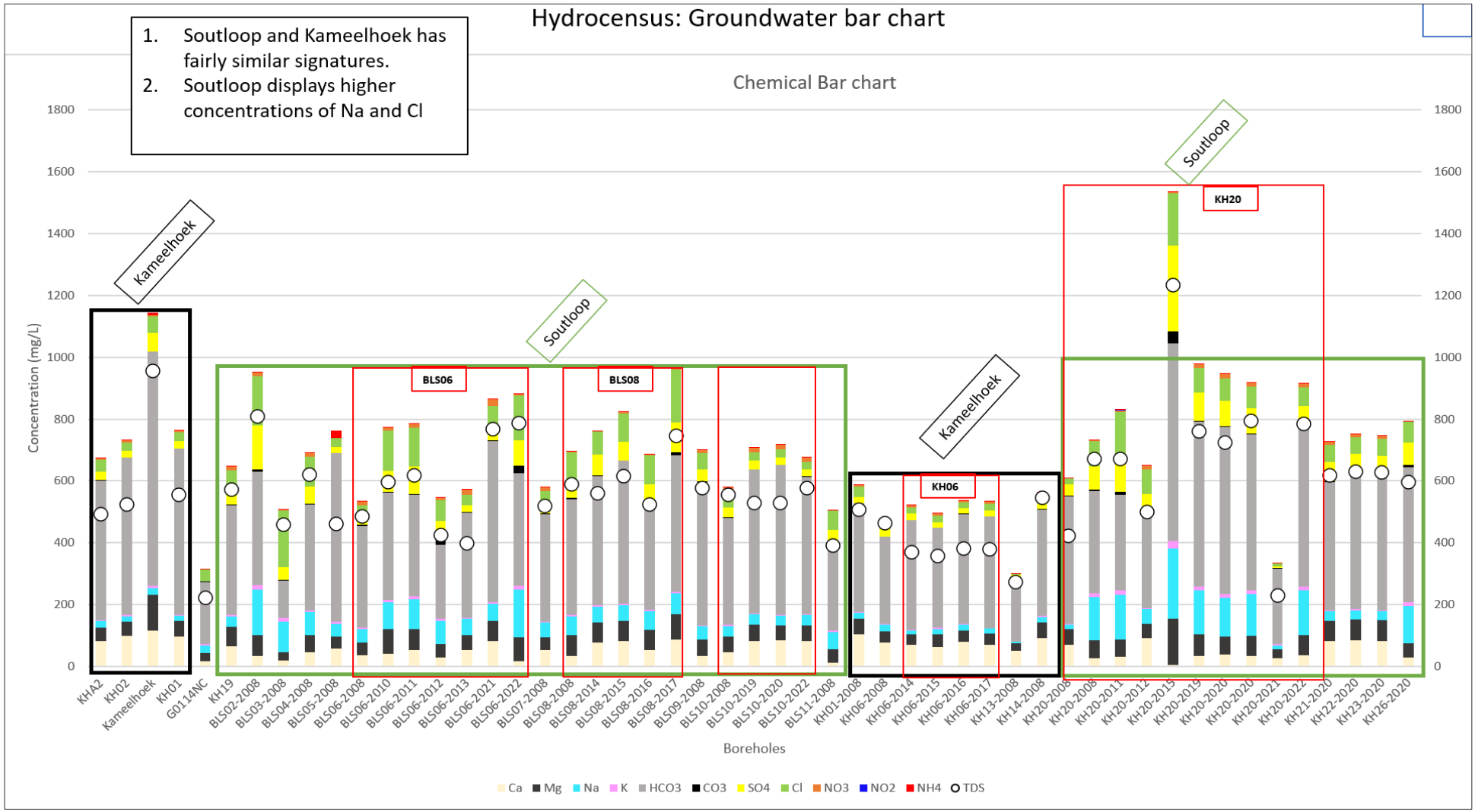

Figure 42: Composite bar chart of Kameelhoek samples (Steyn, et al. 2022)

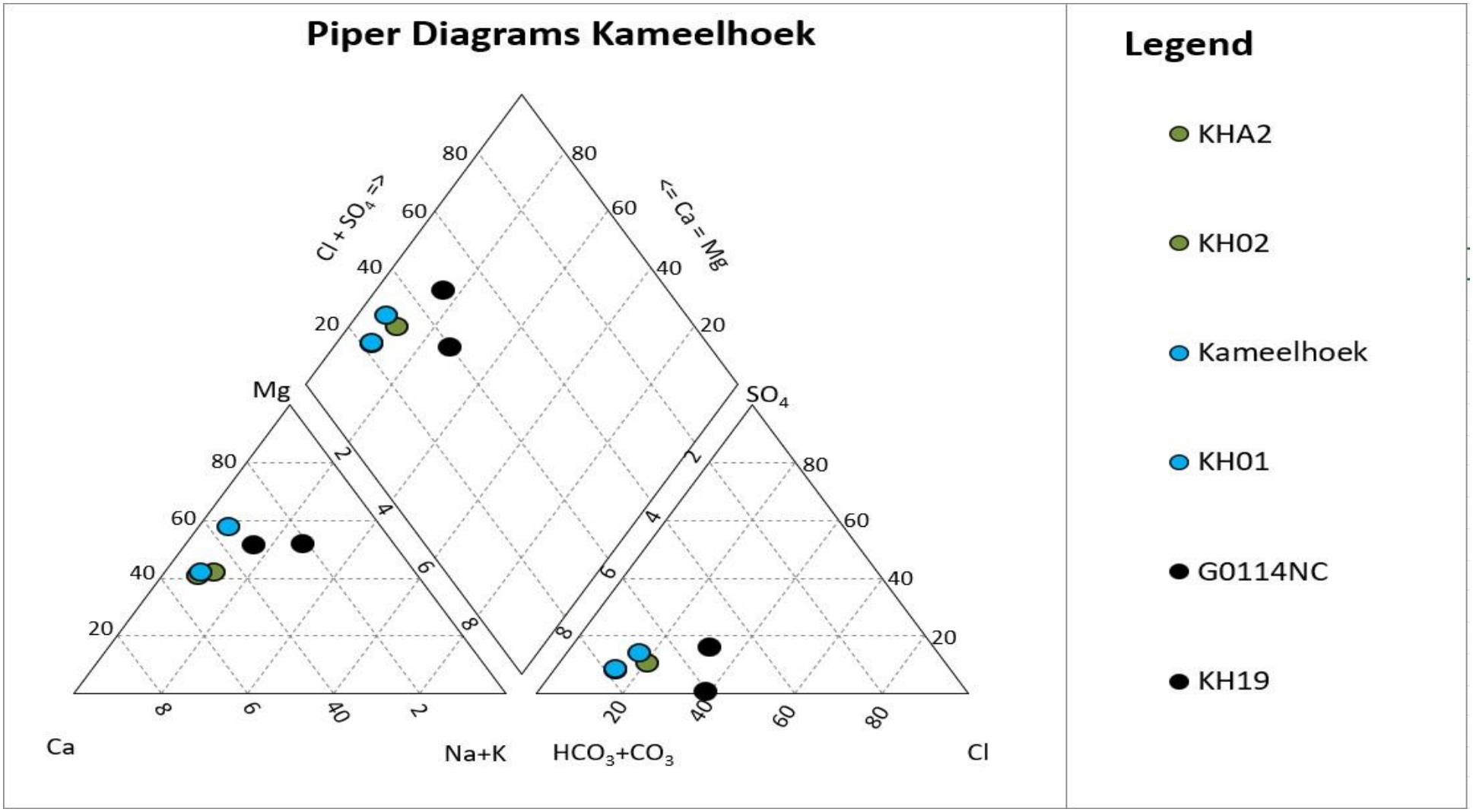

Figure 43: Piper diagram of Kameelhoek samples (Steyn, et al. 2022)

10.1.1.10. Palaeontology

A palaeontological impact assessment was undertaken for the MRA in 2022 by Dr JF Durand. The study included a literature review and study of geological maps, and a site visit.

Dr Durand found that the oldest rocks in the study area are the Vaalian-aged dolomitic limestone with coarse crystalline dolomite, chert, chert breccia and lenses of limestone of the Limeacres Member of the Campbell Rand Subgroup of the Ghaap Group (Eriksson et al., 2009). To the west of the Ghaap Group rocks, the central part of the study site is underlain by the brown jaspilite, banded ironstone, crocidolite, quartzite, dolomite, chert, shale, flagstone of the Heynskop Formation of the Koegas Subgroup of the Ghaap Group and the shale, flagstone, quattzite, conglomerate of the Gamagara Formation of the Olifantshoek Supergroup (Moen, 2009).

Small pockets of diamictite, banded jasper, siltstone, mudstone, dolomite with chert and greywacke of the Makganyene Formation and the amygdaloidal andesitic lava with interbeds of tuff, agglomerate, chert and red jasper of the Ongeluk Formation of the Postmasburg Group of the Transvaal Supergroup occur along the western and eastern borders of the study site.

The largest part of the study site is underlain by tertiary to quaternary-aged limestone and red to flesh-coloured wind-blown sand of the Gordonia Formation that forms part of the most extensive body of terrestrial sediments of Cenozoic age in southern Africa (Partridge *et al*., 2009).

During the site visit Dr Durand found that the study area was covered with the red to pinkish aeolian sand and sandy soil of the quaternary aged Gordonia Formation and grass that obscures the geology of the study area. These sedimentary deposits overlie the Vaalian-aged rock formations. No fossils were found during the field assessment.

The quaternary-aged rubble that occurs along the north-western border of the study site has a low palaeontological sensitivity (Figure 44).

The aeolian sand of the Gordonia Formation of the Kalahari Group, the sedimentary component of the Ongeluk and the Makganyene Formations of the Postmasburg Group of the Transvaal Supergroup and the sediments of the Heynskop Formation of the Koegas Subgroup of the Ghaap Group have a moderate palaeontological sensitivity (Figure 44).

The tertiary to quarterly-aged surface limestone of the Kalahari Group that occurs in the western, southwestern and eastern regions of the study area is considered to have a high palaeontological sensitivity (Figure 44).

The fossil record of the Kalahari Group is sparse, occurs sporadically and is low in diversity. Although no fossils have been reported for the study area, fossils such as root casts, burrows, termitaria, ostrich eggshells, mollusc shells and isolated bones have been discovered in the Kalahari Group elsewhere (Almond & Pether, 2008).

The dolomitic limestone that is exposed in places did not contain stromatolites. This however does not imply that stromatolites would not be discovered once the grass and soil are cleared and it is possible that they will be discovered in the study site when development and mining commences. Banded ironstone is exposed in places at the study site. The Transvaal Supergroup contains shallow marine carbonate metasediments, deeper water banded iron formations (ironstones and chert), siliclastic sediments, volcanic rocks and tillites. The carbonate rocks of this succession have yielded shallow marine and lacustrine stromatolites and microfossils of bacteria and bacterial filaments (Almond & Pether 2008). The chert and dolomitic limestone of the Lime Acres Member of the Campbell Rand Subgroup of the Ghaap Group of the Transvaal Supergroup has therefore a very high palaeontological sensitivity (Figure 44) (Durand, 2022).

It should be noted that although stromatolites are considered to be fossils, there are hundreds of square kilometres of stromatolites in South Africa and it is not considered to be so scarce that every stromatolite formation has to be preserved. In the event of the discovery of an exceptional stromatolite formation, Dr Durand advises that it should on principle not be destroyed if it could be preserved in situ (Durand, 2022).

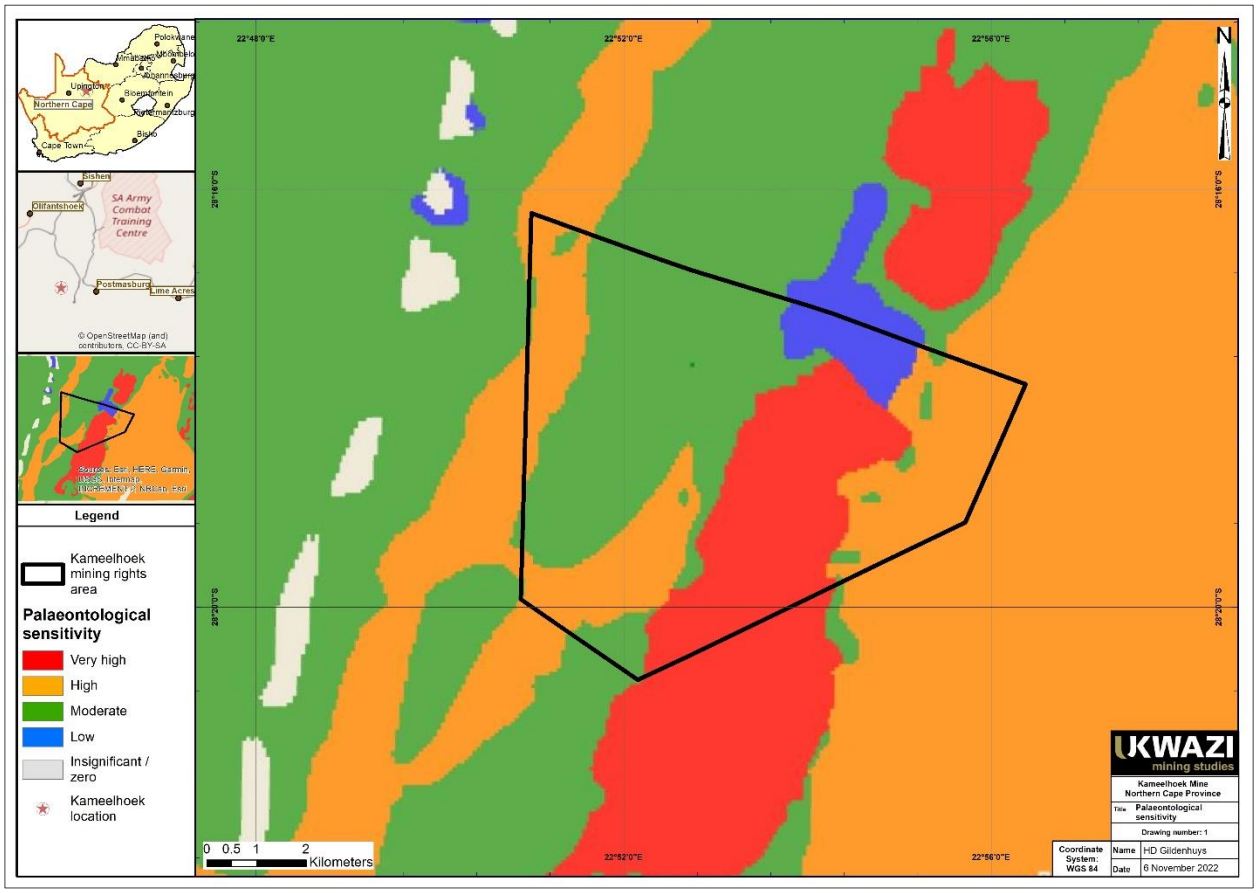

Figure 44: Palaeontological sensitivity of the study site (SAHRA, 2022)

10.1.1.11. Heritage and cultural environment

A heritage assessment was undertaken for the mining right area by G&A Heritage Management Consultants (Gaigher, 2022). The MRA was investigated through archival studies and a field visit on 29 March 2022. The following findings were made (Figure 50):

Site 1: Historic homestead and family graveyard
The original farmhouse on Kameelhoek dates to the late 1800's. The Gouws family acquired the farm Kameelhoek in the Postmasburg region on 21 February 1885 and built the first farmhouse shortly thereafter (~1890). The building remains and is still occupied (Figure 45, Figure 46). On the northern side of the homestead is the family graveyard (Figure 47).

Location:

- Latitude: 28° 19' 41.6" S
- Longitude: 22° 52' 49.1" E

A buffer zone of more than 200m will be kept around the historic homestead and cemetery in line with the archaeologist's recommendations. The closest structure to the homestead is an open pit proposed 310m to the north-west, while an open pit is proposed 315m north of the cemetery. Two open pits that were originally proposed in this area were removed from the application as they were within 200m from the homestead and cemetery (Gaigher, 2022).

Figure 45: The farmhouse shortly after it was built (supplied by farm owner) (Gaigher, 2022)

Figure 46: The present-day farmhouse (Gaigher, 2022)

Figure 47: The family graveyard near the farmhouse (Gaigher, 2022)

Site 2: Late Stone Age artifacts
A site with unique Late Stone Age ("LSA") artifacts were found around a large pan in the north-east of the MRA (Figure 50).

Location:
- Latitude: 28° 17' 56.5" S
- Longitude: 22° 55' 23.9" E.

The artifacts are widely distributed however the geographic suitability of the location suggests that this could well have been a manufacturing or seasonal site. The highest concentrations or artifacts were found on the northern side of the pan.

The archaeologist recommended that a phase 2 archaeological impact assessment should be undertaken to do a detailed analysis of the site should it be impacted by the mining development. This site is however not proposed to be developed. The nearest proposed structure is the access road approximately 2.3km to the south of this site. The nearest open pit is proposed 2.8km to the west of this site (Gaigher, 2022).

Figure 48: Digging stone found at Site 2 (Gaigher, 2022)

Figure 49: LSA scrapers found at Site 2 (Gaigher, 2022)

Site 3: Late Stone Age artifacts
Another possible seasonal LSA site were found next to a pan on the north-eastern outskirts of the MRA. LSA stone tools were found here (Figure 50).

Location:
- Latitude: 28° 17’ 34.6”
- Longitude: 22° 55’ 04.1”.

The archaeologist recommended a phase 2 archaeological impact assessment should it be impacted by the mining development. This site is not proposed to be developed. The nearest proposed structure is an open pit 2.3km to the south-west of this site (Gaigher, 2022).

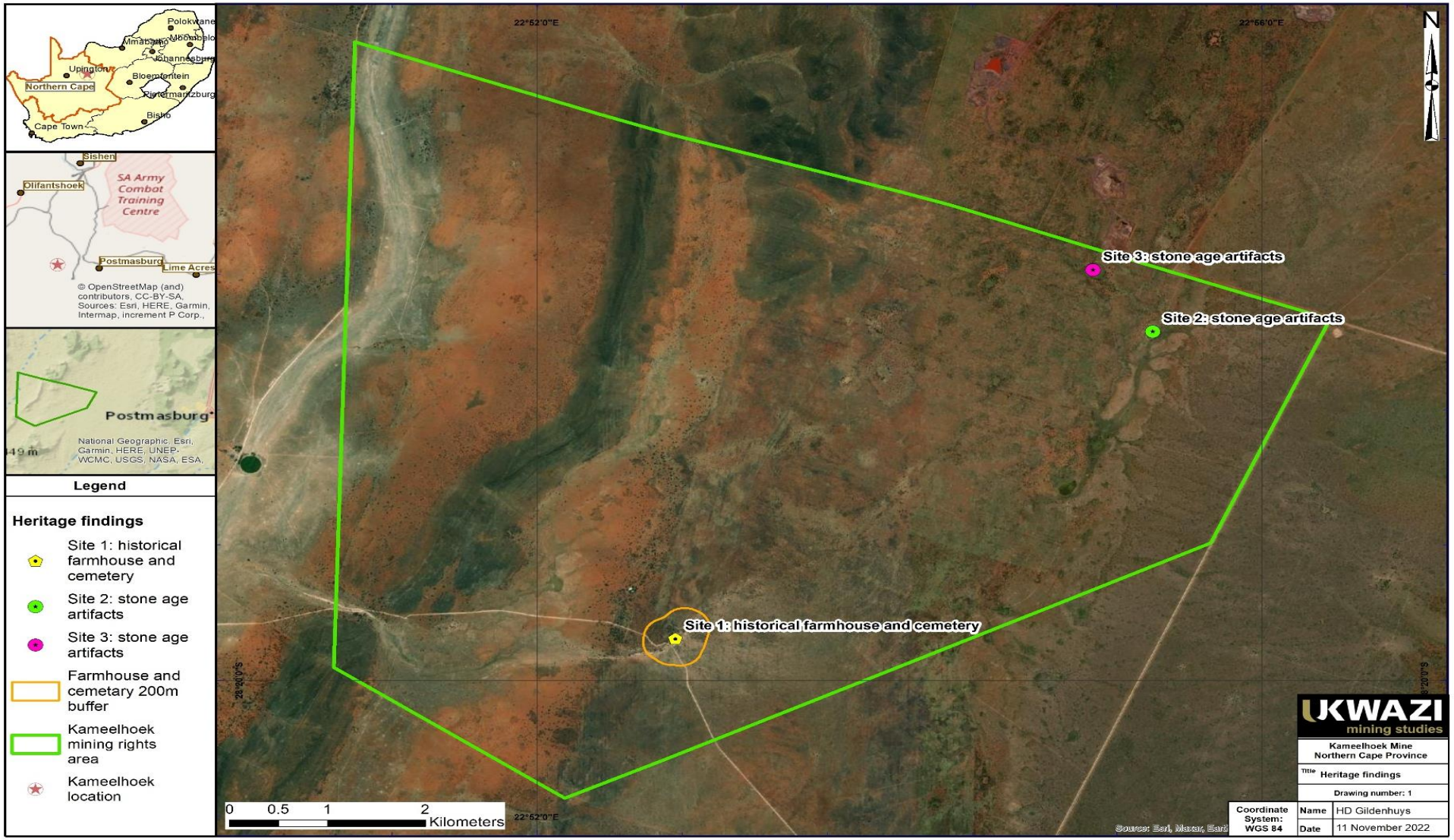

Figure 50: Heritage features identified on the mining rights area (Gaigher, 2022)

10.1.1.12. Air quality

Monitoring stations

Measured air quality data from the Kapstevel monitoring station for the period 2019 to 2020 was obtained. The meteorological station is located ~8.5km south of the project (Figure 51).

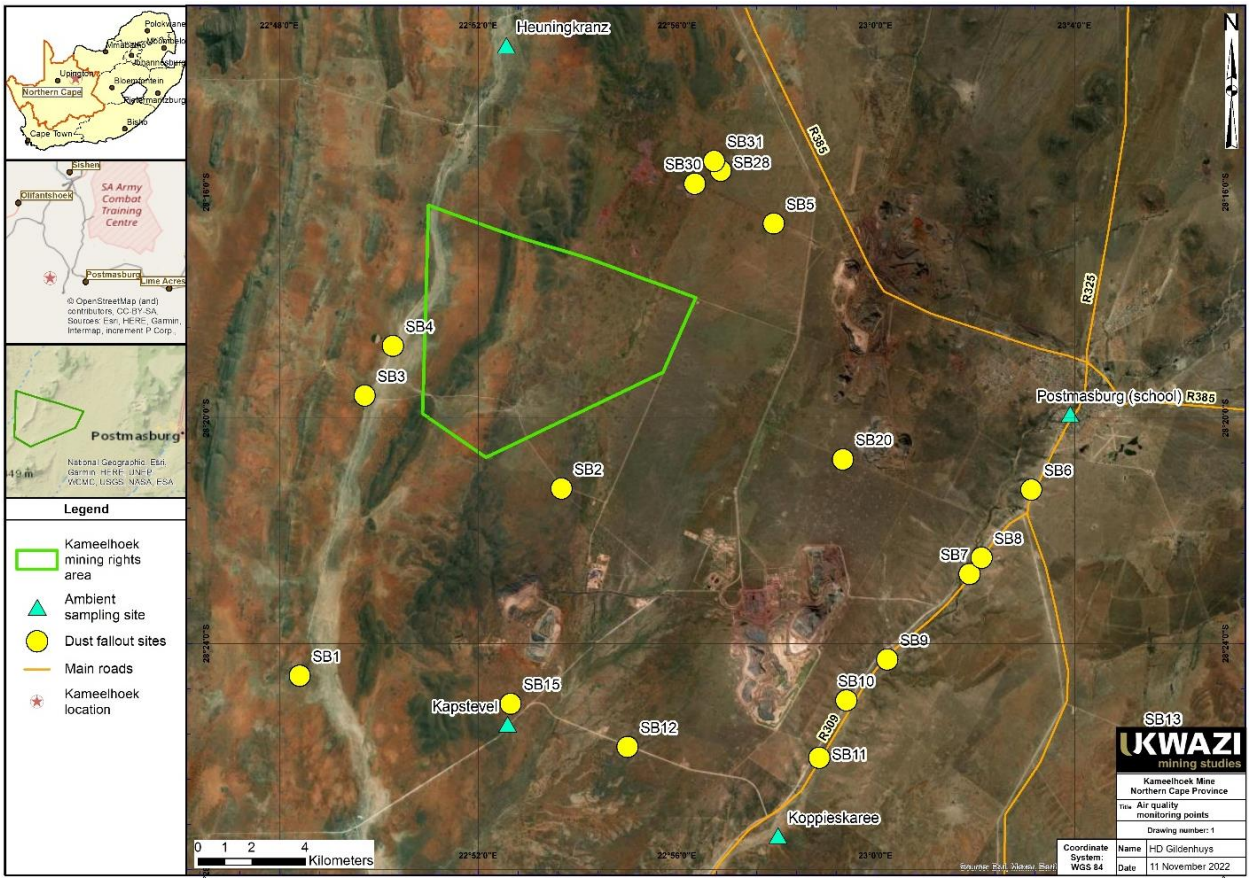

Figure 51: Location of ambient and dust fallout sampling sites (Von Gruenewaldt, 2022)

Ambient Air Quality within the Region

The region is characterised by being a relatively dry, arid and dusty region. It is expected that various local and far-a-field sources will contribute to suspended fine particulate ($PM_{2.5}$ and PM_{10}) concentrations in the region. Local sources include wind erosion from exposed areas, fugitive dust from agricultural activities, mining activities, vehicle entrainment from roadways and veld burning. Long range particulates can result from remote tall stack emissions and from large scale biomass burning in countries to the north of South Africa. These have been found to contribute significantly to background fine particulate concentrations over the interior of South Africa (Von Gruenewaldt, 2022).

Anglo has some monitoring stations within the vicinity of the project site; namely: Kappieskaree, Kapstevel, Heuningkranz, and the Postmasburg School (refer to Figure 51). The data recorded includes hourly PM_{10}, $PM_{2.5}$, SO_2 and NO_2. SO_2 and NO_2 results were analysed, and it was found that neither exceed the relevant evaluation criteria. Kolomela Mine has a dust monitoring network. For this assessment the dust fallout for off-site buckets is provided. Data analysed for the ambient air quality is for the period 2020. Both PM_{10} and $PM_{2.5}$ are screened against National Ambient Air Quality Standards ("NAAQS") while dustfall is screened against the National Dust Control Regulations ("NDCR") (Von Gruenewaldt, 2022).

It should be noted that the ambient measurements account for all emission contributions in the region.

Ambient PM_{10} and $PM_{2.5}$

A summary of the results of the PM_{10} and $PM_{2.5}$ monitoring are represented in Table 21 and Table 22.

The PM_{10} annual average recorded at Heuningkranz, Kappieskaree, Kapstevel and Postmasburg school stations was 9µg/m³, 28µg/m³, 30µg/m³ and 29µg/m³ respectively during 2020. This is below the NAAQS limit of 40µg/m³. Frequency of exceedance were 0, 12, 16 and one days respectively. Therefore, Kappieskaree and Kapstevel were in

non-compliance with the daily PM_{10} NAAQS. Exceedances of the 75µg/m³ lmit is only allowed for four days of the year according to the NAAQS. This happens mostly during the spring months (when the area is dry after winter, rainfall is low and the wind speeds increase), and will be a combination of existing mining activities in the area and other sources in the vicinity.

The $PM_{2.5}$ annual average recorded at Heuningkranz, Kappieskaree, Kapstevel and Postmasburg School stations was 4µg/m³, 6µg/m³, 6µg/m³ and 19µg/m³ respectively during 2020. This is below the NAAQS limit of 20µg/m³. Frequency of exceedance were 0, 0, 0 and ten days respectively. The ambient air quality in the vicinity of Kolomela is in compliance with the NAAQS for $PM_{2.5}$, with the exception of the school, but data availability was poor for the year (Von Gruenewaldt, 2022).

Table 21: Summary of PM_{10} concentrations for 2020 (Von Gruenewaldt, 2022)

Station	Data availability [%]	Number of exceedances of 75 µg/m³	Annual average [µg/m³]	Compliance with NAAQS
Heuningkranz	97	-	9	Yes
Kappieskaree	78	12	28	No
Kapstevel	97	16	30	No
School	47	1	29	Yes

Table 22: Summary of $PM_{2.5}$ concentrations for 2020 (Von Gruenewaldt, 2022)

Station	Data availability [%]	Number of exceedances of 75 µg/m³	Annual average [µg/m³]	Compliance with NAAQS
Heuningkranz	90	-	4	Yes
Kappieskaree	93	-	6	Yes
Kapstevel	95	-	6	Yes
School	48	10	19	No

Dustfall sampling

Dust fallout at the Kolomela mine comprising of 19 off-site single dust buckets was made available for the current assessment. Refer to Figure 51 for a map showing the sampling locations and Figure 52 for a graph illustrating the sampling results. The sampling period included 2018 to 2020.

From the dust fallout measurements, it was found that dustfall at the following off-site dust bucket locations are non-compliant with the NDCR for non-residential areas (exceed 1 200mg/m²/day) (Von Gruenewaldt, 2022):

- 2018 – all non-compliant with NDCR
- 2019 – all non-compliant with NDCR (except number 29)
- 2020 – all non-compliant with NDCR (except number 3,11, 12, 13, 14, 20, 27, 28 and 29).

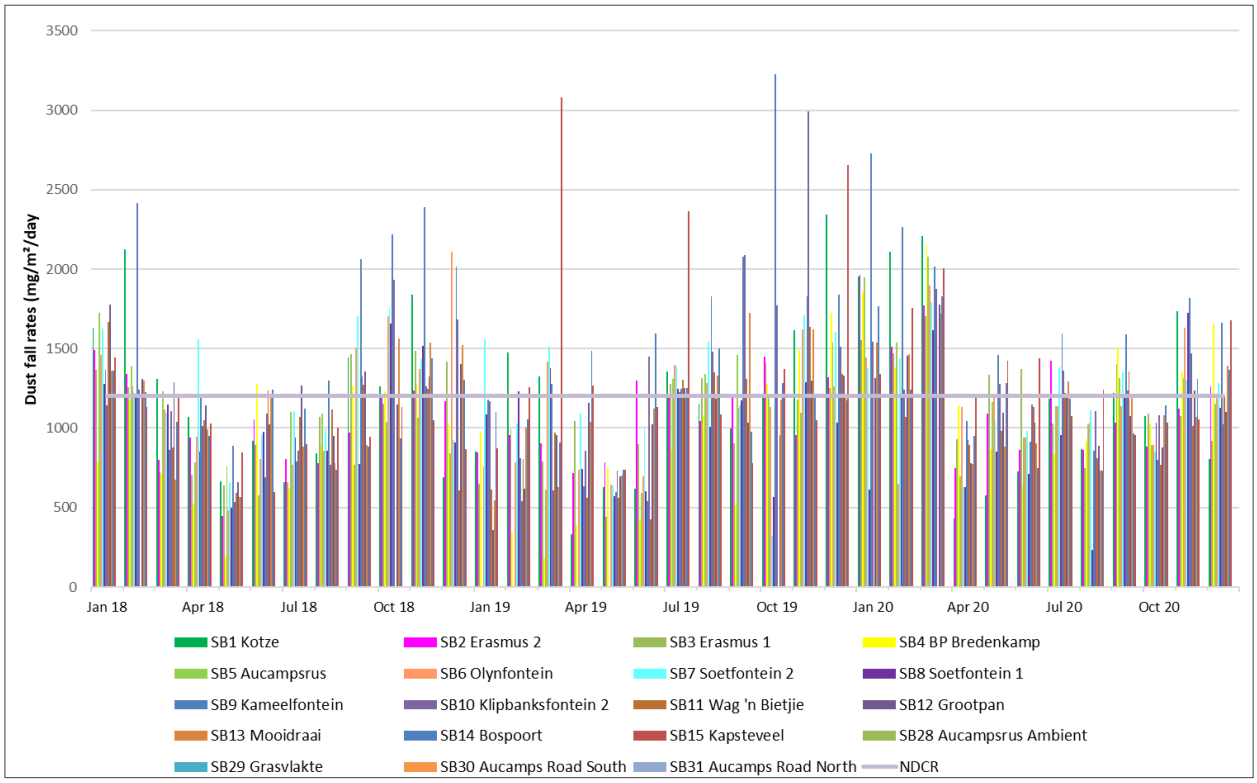

Figure 52: Measured dust fallout in the vicinity of the project site (Von Gruenewaldt, 2022)

10.1.1.13. Visual aspects

10.1.1.13.1. Landscape character

Graham Young from Graham Young Landscape Architects ("GYLA") was commissioned to undertake a visual impact assessment and he visited the site on 13 and 14 August 2022. In order to identify the study area, the visual impact assessment identified receptors within a 5km radius surrounding the proposed project footprint/ site as being within the 'zone of potential influence'. The 'zone of potential influence' is the area defined as the radius from the centre point of the project beyond which the visual impact of the most visible features will be insignificant GYLA, 2022.

The study area for the visual impact assessment, a 15km radius about the center of the MRA, comprises mostly plains with north south orientated hilly terrain in the central and western parts. The eastern section of the study area is mostly flats with mining activities and the built-up areas of Postmasburg further east (GYLA, 2022).

The area's landscape character is illustrated by means of viewpoint photos taken towards to proposed mine infrastructure in Appendix 7. The Soutloop drainage is a prominent feature in the landscape that borders the MRA on the west. The area immediately east of the Soutloop can be characterised as flats, containing thornveld characterised by a dense shrub layer but lacking in a tree layer and is contained by rolling hills on the west. This is the dominant landscape type in the eastern sector of the study area.

The landscape type west of the Soutloop is characterised by wide plains with open tree and shrub layers with a sparse grass layer contained between the parallel ridges, which support open shrub-land with moderately open grass cover. A prominent koppie associated with this topographic system is located immediately south of the MRA. The proposed mine and infrastructure occur immediately east of the hills.

The Soutloop valley contains a drainage line that seldom flows and is located between the low ridge lines associated with the plains and rugged hills landscape type described above. It comprises flat expanses of a well-developed grassed layer dotted with shrubveld that is utilized mostly for livestock grazing, with some central pivot irrigation lands (GYLA, 2022).

Existing mines occur north, east, and south of the MRA in the flats and rolling hills landscape type.

10.1.1.13.2. Visual resource value and landscape sensitivity

The rolling plains and rugged hills to the west of the MRA has a high visual value and will be sensitive to landscape changes. The Flats in the east of the study area has a moderate visual value and maybe potentially sensitive to

change. The parts of the study area where mines and infrastructure are present to the north, east and south of the MRA has a low visual value and is not sensitive to change in general (GYLA, 2022).

10.1.1.13.3. Sense of place

According to Lynch (1992), a sense of place is the extent to which a person can recognize or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own. The sense of place for the study area derives from a combination of the local landscape character types described above, their relative 'intactness', and their impact on the senses. The study area divides into two distinct parts, each with its own sense of place (GYLA, 2022).

The western areas, with distinct grassy valleys contained by rugged and rolling hills where existing farming operations occur, and the natural landscape persists. The relative intactness of the original landscape gives this part of the study area a relatively strong sense of place. The eastern sectors of the study area have a different and less potent sense of place as they are mostly featureless and dominated with mining activities (GYLA, 2022).

10.1.1.13.4. Receptor sensitivity

Receptor locations where people would most likely be susceptible to negative changes in the landscape caused by the physical presence of the proposed mine are (GYLA, 2022):

- Farmsteads and properties associated with western sectors of the study area
- Farmsteads and properties south and east of the MRA
- Travellers along the R385 and R383 main roads, district road D3226, the local farm access road west of the MRA and the gravel road south of the MRA.

Project components are planned within the moderately rated landscape type which has a low visual absorption capacity making the project potentially visible to people living and travelling within the vicinity of the project. However, the closest public sensitive viewing point (homestead or public road) is approximately 4km from the nearest project component. This is along the local farm access road west of the MRA. The road is west of a series of low hills that extend from north of the mine to south of the MRA and which form an effective visual screen. The closest the public would be able to come to the northern parts of the mine is along the D3226 (approximately 5km from the closest point of the mine) and foreground views are mostly dominated by existing mining activities. The hills and existing mining operations screen views from the south and east of the MRA (GYLA, 2022).

The proposed mine is expected to cause major changes in the landscape character of the site and its immediate surrounds. However, even though the landscape impact is predicted to be high, the visual impact could be low for the mine in all its phases. The project will contrast to varying degrees with existing landscape patterns, the night-sky patterns and land uses west of the MRA causing negative change to the existing landscape. However, this change would for the most part, not be visible to sensitive viewers (GYLA, 2022).

10.1.1.14. Socio-economic

A socio-economic impact assessment is currently being undertaken by Ursula Pape of Solarys (Pty) Ltd ("Solarys"). The socio-economic baseline description below was compiled by Solarys.

10.1.1.14.1. District municipality

The proposed project site is located within the jurisdiction of the TLM and the ZFMDM in the north-eastern region of the Northern Cape Province. The ZFMDM extends across an area of 102 504km², almost a third of the Northern Cape Province (Local Government Handbook, 2022). The district comprises five local municipalities which include Dawid Kruiper, Kai Garib, Tsantsabane, Kheis and Kgatelopele. ZFMDM shares borders with Botswana to the northeast and Namibia to the north; John Taolo Gaetsewe District Municipality to the north-west; Frances Baard District to the west; Pixley ka Seme to the south-east; and Namakwa District Municipality to the southwest.

Municipal government is situated in Upington, the district capital. Agriculture, mining, tourism and manufacturing are the four primary drivers of the ZFMDMs economy. At 34%, the largest contributor to the district's real gross value added ("GVA") in manufacturing is the food, drinks and tobacco subsector.

10.1.1.14.2. Local municipality

TLM occupies an area of 18 289km² and is comprised of several smaller settlements including Beeshoek, Boichoko, Postdene, New Town, Stasie, Groen Water, Skyfontein, Jean Heaven, Maremane and the town of Postmasburg (Tsantsabane Local Municipality, 2022). Three major routes provide access to other major business centres, namely Johannesburg via Kuruman (N14) and the Kalahari (N12/N1) and Cape Town via Upington (N14).

The municipal area falls within the Gamagara Mining Corridor which is primarily focussed on mining of Mn and Fe ore. The TLM IDP, the local study area does not appear to be subject to the jurisdiction of a Tribal Council.

10.1.1.14.3. Population, race and gender profile

Demographic information in this section was sourced from Statistics South Africa ("Stats SA") Local Municipality Population Estimates 2002 – 3030 (Stats SA 2022). Table 23 provides an overview of key demographic indicators for the ZFMDM and TLM. The data is based on estimates for 2016 and 2021.

Table 23: Key demographic indicators for ZFMDM and TLM (Stats SA, 2022)

Indicator	ZF Mgcawu		TLM	
	2016	2021	2016	2021
Total population	262 067	283 313	39 517	43 738
% population increase		8.11		10.68
% of population below the age of 15	27.16	26.42	26.81	26.09
% of population between 15 and 64	66.96	67.18	67.97	68.18
% of population aged 65+	5.88	6.39	5.22	5.73
Dependency ratio	49.34	48.84	47.12	46.67
Child dependency ratio	*40.55*	*39.33*	*39.45*	*38.27*
Old age dependency ratio	*8.78*	*9.52*	*7.67*	*8.40*
% of population male / female	49.97/ 50.03	50.06/ 49.94	51.65/ 48.35	51.89/ 48.11

As seen in Table 23, the estimated total population of TLM increased by almost 11% between 2016 and 2021 while the ZFMDM population increased by 8.11% over the same period. In both ZFMDM and TLM, there was a slight increase in the number of males versus females, possibly due to the perception that there are more employment opportunities at mining operations in the region.

In both ZFMDM and TLM there was an increase in the old age dependency ratio and a decrease in the child dependency ratio. This trend could be attributed to declining fertility rates and increased life expectancy as a result of improved access to anti-retroviral ("ARV") treatment which has enabled human immunodeficiency viruses ("HIV") positive people to live longer. The overall total dependency ratios for both ZFMDM and TLM have however decreased slightly. This representing positive socio-economic improvement in these municipalities, given that there are on average less people dependant on the working age population (aged between 15 and 64).

Figure 53 provides an overview of the race composition of the Northern Cape Province, ZFMDM and TLM as recorded in the Stats SA Community Survey 2016. While the predominant race group in both TLM and Northern Cape Province is Black African, followed by Coloured, ZFMDM by contrast has a much larger contingent of Coloured people, with a corresponding lower Black African population.

According to the Stats SA Community Survey 2016, the dominant language in TLM is Afrikaans (56.9%), followed by Setswana (36.29%).

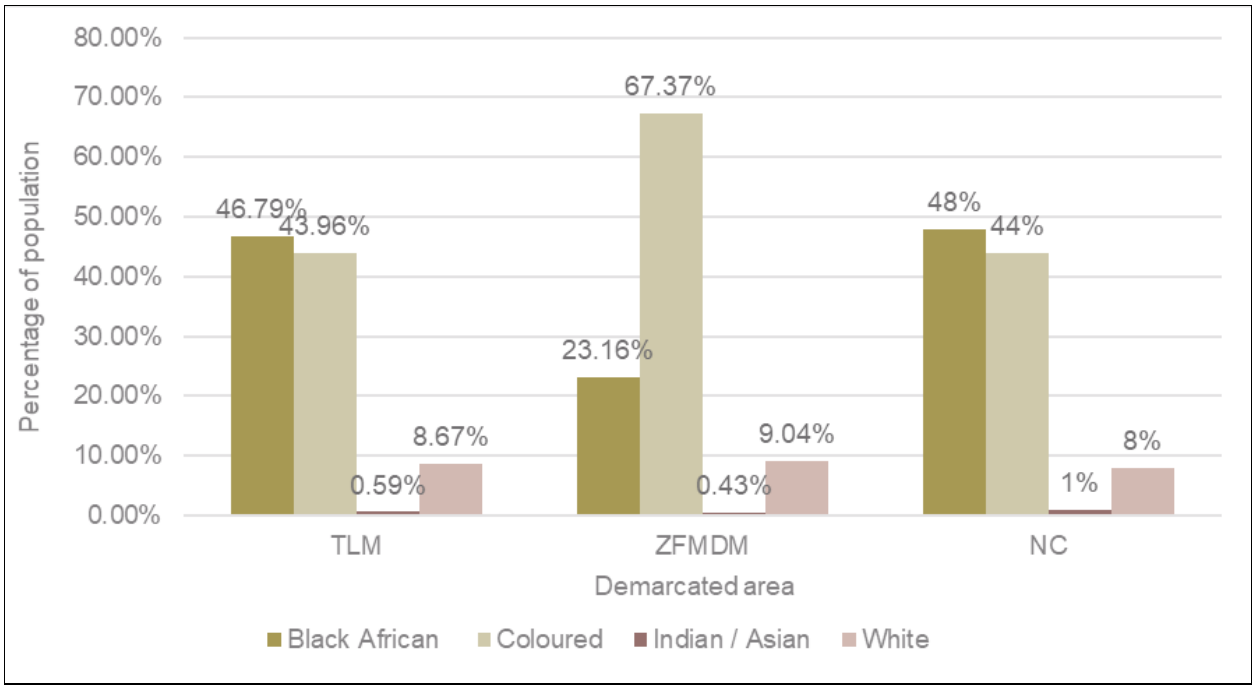

Figure 53: Population groups as per the Stats SA Community Survey 2016 (Stats SA, 2022)

10.1.1.14.4. Health and HIV/AIDS Prevalence

According to Stats SA Mid-year Population Estimates for 2022, life expectancy in the Northern Cape Province has increased steadily for both males and females as seen in Figure 54. This trend is likely to increase in the foreseeable future. Life expectancy for males in the Northern Cape Province has however been slightly below the national average for males since 2001. Female life expectancy in the province kept pace with the national average for females up until 2011. Since 2011, females in the Northern Cape Province have a shorter life expectancy than the national average for females (Figure 54).

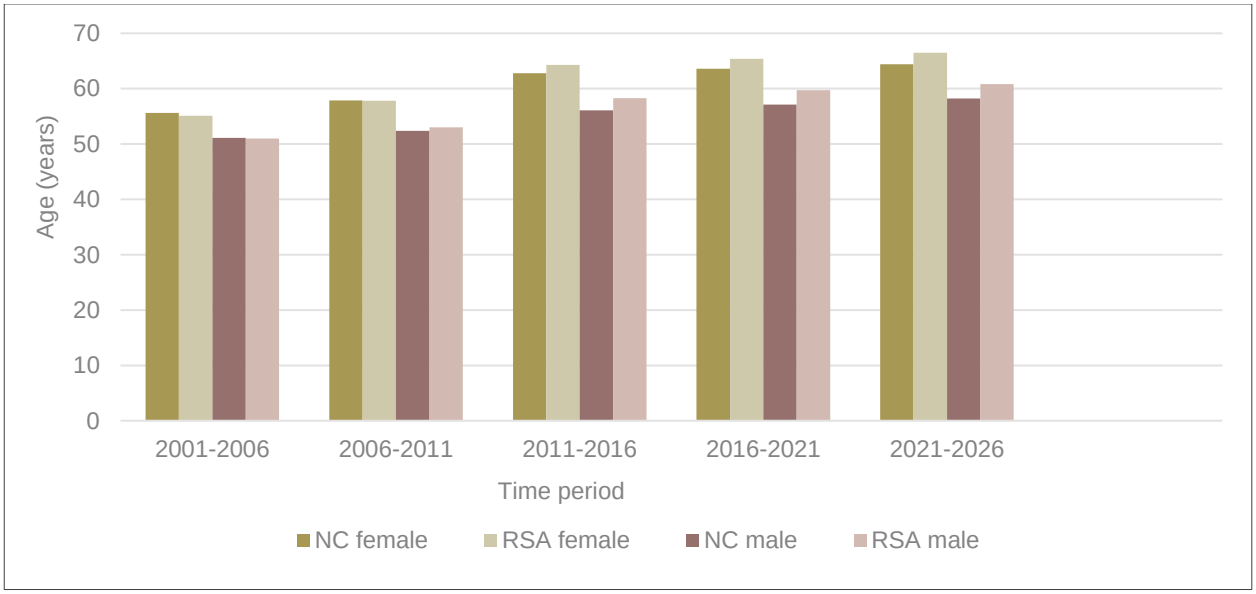

Figure 54: Average life expectancy in the Northern Cape Province vs South Africa (Stats SA, 2022)

According to Stats SA 2018 data, the primary natural cause of death in the ZFMDM is Tuberculosis (“TB”). Other leading causes of death in the ZFMDM are listed in Table 24.

Table 24: Leading causes of death in ZFMDM in 2018 (Stats SA, 2019)

Causes of death	Total deaths in 2018	Percentage of all deaths [%]
TB	232	8.08
Hypertensive diseases	194	6.75
Chronic lower respiratory diseases	184	6.40
HIV disease	154	5.36
Influenza and pneumonia	144	5.01
Diabetes mellitus	139	4.84
Certain disorders involving the immune mechanism	137	4.77
Cerebrovascular diseases	129	4.49
Other forms of heart disease	83	2.89
Ischemic heart disease	80	2.78
Other natural causes	1109	38.60
Non-natural (e.g., accidents, homicides, suicides, etc.)	288	10.02
All causes	**2873**	

During interviews and workshops conducted in TLM, and aligned with available quantitative data for the Municipality, Rice *et al* (2022) identified substance abuse, sexual and reproductive health and the treatment of HIV and TB as the top three health priorities in TLM.

The ZFMDM Development Profile 2020 records that there are 52 primary healthcare clinics and hospitals in the district. This total is comprised of 15 clinics, six community healthcare centres, 15 satellite clinics, 13 mobile clinics, two district hospitals and one regional hospital.

10.1.1.14.5. Education levels

Progress in education outcomes, such as a matric pass, is an important indicator of socio-economic development in a region. A matric pass is a foundational step and an important starting point for an individual's future engagement in economic activities. In this regard, the Stats SA Quarterly Labour Force Survey data consistently demonstrates that unemployment rates for people with less than a Grade 12 education are higher than any other group.

Table 25 provides comparative estimated education levels for the Northern Cape Province, ZFMDM and TLM as per the Stats SA Community Survey 2016. According to these estimates it is apparent that the TLM population is poorly educated, indicating a need for interventions in local education and training initiatives.

Table 25: TLM estimated education levels (2016)

Highest level of education achieved	Northern Cape [%]	ZFMDM [%]	TLM [%]
No / up to pre-AET level schooling (% of population aged 15+)	6.45	5.37	5.80
Completed primary	3.99	3.92	3.20
Completed some secondary	33.91	36.95	32.21
Completed secondary	24.75	25.96	31.24
Higher education	4.99	3.74	3.93

The Kumba Iron Ore Limited: Kolomela Mine Socio-Economic Assessment Toolbox ("SEAT") Report 2014 notes that TLM faces multiple challenges, including high drop-out levels from schools in the area. The municipality has experienced a large in-migration of hopeful jobseekers from other communities in the Northern Cape and ZFMDM, many of whom have not completed matric. The net effect is that TLM hosts a large contingent of young people who are not eligible for employment at the local mines (Kumba Iron Ore, 2014).

While the TLM Final Revised Integrated Development Plan, 2021/22 records that residents have access to educational facilities, a need for additional primary schools was indicated. Challenges confronting local schools include (Kumba Iron Ore, 2014):

- An urgent need for additional school facilities in (Postmasburg) and Groenwater / Skeyfontein
- Lack of Setswana medium schools
- Lack of schools focusing on specialized schools, e.g., technical or agricultural disciplines
- Lack of proper water and sanitation services at schools
- Insufficient classrooms and high learners and teacher ratios

- Additional technical high school that will respond/ address the needs of the mining sector.

10.1.1.14.6. Employment levels

According to the Kolomela SEAT Report 29% of the TLM population that formed part of the 2014 survey indicated that they were unemployed. Within TLM, Postmasburg had the lowest levels of unemployment (5.5%) while Skeyfontein recorded the highest 63.8% (Figure 55). The sharp decline and steady increase in unemployment levels during the 2001 to 2014 timeframe can be ascribed to the impact of the Kolomela mine, when the area experienced a 'typical boom-bust effect' associated with new mining operations (Kumba Iron Ore, 2014).

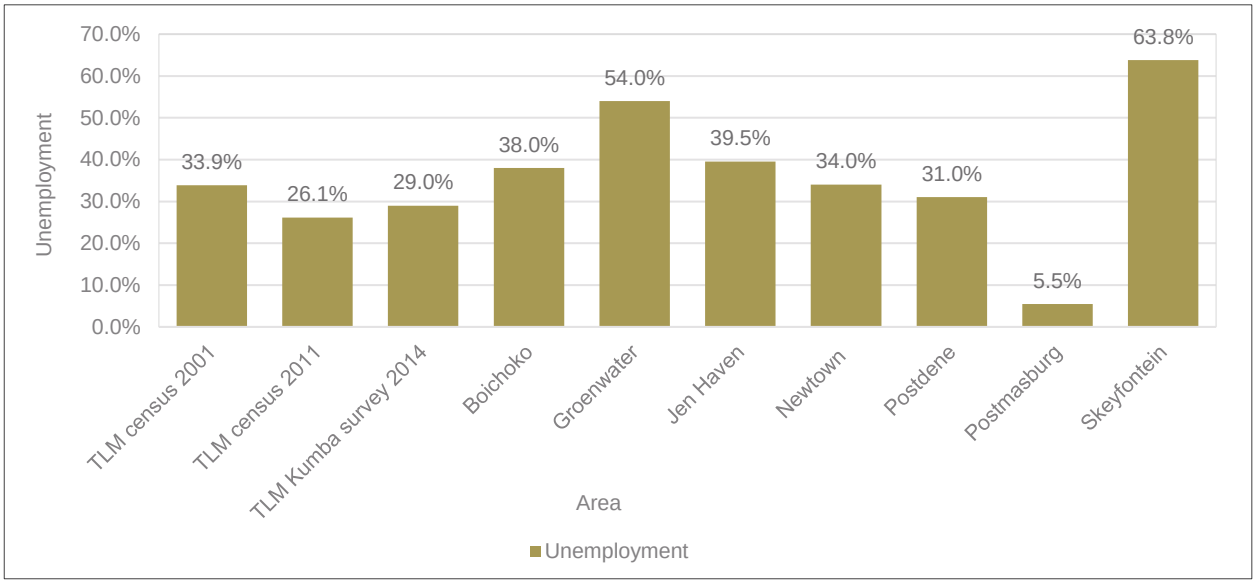

Figure 55: Unemployment rate per area (Kumba Iron Ore, 2014)

The Kolomela SEAT Report 2014 records furthermore that the youth unemployment rate in TLM is notably higher than the average for the ZFMDM and increasing from a level of 32.2% in 2011 to 45.6% in 2014.

10.1.1.14.7. Poverty, development indicators and household income

According to the comparative analysis of municipalities in the ZFMDM undertaken by the Northern Cape Provincial Treasury, the Human Development Index ("HDI") for TLM improved between 2005 and 2015 from 0.55 to 0.68. The HDI is a composite indicator used by the United Nations ("UN") to assess the relative level of socio-economic development in a region. HDI is represented as a value between 0 and 1, with 1 indicating a high level of human development and 0 indicting no human development.

This improvement in HDI must however be understood within the context of prevailing levels of inequality in the region, which indicates that the benefits of socio-economic development are not necessarily experienced by everyone in the municipality. During the 2005 to 2015 period, the Gini coefficient of TLM improved marginally from 0.624 to 0.600. Even with a marginal improvement, TLM still has the highest Gini coefficient in the district. The Gini coefficient is an indicator of income or wealth inequality within a population. It ranges between 0 and 1, with 0 indicating complete equality and 1 complete inequality.

As seen in Table 26, 20.92% of the TLM populations earned less than ZAR3 500 per month in 2015. The percentage of people in poverty decreased from a level of 51.5% in 2005 to 30% in 2015. Annual income distribution data for TLM in 2015 is listed in Table 26.

Table 26: Annual income distribution data for ZFMDM and TLM in 2015 (Northern Cape Provincial Treasury, 2017)

Annual Income			ZFMDM	TLM
0	-	2 400	17	7
2 400	-	6 000	165	50
6 000	-	12 000	1158	273
12 000	-	18 000	1714	389
18 000	-	30 000	3839	755
30 000	-	42 000	5768	934

Annual Income			ZFMDM	TLM
42 000	-	54 000	6548	901
54 000	-	72 000	7810	1032
72 000	-	96 000	7870	1088
96 000	-	132 000	7085	1214
132 000	-	192 000	7925	1339
192 000	-	360 000	8650	1607
360 000	-	600 000	5099	1019
600 000	-	1 200 000	3107	651
1 200 000	-	2 400 000	900	205
2 400 000+			169	45

In a door-to-door survey of mining affected communities in TLM commissioned by Kumba Iron Ore and undertaken in 2014, a significant improvement in average annual household income since 2001 was observed. The period between 2001 and 2014 was characterised by rapid expansion of production capacities of mines and the establishment of new mining operations in TLM. During this survey, a total of 3 321 households (11 489 individual participants) in Boichoko, Groenwater, Jen Haven, Newtown, Postdene, Postmasburg and Skeyfontein were interviewed. The survey was structured in a manner that enabled comparison with 2001, 2011 Stats SA Census and 2007 Community Survey data. The survey revealed that the average annual household income (of households with an income) increased from ZAR40 429 in 2011 to ZAR135 466 in 2014 (Kumba Iron Ore, 2014) (Figure 56).

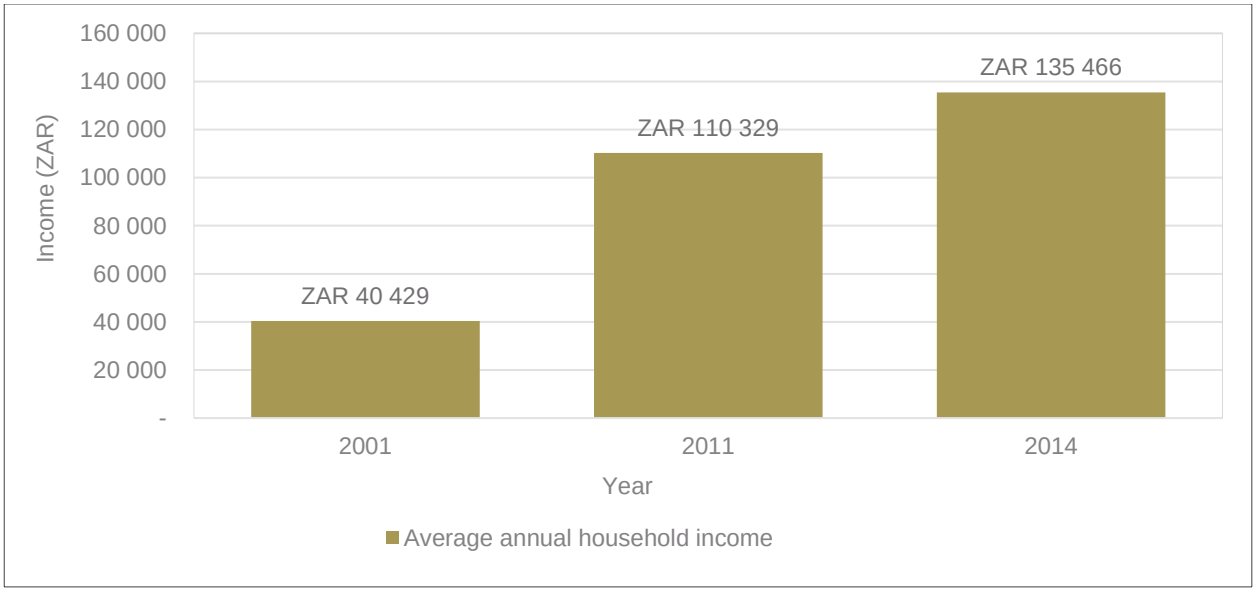

Figure 56: TLM Average annual household income (of households with an income)

10.1.1.14.8. Economic profile

According to the ZFMDM Development Profile 2020, mining is the dominant economic activity in TLM, followed by agriculture and manufacturing. TLM furthermore had the highest average annual economic growth (3.95%) between 2009 and 2019 compared to other municipalities in the ZFMDM.

Economic activity in the municipality is centred primarily around the town of Postmasburg and the settlement of Beeshoek. According to the ZFMDM Development Profile 2020, mining is the dominant economic activity in TLM, followed by agriculture and manufacturing. TLM furthermore had the highest average annual economic growth (3.95%) between 2009 and 2019 compared to other municipalities in the ZFMDM.

In a comparative analysis of municipalities in the ZFMDM undertaken by the Northern Cape Provincial Treasury in 2017, data for 2005 and 2015 reveals that mining is the predominant industry in the district. Table 27 details the contribution of TLM to ZFMDM economic sector totals in 2005 and 2015. TLMs contribution to the total ZFMDM GDP was 20.5% and 23.1% respectively in 2005 and 2015.

Table 27: Contribution of TLM to ZFMDM economic sector totals in 2005 and 2015 (constant 2010 prices)

Sector	TLM contribution to ZFMDM economic sector total	
	2005 [%]	2015 [%]
Mining	53.40	59.90
Community Services	11.60	13.40
Electricity	11.90	11.90
Transport	10.80	11.90
Construction	9.90	11.50
Finance	9.60	10.00
Manufacturing	8.60	9.40
Trade	6.90	8.10
Agriculture	5.90	6.50

10.1.1.14.9. Housing and basic services

The Constitution stipulates that everyone has the right to have access to adequate housing and that the state must take reasonable legislative and other measures within its available resources to achieve the progressive realisation of this right. Access to housing includes access to services such as potable water, basic sanitation, safe energy sources and refuse removal services, to ensure that households enjoy a decent standard of living. This section considers to what extent this has been achieved by reflecting on the latest available information from Quantec Research for 2020, Stats SA 2016 Community Survey, and the Stats SA non-financial census of municipalities, 2019.

10.1.1.14.9.1. Housing

As indicated in Figure 57, which is based on Stats SA Community Survey 2016 data, 79.3% of the TLM population lived in formal dwellings while 16% lived in informal dwellings or shacks. Of the estimated total of 31 210 people who occupied formal dwellings in 2016, 77.48% own and have paid for the properties they live in, while 9.49% rent from private individuals. A further 17% own homes but are still paying off home loans. 5% of the TLM population neither rent nor own the property that they live in.

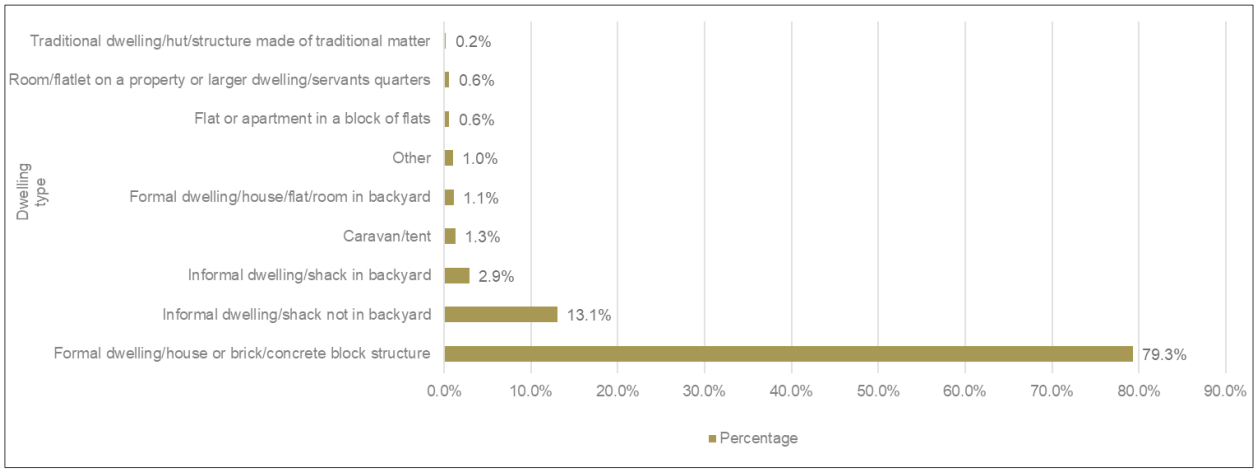

Figure 57: Main dwelling type in TLM (2016)

The TLM IDP records that the municipality is working in collaboration with the Northern Cape Department of Housing and Kumba Resources to expedite development of various residential housing projects in the municipality. The following proposed housing projects are listed in the TLM IDP:

- Future residential extensions of Postdene and Postmasburg
- Future residential extensions of Newtown and Boichoko townships
- In-fill planning opportunities should be exploited and densifying large properties within the residential neighbourhoods through high density developments
- Future Golf Estate for upper housing market
- Possible future residential extension for the west of Postdene
- Possible long-term future residential extension integrating Boichoko with Postmasburg and Newtown

- Possible future residential development on Portion 3 and 5 of the farm Pensfontein No. 475.

Through its National Human Settlement Program, TLM has access to ZAR21 million in funding for the various housing developments. The municipality aims to deliver 265 houses per year and provide a support system to allocate new houses to beneficiaries; assist with the registration of beneficiaries for reconstruction and development programme ("RDP") houses and set up systems to assist with the relocation of informal settlers to formal houses. The Housing and Living Conditions Standards for the Minerals Industry, 2019 ("HLC" Standards) detail the following key strategic goals that could be applicable at the Kameelhoek mine:

- Access to decent and affordable housing
- A plan to promote home ownership
- Ensuring that employees are socially, physically and economically integrated into the local mine community/human settlements
- Securing tenure for mine employees by promoting home ownership
- Offering transportation to local facilities that provide healthcare services
- Ensuring that employees have access to affordable healthcare and balanced nutrition.

10.1.1.14.10. Basic services

According to Stats SA mid-year population estimates ("MYPE") projections for 2022, TLM is currently comprised of approximately 13 890 households. The number of households increased by around 6.4% from an estimated number of 13 054 in 2020. Table 28 lists basic services available to the estimated 13 054 households in TLM in 2020.

Table 28: Municipal services provided/available in TLM (2020)

Service	Domestic units provided in 2020	% of estimated household in 2020
Water inside the yard	12 302	94.24
Water less than 200m from yard	212	1.62
Flush toilets connected to public sewerage system	9662	74.02
Flush toilets connected to septic tank	1957	14.99
Bucket system/ other	375	2.8
Number of domestic units receiving free basic services (indigent support) including water; electricity; sewerage and sanitation; and solid waste management	1 503	11.51

Electricity supply data for the total populations of ZFMDM and TLM, according to the Stats SA 2016 Community Survey is provided in Table 29.

Table 29: Electricity supply within ZFMDM and TLM

Service	% of total ZFMDM population [2016]	% of total TLM population [2016]
Access to electricity	87.24	84.39
Electricity from mains for cooking	82.03	86.41
Electricity from mains for lighting	87.71	88.92
Electricity from mains for water heating	85.18	86.73

As indicated above, the majority of individuals residing in TLM have access to water inside the yard; access to flush toilets connected to a sewerage system and electricity supplied either by Eskom or by the Municipality. There is however a large contingent (11.51%) of households in TLM that rely on indigent support.

10.1.2. Description of the current land uses

According to Milne (2022) the Kameelhoek MRA is situated in a rural area, with major land uses in the region including mining and agriculture. Currently, the property is primarily used for prospecting activities, with livestock and wildlife utilising the natural pastures (refer to Figure 59).

The closest main road, the R385 which links to the N14 highway, passes approximately 6km northeast of the site. Access to the site is via a private road linking to the D3326 secondary road. The site is surrounded by mining towards the north, east (Beeshoek mine) and south-east (Kolomela mine) (Steyn, et al., 2022).

10.1.3. Description of specific environmental features and infrastructure on site

Existing infrastructure on site includes homesteads, farm tracks and grazing camps, while evidence of old fields and historic diggings are visible (refer to Figure 59).

Specific environmental features to not include the following:

- Historic homestead dating back to the late 1800s
- Family graveyard next to the historic homestead
- Highest concentrations or Late Stone Age artifacts found at two of the pans in the north-eastern part of the MRA
- At least 32 ephemeral pans, predominantly located in the north-eastern part of the MRA
- The ephemeral Soutloop river on the north-western boundary of the MRA
- Various non-perennial drainage lines that flow in a westerly direction towards the Soutloop
- Protected trees in terms of the NFA such as *Vachellia erioloba, Vachellia haematoxylon* and *Boscia albitrunca,* and a number of plant species of conservation concern that are scattered throughout the MRA
- Dolomitic limestone geological formation that is potentially sensitive from a geotechnical perspective and it can potentially contain stromatolites (fossils).

10.1.4. Environmental and current land use map

The existing land use features of the MRA is illustrated in Figure 59.

The land cover of the MRA and surrounding farms is illustrated in Figure 60 as per the South African National Land-Cover 2020 (“SANLC 2020”) dataset. The SANLC 2020 dataset is a raster format database at 20m resolution that has been generated from automated mapping models using multi-seasonal 20m resolution Sentinel 2 satellite imagery. The imagery used represents the full temporal range of available imagery acquired by Sentinel 2 during the period 01 January 2020 to 31 December 2020. The overall map accuracy for the SANLC 2020 dataset, calculated from 6 835 reference points, is 85.47% (Department of Environment, Forestry & Fisheries, 2021).

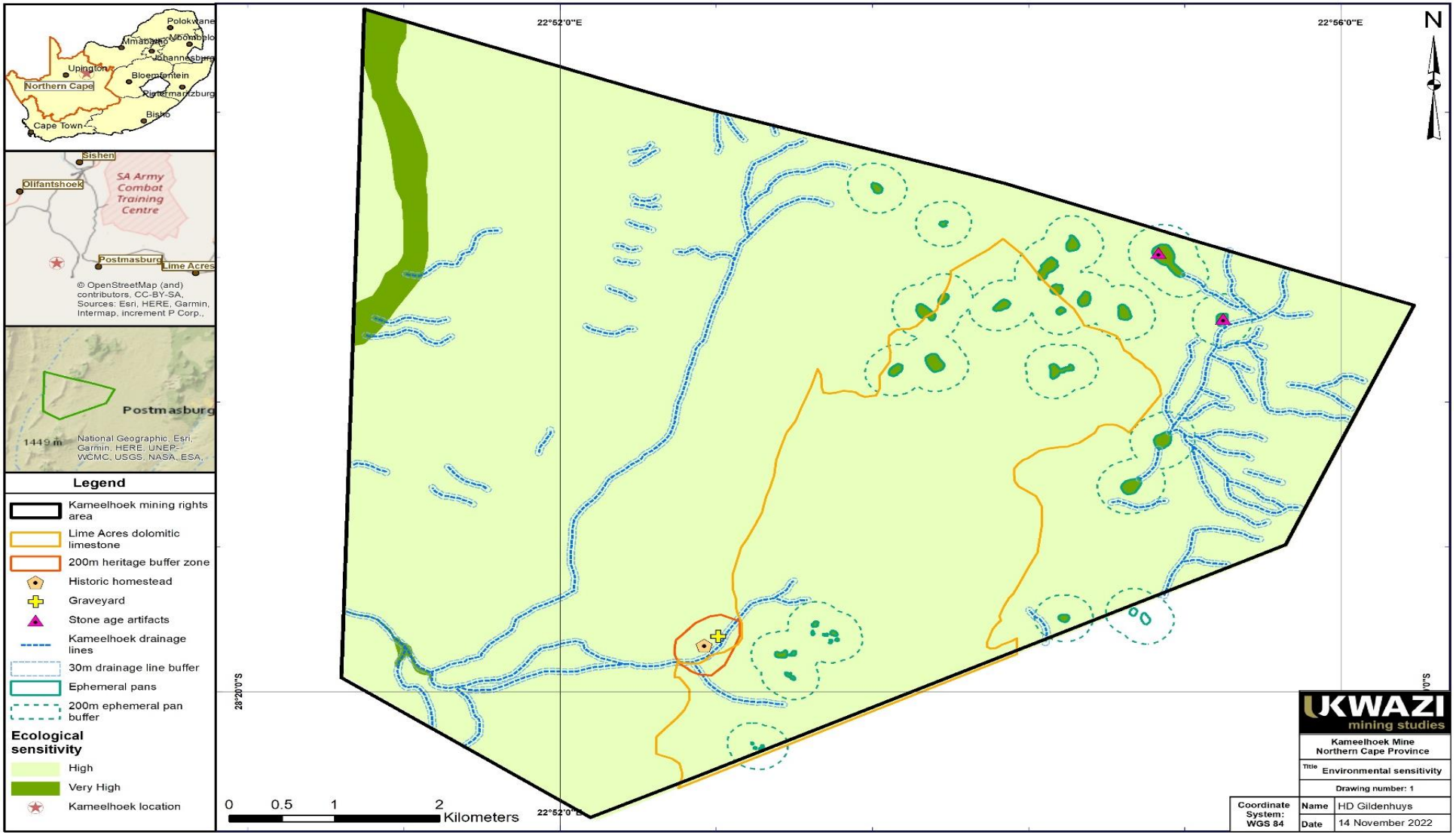

Figure 58: Environmental sensitivity map

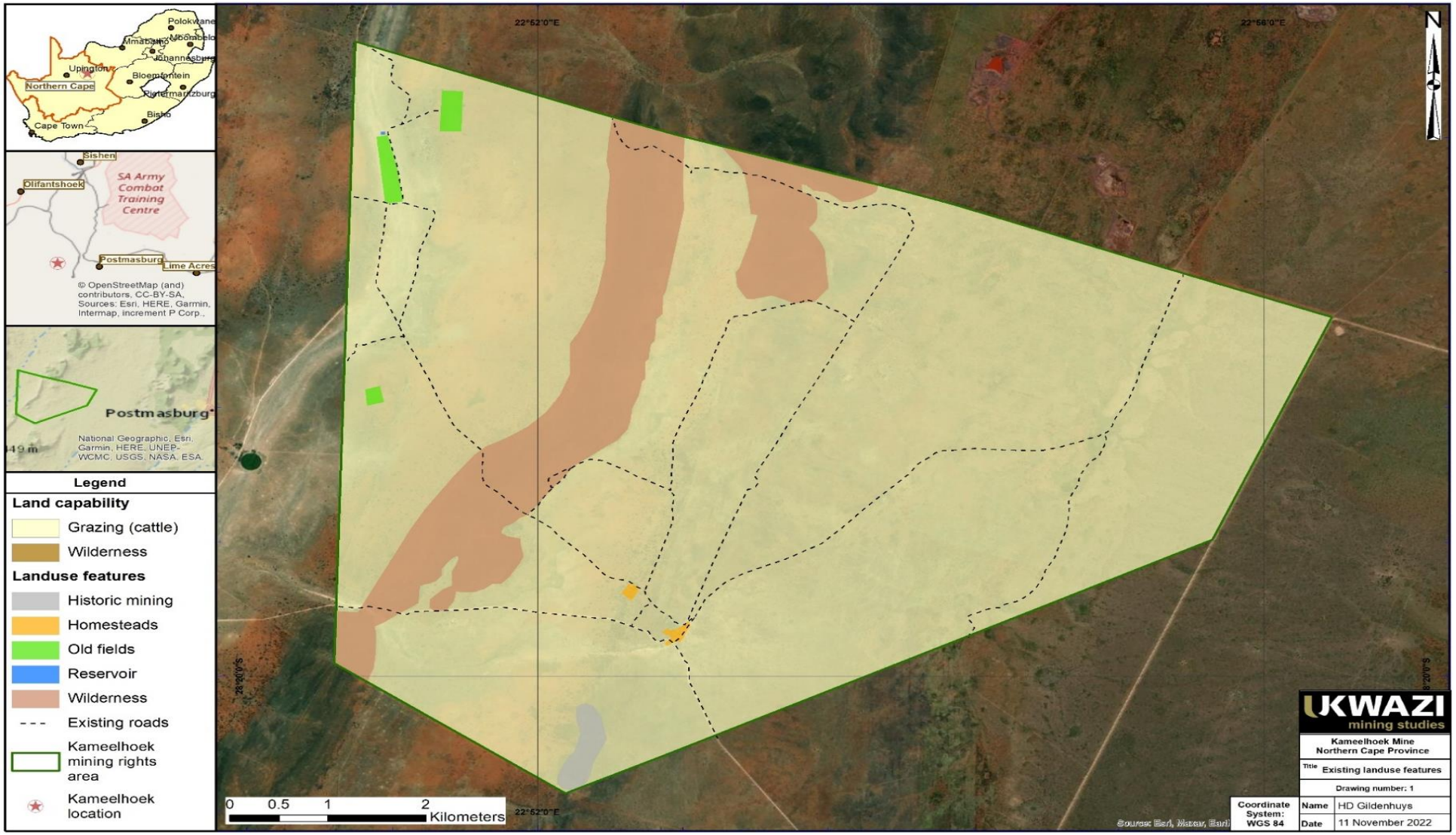

Figure 59: The existing land use features on the Kameelhoek MRA (adapted from Milne, 2022).

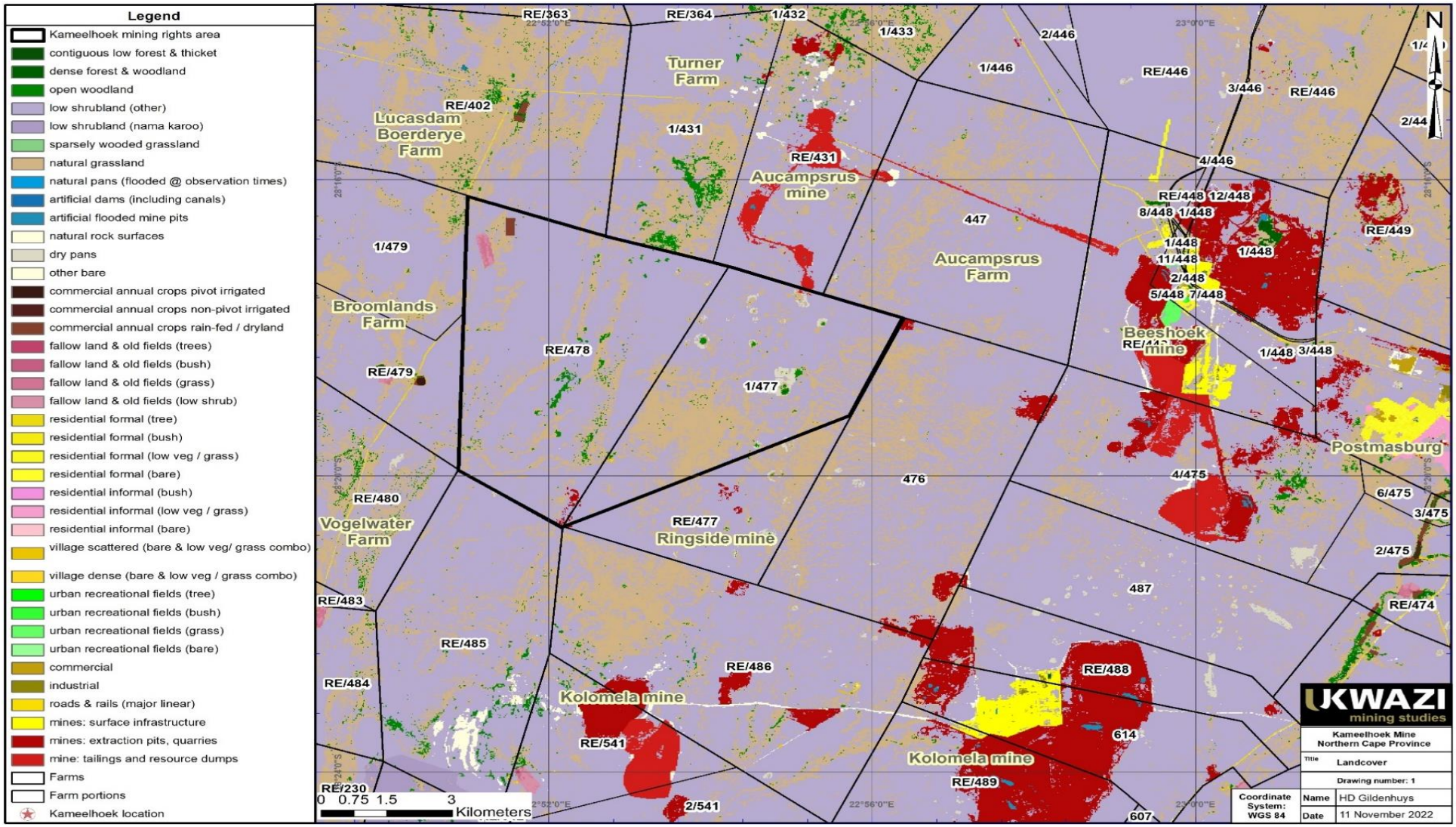

Figure 60: Land cover according to the SANLC 2020 dataset (Department of Environment, Forestry & Fisheries, 2021)

11. Preliminary impacts identified

Appendix 2 of the 2014 EIA Regulations (as amended) and the scoping report template provided by the DMRE requires that the impacts and risk of each alternative including the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these can be reversed; may cause irreplaceable loss of resources; and can be avoided, managed or mitigated, should be included to the scoping report. It is however Ukwazi's view that it is the purpose of the EIA phase to determine impact significance and therefore any impacts that are stated in the scoping report will therefore be premature and subject to review later on in the project.

Take note – the preliminary impacts, mitigation measures and associated reporting are subject to being updated during the EIA phase subsequent to further and more detailed specialist studies being conducted as may be required or as new information becomes available (these being for scoping purposes at present).

The impacts and mitigation measures identified in Table 30 and Table 34 below should therefore be seen as preliminary and the table will be updated in the EIA phase.

The potential for residual risk with mitigation will only be established during the EIA phase once all the specialist studies have been completed. The reason for including an impact statement is to identify which aspects must be investigated further in the EIA Phase by means of specialist studies and to identify mitigation measures to reduce the significance of the impact identified during the scoping phase.

Table 30: Preliminary impact assessment matrix

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
Ecological impacts																
Construction / Development Phase																
1	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, oil and petrochemical spills	Alteration of soil character and quality	**WOM**	Long term	4	Site	2	High	4	With prohibitively high time and cost	4	Definite	5	-17.5	High	**Negative**
			WM	Long term	4	Site	2	High	4	With prohibitively high time and cost	4	High	4	-14	Medium	**Negative**
2	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling.	Loss of soil fertility	**WOM**	Long term	4	Site	2	High	4	With prohibitively high time and cost	4	Definite	5	-17.5	High	**Negative**
			WM	Long term	4	Site	2	High	4	With prohibitively high time and cost	4	High	4	-14	Medium	**Negative**
3	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, natural events.	Soil erosion and sedimentation	**WOM**	Long term	4	Local	3	Moderate	3	With significant time and cost	3	High	4	-13	Medium	**Negative**
			WM	Long term	4	Site	2	Moderate	3	With significant time and cost	3	Medium	3	-9	Low	**Negative**
4	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling.	Loss of indigenous vegetation	**WOM**	Long term	4	Site	2	High	4	With significant time and cost	3	Definite	5	-16.25	High	**Negative**
			WM	Long term	4	Site	2	Moderate	3	With significant time and cost	3	Definite	5	-15	Medium	**Negative**
5	Removal of plant species of conservation concern during clearing of an area for excavations,	Loss of red data and/or protected floral species	**WOM**	Long term	4	Site	2	High	4	With prohibitively high time and cost	4	Definite	5	-17.5	High	**Negative**
			WM	Long term	4	Site	2	High	4	With prohibitively	4	High	4	-14	Medium	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
	construction of infrastructure and roads, stockpiling. Intentional removal of plant species for non-mine related purposes, e.g. illegal plant trade, fire-wood, medicinal, ornamental use.									high time and cost						
6	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, improper rehabilitation practises.	Spreading and establishment of alien invasive species	**WOM**	Long term	4	Local	3	High	4	With significant time and cost	3	High	4	-14	Medium	**Negative**
			WM	Long term	4	Site	2	Moderate	3	With significant time and cost	3	Medium	3	-9	Low	**Negative**
7	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, improper rehabilitation practises.	Encouraging bush encroachment	**WOM**	Long term	4	Site	2	High	4	With significant time and cost	3	High	4	-13	Medium	**Negative**
			WM	Long term	4	Site	2	Moderate	3	With significant time and cost	3	Medium	3	-9	Low	**Negative**
8	During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling.	Habitat fragmentation	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	-18.75	High	**Negative**
			WM	Long term	4	Regional	4	High	4	With significant time and cost	3	High	4	-15	Medium	**Negative**
9	Vegetation clearing; increase in noise and	Disturbance, displacement and killing of fauna	**WOM**	Long term	4	Local	3	Moderate	3	With little time and cost	2	High	4	-12	Medium	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
	vibration; human and vehicular movement on site resulting from mining activities.		**WM**	Long term	4	Local	3	Moderate	3	With little time and cost	2	Medium	3	-9	Low	**Negative**
10	During excavation of minerals, construction of infrastructure and roads, stockpiling.	Alteration/destruction of watercourses	**WOM**	Permanent	5	Local	3	High	4	With prohibitively high time and cost	4	Definite	5	-20	High	**Negative**
			WM	Permanent	5	Local	3	Moderate	3	With significant time and cost	3	High	4	-14	Medium	**Negative**
11	During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, natural events.	Siltation of surface water	**WOM**	Long term	4	Regional	4	Moderate	3	With significant time and cost	3	High	4	-14	Medium	**Negative**
			WM	Long term	4	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-9.75	Low	**Negative**
12	Clearing of vegetation and disturbance during the construction of roads and mining activities; alterations to watercourse habitat characteristics.	Broad-scale ecological processes	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	High	4	-15	Medium	**Negative**
			WM	Long term	4	Regional	4	High	4	With significant time and cost	3	High	4	-15	Medium	**Negative**
Closure & Decommissioning Phase																
13	Rehabilitation of mining site	Improvement of habitat through revegetation / succession over time	**WOM**	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	High	4	11	Medium	**Positive**
			WM	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	High	4	11	Medium	**Positive**
14	Demolition of mining infrastructure / cessation of	Soil erosion and sedimentation	**WOM**	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	High	4	-11	Medium	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
	mining / rehabilitation of mining site		**WM**	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
15	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site	Spreading and establishment of alien invasive species	**WOM**	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	High	4	-11	Medium	**Negative**
			WM	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
16	Heavy machinery and vehicle movement on site	Alteration of soil character and quality	**WOM**	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	High	4	-11	Medium	**Negative**
			WM	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
17	Heavy machinery and vehicle movement on site	Disturbance, displacement and killing of fauna	**WOM**	Medium term	3	Site	2	Moderate	3	With little time and cost	2	High	4	-10	Low	**Negative**
			WM	Medium term	3	Site	2	Moderate	3	With little time and cost	2	Medium	3	-7.5	Low	**Negative**
Post-Closure & Rehabilitation Phase																
18	Natural Successional processes	Improvement of habitat through revegetation / succession over time	**WOM**	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	High	4	-11	Medium	**Negative**
			WM	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
19	Exposed surfaces / unrehabilitated areas on site post closure / poor monitoring during LoM	Soil erosion and sedimentation	**WOM**	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	High	4	-11	Medium	**Negative**
			WM	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
20	Exposed surfaces / poor monitoring of	Spreading and establishment of alien invasive species	**WOM**	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	High	4	-11	Medium	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
	revegetation on site		**WM**	Medium term	3	Site	2	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
Soil, Agricultural Potential and Land Capability Impacts																
Construction / Development Phase																
21	Topsoil & subsoil stripping	Soil destruction and sterlization	**WOM**	Permanent	5	Regional	4	High	4	With prohibitively high time and cost	4	High	4	-17	High	**Negative**
			WM	Permanent	5	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-10.5	Medium	**Negative**
22	Heavy machinery and vehicle movement on site	Soil compaction	**WOM**	Long term	4	Local	3	High	4	With significant time and cost	3	Definite	5	-17.5	High	**Negative**
			WM	Long term	4	Local	3	High	4	With significant time and cost	3	High	4	-14	Medium	**Negative**
23	Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation of water courses	Soil erosion and sedimentation	**WOM**	Long term	4	Local	3	High	4	With significant time and cost	3	Definite	5	-17.5	High	**Negative**
			WM	Long term	4	Local	3	High	4	With significant time and cost	3	High	4	-14	Medium	**Negative**
24	Heavy machinery and vehicle movement on site	Spillages of harmful substances	**WOM**	Long term	4	Local	3	High	4	With significant time and cost	3	Definite	5	-17.5	High	**Negative**
			WM	Long term	4	Local	3	High	4	With significant time and cost	3	High	4	-14	Medium	**Negative**
25	Topsoil & subsoil stripping	Loss of land capability	**WOM**	Long term	4	Local	3	High	4	With significant time and cost	3	Definite	5	-17.5	High	**Negative**
			WM	Long term	4	Local	3	High	4	With significant	3	High	4	-14	Medium	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
										time and cost						
Operational Phase																
26	Topsoil & subsoil stripping, opencast mining	Soil destruction and sterlization	**WOM**	Long term	4	Local	3	High	4	With prohibitively high time and cost	4	Definite	5	-18.75	High	**Negative**
			WM	Long term	4	Local	3	High	4	With prohibitively high time and cost	4	High	4	-15	Medium	**Negative**
27	Heavy machinery and vehicle movement on site, mine residue and topsoil facilities	Soil compaction	**WOM**	Long term	4	Local	3	High	4	With significant time and cost	3	Definite	5	-17.5	High	**Negative**
			WM	Long term	4	Local	3	High	4	With significant time and cost	3	High	4	-14	Medium	**Negative**
28	Mine residue and topsoil facilities, crushing and stockpiling	Increased soil erosion and sedimentation	**WOM**	Long term	4	Local	3	High	4	With significant time and cost	3	Definite	5	-17.5	High	**Negative**
			WM	Long term	4	Local	3	High	4	With significant time and cost	3	High	4	-14	Medium	**Negative**
29	Heavy machinery and vehicle movement on site	Spillages of harmful substances to the soils	**WOM**	Long term	4	Local	3	High	4	With significant time and cost	3	Definite	5	-17.5	High	**Negative**
			WM	Long term	4	Local	3	High	4	With significant time and cost	3	High	4	-14	Medium	**Negative**
30	Topsoil & subsoil stripping	Loss of land capability	**WOM**	Long term	4	Local	3	High	4	With prohibitively high time and cost	4	Definite	5	-18.75	High	**Negative**
			WM	Long term	4	Local	3	High	4	With prohibitively high time and cost	4	High	4	-15	Medium	**Negative**
Closure & Decommissioning Phase																
31	Demolition of mining		**WOM**	Medium term	3	Local	3	Moderate	3	With prohibitively	4	Medium	3	9.75	Low	**Positive**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
	infrastructure; Heavy machinery and vehicle movement on site	Improvement of eroded soils and compaction								high time and cost						
			WM	Medium term	3	Local	3	Moderate	3	With prohibitively high time and cost	4	Medium	3	9.75	Low	**Positive**
32	Demolition of mining infrastructure / Cessation of mining / rehabilitation of mining site	Soil erosion and sedimentation	**WOM**	Medium term	3	Local	3	Moderate	3	With significant time and cost	3	High	4	-12	Medium	**Negative**
			WM	Medium term	3	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-9	Low	**Negative**
33	Demolition of mining infrastructure, Heavy machinery and vehicle movement on site	Soil compaction	**WOM**	Medium term	3	Local	3	Moderate	3	With significant time and cost	3	High	4	-12	Medium	**Negative**
			WM	Medium term	3	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-9	Low	**Negative**
34	Heavy machinery and vehicle movement on site	Spillages of harmful substances	**WOM**	Medium term	3	Local	3	Moderate	3	With significant time and cost	3	High	4	-12	Medium	**Negative**
			WM	Medium term	3	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-9	Low	**Negative**
Post-Closure & Rehabilitation Phase																
35	Rehabilitation	Improvement of land capability	**WOM**	Medium term	3	Local	3	Moderate	3	With significant time and cost	3	High	4	12	Medium	**Positive**
			WM	Medium term	3	Local	3	Moderate	3	With significant time and cost	3	High	4	12	Medium	**Positive**
36	Rehabilitation	Soil erosion and sedimentation	**WOM**	Medium term	3	Local	3	Moderate	3	With significant time and cost	3	High	4	-12	Medium	**Negative**
			WM	Medium term	3	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-9	Low	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
Heritage Impacts																
Construction / Development Phase																
37	Siting of beneficiation plant, open pits and mine roads	Impact on historical homestead and graveyard	**WOM**	Permanent	5	Site	2	High	4	Irreversible	5	Medium	3	-12	Medium	**Negative**
			WM	Long term	5	Site	2	Low	2	With significant time and cost	3	Low	2	-6	Low	**Negative**
38	Siting of beneficiation plant, open pits and mine roads	Unidentified / sub-surface archaeological remains	**WOM**	Long term	4	Site	2	High	4	Irreversible	5	Medium	3	-11.25	Medium	**Negative**
			WM	Long term	4	Site	2	Moderate	3	With significant time and cost	3	Medium	3	-9	Low	**Negative**
Operational Phase																
39	Mine operation, heavy machinery movement on site	Impact on historical homestead, graveyard and sub-surface archaeological remains	**WOM**	Long term	4	Site	2	High	4	Irreversible	5	Medium	3	-11.25	Medium	**Negative**
			WM	Long term	4	Site	2	High	4	With significant time and cost	3	Low	2	-6	Low	**Negative**
Closure & Decommissioning Phase																
40	Rehabilitation of plant, open pit and mine road footprints	Impact on historical homestead, graveyard and sub-surface archaeological remains	**WOM**	Long term	4	Site	2	High	4	Irreversible	5	Medium	3	-11.25	Medium	**Negative**
			WM	Long term	4	Site	2	High	4	With significant time and cost	3	Low	2	-6	Low	**Negative**
Post-Closure & Rehabilitation Phase																
41	Rehabilitation of plant, open pit and mine road footprints	Impact on historical homestead, graveyard and sub-surface archaeological remains	**WOM**	Long term	4	Site	2	High	4	Irreversible	5	Low	2	-7.5	Medium	**Negative**
			WM	Long term	4	Site	2	High	4	With significant time and cost	3	Low	2	-6.5	Low	**Negative**
Palaeontological Impacts																
Construction & Operational Phase																
42	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of stromatolites	**WOM**	Long term	4	Site	2	Moderate	3	Irreversible	5	High	4	-14	Medium	**Negative**
			WM	Long term	4	Site	2	Low	2	Irreversible	5	Medium	3	-9.75	Low	**Negative**
Hydrogeological Impacts																

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
Construction Phase																
43	Contamination to ground- and surface water systems from oil, grease and diesel spillages from construction vehicles	Contamination to ground- and surface water systems	**WOM**	Short term	2	Site	2	High	4	With significant time and cost	3	High	4	-11	Medium	**Negative**
			WM	Short term	2	Site	2	High	4	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
44	On-site sanitation	Contamination to ground- and surface water systems	**WOM**	Short term	2	Site	2	High	4	With significant time and cost	3	High	4	-11	Medium	**Negative**
			WM	Short term	2	Site	2	High	4	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
45	Storage of chemicals and building materials during construction of mine infrastructure	Contamination to ground- and surface water systems	**WOM**	Short term	2	Site	2	High	4	With significant time and cost	3	High	4	-11	Medium	**Negative**
			WM	Short term	2	Site	2	High	4	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
Operational Phase																
46	On-site sanitation	Contamination to ground- and surface water systems	**WOM**	Long term	4	Site	2	High	4	With significant time and cost	3	High	4	-13	Medium	**Negative**
			WM	Long term	4	Site	2	High	4	With significant time and cost	3	Medium	3	-9.75	Low	**Negative**
47	Spillages of hydrocarbons & reagents, use of explosives	Contamination to ground- and surface water systems	**WOM**	Long term	4	Local	3	Moderate	3	With significant time and cost	3	High	4	-13	Medium	**Negative**
			WM	Long term	4	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-9.75	Low	**Negative**
48	Mass transport and seepage from overburden	Contamination to ground- and surface water systems	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	High	4	-15	Medium	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
	facility at the proposed mine		**WM**	Long term	4	Regional	4	High	4	With significant time and cost	3	Medium	3	-11.25	Medium	**Negative**
Closure & Decommissioning Phase																
49	Seepage and mass transport from mine residue facilities and mine residue facilities on groundwater quality	Contamination to ground- and surface water systems	**WOM**	Short term	2	Regional	4	High	4	With significant time and cost	3	High	4	-13	Medium	**Negative**
			WM	Short term	2	Regional	4	High	4	With significant time and cost	3	Medium	3	-9.75	Low	**Negative**
Post-Closure & Rehabilitation Phase																
50	Seepage and mass transport from mine residue facilities and mine residue facilities on groundwater quality	Contamination to ground- and surface water systems	**WOM**	Short term	2	Regional	4	High	4	With significant time and cost	3	High	4	-13	Medium	**Negative**
			WM	Short term	2	Regional	4	High	4	With significant time and cost	3	Medium	3	-9.75	Low	**Negative**
Air Quality Impacts																
Construction / Development Phase																
51	Transport and general construction activities	Gaseous and particulate emissions; fugitive dust	**WOM**	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
			WM	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
52	Clearing of groundcover and levelling of area	Particulate emissions; fugitive dust	**WOM**	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
			WM	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
53	Materials handling	Particulate emissions; fugitive dust	**WOM**	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
			WM	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
54	Wind erosion from open areas	Particulate emissions; fugitive dust	**WOM**	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
			WM	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
Operational Phase																
55	Vehicle activity on paved and unpaved roads	Gaseous and particulate emissions; fugitive dust	**WOM**	Long term	4	Regional	4	Moderate	3	With significant time and cost	3	Medium	3	-10.5	Medium	**Negative**
			WM	Long term	4	Regional	4	Low	2	With significant time and cost	3	Medium	3	-9.75	Low	**Negative**
56	Crushing and screening	Particulate emissions; fugitive dust	**WOM**	Long term	4	Regional	4	Moderate	3	With significant time and cost	3	Medium	3	-10.5	Medium	**Negative**
			WM	Long term	4	Regional	4	Low	2	With significant time and cost	3	Medium	3	-9.75	Low	**Negative**
57	Materials handling	Particulate emissions; fugitive dust	**WOM**	Long term	4	Regional	4	Moderate	3	With significant time and cost	3	Medium	3	-10.5	Medium	**Negative**
			WM	Long term	4	Regional	4	Low	2	With significant time and cost	3	Medium	3	-9.75	Low	**Negative**
58	Wind erosion	Particulate emissions; fugitive dust	**WOM**	Long term	4	Regional	4	Moderate	3	With significant time and cost	3	Medium	3	-10.5	Medium	**Negative**
			WM	Long term	4	Regional	4	Low	2	With significant time and cost	3	Medium	3	-9.75	Low	**Negative**
Closure & Decommissioning Phase																

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
59	Dust generated during rehabilitation activities	Particulate emissions; fugitive dust	**WOM**	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
			WM	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
60	Demolition of infrastructure	Particulate emissions; fugitive dust	**WOM**	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
			WM	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
61	Tailpipe emissions from the vehicles used during the closure phase	Gaseous and particulate emissions; fugitive dust	**WOM**	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
			WM	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
Post-Closure & Rehabilitation Phase																
62	Wind erosion from open areas	Particulate emissions; fugitive dust	**WOM**	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
			WM	Short term	2	Local	3	Moderate	3	With significant time and cost	3	Medium	3	-8.25	Low	**Negative**
Noise impacts																
Construction / Development Phase																
63	Various construction activities	Increase in ambient sound levels. Noise levels above the acceptable rating level	**WOM**	Short term	2	Local	3	Moderate	3	With little time and cost	2	High	4	-10	Low	**Negative**
			WM	Short term	2	Local	3	Moderate	3	With little time and cost	2	Medium	3	-7.5	Low	**Negative**
Operational Phase																
64	Various operational activities at night	Increase in ambient sound levels. Noise levels above the	**WOM**	Long term	4	Regional	4	Moderate	3	With little time and cost	2	High	4	-13	Medium	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
		acceptable rating level	**WM**	Long term	4	Regional	4	Moderate	3	With little time and cost	2	Medium	3	-9.75	Low	**Negative**
Closure & Decommissioning Phase																
65	Decommissioning activities	Increase in ambient sound levels. Noise levels above the acceptable rating level	**WOM**	Short term	2	Local	3	Moderate	3	With little time and cost	2	High	4	-10	Low	**Negative**
			WM	Short term	2	Local	3	Moderate	3	With little time and cost	2	Medium	3	-7.5	Low	**Negative**
Post-Closure & Rehabilitation Phase																
66	Maintenance activities	Increase in ambient sound levels. Noise levels above the acceptable rating level	**WOM**	Short term	2	Local	3	Moderate	3	With little time and cost	2	High	4	-10	Low	**Negative**
			WM	Short term	2	Local	3	Moderate	3	With little time and cost	2	Medium	3	-7.5	Low	**Negative**
Visual impacts																
Construction / Development Phase																
67	• Removal of vegetation, the building of access roads, earthworks, and exposure of earth to establish the areas to be developed. • The physical presence of construction camps and the movement of construction vehicles within the site and along local roads. • Generation of dust by construction activities.	Construction of roads, exposure of earth to create place for the construction activities - the building of the plant and offices. The exposure of earth and rock (contrast with existing landscape character) results in the altering of the visual quality and sense of place of the study area.	**WOM**	Short term	2	Regional	4	Low	2	With significant time and cost	3	Low	2	-5.5	Low	**Negative**
			WM	Short term	2	Regional	4	Low	2	With significant time and cost	3	Low	2	-5.5	Low	**Negative**
Operational Phase																
68	**Removal of vegetation,**	The exposure of earth and rock	**WOM**	Long term	4	Regional	4	High	4	With significant	3	Low	2	-7.5	Low	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
	topsoil and waste rock from mining (open pit) areas. Preparation of earthworks and the construction of the offices, plant and infrastructure.	(contrast with existing landscape character) results in the altering of the visual quality and sense of place of the study area.								time and cost						
			WM	Long term	4	Regional	4	Moderate	3	With significant time and cost	3	Low	2	-7	Low	**Negative**
Closure & Decommissioning Phase																
69	Final grading, laying of topsoil in selected areas and hydroseeding.	The final shaping (dust creation) and rehabilitation process that alters the visual quality and sense of place of the study area.	**WOM**	Short term	2	Regional	4	Low	2	With significant time and cost	3	Low	2	-5.5	Low	**Negative**
			WM	Short term	2	Regional	4	Low	2	With significant time and cost	3	Low	2	-5.5	Low	**Negative**
Post-Closure & Rehabilitation Phase																
70	Rehabilitation of exposed areas and growth of grasses and vegetation (management and maintenance)	Improvement of the visual quality and sense of place.	**WOM**	Short term	2	Regional	4	Low	2	With significant time and cost	3	Low	2	-5.5	Low	**Negative**
			WM	Short term	2	Regional	4	Low	2	With significant time and cost	3	Low	2	-5.5	Low	**Negative**
Socio-economic Impacts																
Planning Phase																
71	In-migration of job seekers	Increase pressure on and demands for local social services, and to cause conflict and competition between various social groups competing for employment and services	**WOM**	Medium term	3	Regional	4	High	4	With prohibitively high time and cost	4	High	4	-15	Medium	**Negative**
			WM	Medium term	3	Regional	4	High	4	With prohibitively high time and cost	4	Medium	3	-11.25	Medium	**Negative**
Construction / Development Phase																
72	Employment of staff	Expectation of employment for local residents	**WOM**	Medium term	3	Regional	4	High	4	With significant time and cost	3	Definite	5	-17.5	High	**Negative**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
			WM	Medium term	3	Regional	4	High	4	With significant time and cost	3	Medium	3	-10.5	Medium	**Negative**
73	External job seekers moving to the area to look for work	In-migration and increased levels of communicable diseases, esp. Sexually Transmitted diseases	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	High	4	-15	Medium	**Negative**
			WM	Long term	4	Regional	4	High	4	With significant time and cost	3	Medium	3	-11.25	Medium	**Negative**
74	In-migration of job seekers	Increase pressure on and demands for local social services, and to cause conflict and competition between various social groups competing for employment and services	**WOM**	Medium term	3	Regional	4	High	4	With significant time and cost	3	High	4	-14	Medium	**Negative**
			WM	Medium term	3	Regional	4	High	4	With significant time and cost	3	Medium	3	-10.5	Medium	**Negative**
75	Mine creating new employment opportunities	Increase in incomes and spending in local communities	**WOM**	Medium term	3	Regional	4	High	4	With significant time and cost	3	Definite	5	17.5	High	**Positive**
			WM	Medium term	3	Regional	4	High	4	With significant time and cost	3	Definite	5	17.5	High	**Positive**
76	Payment of taxes and purchase of goods and services by the mine and its employees	Indirect increase in local, regional, and national income and economic transactions	**WOM**	Medium term	3	Regional	4	High	4	With significant time and cost	3	Definite	5	17.5	High	**Positive**
			WM	Medium term	3	Regional	4	High	4	With significant time and cost	3	Definite	5	17.5	High	**Positive**
Operational Phase																
77	Mining and processing activities	Sustainable stimulation of economy	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	High	4	15	Medium	**Positive**
			WM	Long term	4	Regional	4	High	4	With significant time and cost	3	High	4	15	Medium	**Positive**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
78	Mining and processing activities	Creation of employment	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
			WM	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
79	Mining and processing activities	Impact on government revenue	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
			WM	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
80	Mining and processing activities	Increase in household income during operation	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
			WM	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
81	Mining and processing activities	Improved living standards of positively affected households	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
			WM	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
82	Mining and processing activities	Skills development of permanently employed workers	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
			WM	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
83	Mining and processing activities	Local economic development benefits derived through mine's social responsibility programme	**WOM**	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**
			WM	Long term	4	Regional	4	High	4	With significant time and cost	3	Definite	5	18.75	High	**Positive**

No	Activity	Impact / risk	Without ["WOM"] or With Mitigation [WM]	Duration		Extent		Magnitude/ Severity		Reversibility		Probability		Impact significance		Nature
				Description	Score	Description	Score	Description	Score	Description	Score	Description	Score	Score	Rating	Description
Closure, Decommissioning, Post-Closure & Rehabilitation Phase																
84	Loss of employment opportunities due to mine closure	Decrease in incomes and spending in local communities.	**WOM**	Medium term	3	Regional	4	Moderate	3	With significant time and cost	3	Definite	5	-16.25	High	**Negative**
			WM	Medium term	3	Regional	4	Low	2	With significant time and cost	3	Definite	5	-15	Medium	**Negative**

11.1. Methodology used in determining the significance of environmental impacts

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environment that can be attributed to human activities. The impact assessment methodology will be guided by the requirements of the NEMA EIA Regulations. The broad approach to the significance rating methodology is to determine the significance of the environmental impact by considering the consequence of each impact and relate this to the probability or likelihood of the impact occurring.

Consequence ("C") is determined through the consideration of the Extent ("E"), Duration ("D"), Magnitude ("M"), Reversibility ("R") and the nature of the impact ("N") applicable to the specific impact. Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 31.

The consequence of the impact is determined by:

$$C = \frac{(E + D + M + R) \times N}{4}$$

Table 31: Consequence assessment

Aspect	Rating	Description
Geographic Extent of Impact	1	Activity (limited to the area applicable to the specific activity)
	2	Site (within the development property boundary)
	3	Extends beyond the boundary of the site to adjacent areas, but effects occurring mainly within or in close proximity to the proposed development area
	4	Regional (effects extending outside of the project boundary to regional surroundings)
	5	Effects extending outside of the regional surroundings and may have a provincial, national or international impact
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years)
	3	Medium term (6-10 years)
	4	Long term (the impact will cease after the operational life span of the project)
	5	Permanent (the impact is expected to continue post-closure and no mitigation measure or natural process will remove the impact)
Magnitude	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way)
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost
	2	Impact is reversible without incurring significant time and cost
	3	Impact is reversible only by incurring significant time and cost
	4	Impact is reversible only by incurring prohibitively high time and cost
	5	Irreversible Impact

Once C has been determined, the impact significance ("IS") is determined by multiplying the C and Probability ("P"). P is defined according to Table 32. The result is a qualitative representation of relative IS associated with the impact. IS is therefore calculated as follows:

$$IS = C \times P$$

Table 32: Probability rating

Aspect	Rating	Definition
Probability	1	Improbable (the possibility of the impact materializing is very low as a result of design, historic experience, or implementation of adequate corrective actions (<25%)
	2	Low probability (there is a possibility that the impact will occur (>25% and <50%)
	3	Medium probability (the impact may occur (>50% and <75%)
	4	High probability (it is most likely that the impact will occur - > 75% probability)
	5	Definite (the impact will occur)

The outcome of the environmental impact assessment will result in a range of scores, ranging from -25 through to 25 depending on whether the nature of the impact will be positive or negative. These IS scores are then grouped into respective classes as described in Table 33.

Table 33: Impact significance assessment

Value	Nature	Significance and colour code	Description
0 to 3	Positive	Negligible +	Positive impacts with little real effect.
3 to 9	Positive	Low +	Positive impact or benefit that would not have a direct influence on the decision to develop in the area.
9 to 17	Positive	Medium +	Positive impact or benefit that might influence the decision about whether to proceed with the project.
>17	Positive	High +	Where the positive impact or benefit is significantly high enough to influence the decision process to develop in the area.
0 to -3	Negative	Negligible -	Negative impacts with little real effect. Will not have an influence on, or require modification of, the project design. Project/activity can be authorised with low risk of adverse environmental impacts.
-3 to -10	Negative	Low -	Negative impact that requires management but that would not have a direct influence on the decision to develop in the area if it is mitigated. Project can be authorised but with conditions and routine inspections.
-9 to -16	Negative	Medium -	Negative impact that could influence the decision about whether to proceed with the project. Project can be authorised but with strict conditions and high levels of compliance and enforcement. Monitoring and mitigation are essential.
<-16	Negative	High -	Where the negative impact must have an influence on the decision process to develop in the area. The risk/impact will result in an alteration to the environment even with the implementation of appropriate mitigation measures and will have an influence on decision-making. Strict conditions and high levels of compliance and enforcement will be essential and monitoring and mitigation.

The impact significance will be determined for each impact without relevant management and mitigation measures (pre-mitigation), and post implementation of relevant management and mitigation measures (post mitigation). This allows for a prediction in the degree to which the impact can be managed or mitigated. In accordance with the requirements of the EIA Regulations each impact will be assessed in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

11.2. The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected

Refer to the alternatives assessment discussion in Section 8 for the advantages and disadvantages of the site layout alternative options considered. An assessment of preliminary impacts identified for the proposed mining development was undertaken in Table 30.

11.3. The possible mitigation measures that could be applied and the level of risk

Note that the preliminary mitigation measures below (Table 34) are subject to being updated during the EIA phase subsequent to further and more detailed specialist work being conducted.

The mitigation measures will be updated as new information becomes available (these being for scoping purposes at present). These are typical mitigation measures and will be confirmed during the EIA phase.

Table 34: Preliminary mitigation measures

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
Ecological impacts					
Construction / development phase					
1	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, oil and petrochemical spills	Alteration of soil character and quality	• Topsoil needs to be removed and stored separately during mining. • These topsoil stockpiles must be kept as small as possible in order to prevent compaction and the formation of anaerobic conditions. • Topsoil must be stockpiled for the shortest possible timeframes to ensure that the quality of the topsoil is not impaired. • Topsoil stockpiles must by no means be mixed with sub-soils. • Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings. • Vehicles and machinery should be regularly serviced and maintained. • Refuelling and vehicle maintenance must take place in well demarcated areas and over suitable drip trays to prevent soil pollution. • Drip trays must be available on site and installed under all stationary vehicles. • Spill kits to clean up accidental spills from any accidental spillages must be well-marked and available on site. • Workers must undergo induction to ensure they are prepared for rapid clean-up procedures. • Any soil or area that is contaminated must be cleaned immediately by removing the soil and disposing it as hazardous waste in the correct manner.	Control/reduction measure	High
2	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling.	Loss of soil fertility	• Topsoil needs to be removed and stored separately during mining and the construction of roads, infrastructure and stockpile areas. • These topsoil stockpiles must be kept as small as possible in order to prevent compaction and the formation of anaerobic conditions. • Topsoil must be stockpiled for the shortest possible timeframes to ensure that the quality of the topsoil is not impaired. • Topsoil stockpiles must by no means be mixed with sub-soils. • The topsoil should be replaced as soon as possible on to the disturbed areas, thereby allowing for the re-growth of the seed bank contained within the topsoil. • To restore areas where compacted soil occurs, a ripper blade or deep plow can be pulled across the affected area to alleviate compaction. • Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings.	Control/reduction measure	High
3	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, natural events.	Soil erosion and sedimentation	• Bare ground exposure should be minimised at all times in terms of surface area and duration. • Re-establishment of plant cover on disturbed areas must take place as soon as possible once activities in the area have ceased. • Disturbances during the rainy season should be monitored and controlled. • Regular monitoring during the mining operation should be carried out to identify areas where erosion is occurring; followed by appropriate remedial actions.	Control/reduction measure	Medium

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
4	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling.	Loss of indigenous vegetation	• Implement best practise principles to minimise the footprint of transformation, by keeping to existing roads and earmarked areas where possible. • Implement effective avoidance measures to limit any activities in the highly sensitive areas, by applying the no-go principles. • Develop an effective dust suppression system to limit dust fallout risks. • Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings. • Apply for permits to authorise the large-scale clearance of indigenous plants from DENC at least three months before such activities will commence.	Control/reduction measure	Medium
5	Removal of plant species of conservation concern during clearing of an area for excavations, construction of infrastructure and roads, stockpiling. Intentional removal of plant species for non-mine related purposes, e.g. illegal plant trade, fire-wood, medicinal, ornamental use.	Loss of red data and/or protected floral species	• The footprint areas of the mining activities must be scanned for Red Listed and protected plant species prior to any destructive activities by means of a search-and-rescue operation. • These plants should be identified and marked prior to intended activity and should ideally be incorporated into the design layout and left in situ. However, due to the nature of the proposed mining activities they will most likely all be removed or relocated if possible. The relevant permits from DAFF / DENC should be obtained at least three months before such activities will commence. • All those working on site must be educated about the conservation importance of the flora occurring on site and the legislation relating to protected species. • Employ regulatory measures to ensure that no illegal harvesting takes place.	Avoidance/Prevention measure	High
6	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, improper rehabilitation practises.	Spreading and establishment of alien invasive species	• Implement best practise principles to minimise the footprint of transformation, by keeping to existing roads and earmarked areas where possible. • Mechanical methods of control should be implemented pro-actively as soon as invasive species start to emerge. • Regular follow-up monitoring of invasive control areas needs to be implemented to ensure effective eradication. • Encourage proper rehabilitation of disturbed areas through soil restoration and reseeding of indigenous plant species.	Avoidance/Prevention measure	Medium
7	Clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, improper rehabilitation practises.	Encouraging bush encroachment	• Mechanical methods of control should be implemented pro-actively when encroaching species form dense stands. • Regular follow-up monitoring of encroached control areas needs to be implemented to ensure effective eradication. • Encourage proper rehabilitation of disturbed areas through soil restoration and reseeding of indigenous plant species.	Avoidance/Prevention measure	Medium
8	During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling.	Habitat fragmentation	• All activities associated with the mining operation must be planned, where possible to encourage faunal dispersal and should minimise dissection or fragmentation of any important faunal habitat type. • The extent of the earmarked area should be demarcated on site layout plans. No staff, contractors or vehicles may leave the demarcated area	Avoidance/Prevention measure	Medium

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
			except those authorised to do so. • Those pristine areas surrounding the earmarked area that are not part of the demarcated area should be considered as a no-go zone for employees, machinery or even visitors. • If watercourse disturbances are unavoidable, a water use license to alter the beds and banks of each affected watercourse should be obtained from DWS prior to such activities. • Employ sound rehabilitation measures to restore characteristics of all affected terrestrial and aquatic habitats.		
9	Vegetation clearing; increase in noise and vibration; human and vehicular movement on site resulting from mining activities.	Disturbance, displacement and killing of fauna	• Careful planning of the operation is needed to avoid the destruction of pristine habitats and minimise the overall disturbance footprint. • The extent of the mining activities should be demarcated on site layout plans, and no personnel or vehicles may leave the demarcated area except if authorised. Areas surrounding the earmarked site that are not part of the demarcated area should be considered as a no-go zone. • If any of the protected wildlife species are directly threatened by habitat destruction or displacement during the mining operation, then the relevant permits from DENC should be obtained followed by the relevant mitigation procedures stipulated in the permits. • Everyone on site must undergo environmental induction for awareness on not capturing or harming species that are often persecuted out of superstition and to be educated about the conservation importance of the fauna occurring on site. • Reptiles, amphibians, mammals, special invertebrates, or active bird nests exposed during the clearing operations should be captured for later release or translocation by a qualified expert. • Employ measures that ensure adherence to a speed limit.	Avoidance/Prevention measure	Medium
10	During excavation of minerals, construction of infrastructure and roads, stockpiling.	Alteration/destruction of watercourses	• All activities associated with the mining operation must be planned to avoid any disturbances to the watercourses and their recommended buffer zones. • No new roads should be created across the watercourses and no mining should take place in them. If this is unavoidable, a water use license to alter its beds and banks should be obtained from DWS prior to such activities. • Employ sound rehabilitation measures to restore characteristics of any affected watercourses.	Avoidance/Prevention measure	High
11	During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, natural events.	Siltation of surface water	• Bare ground exposure should always be minimised in terms of the surface area and duration. • Re-establishment of plant cover on disturbed areas must take place as soon as possible once activities in the area have ceased. • Disturbances during the rainy season should be monitored and controlled. • Any potential run-off from exposed ground should be controlled with flow retarding barriers. • Regular monitoring during the mining operation should be carried out to identify areas where erosion is occurring; followed by appropriate remedial actions.	Avoidance/Prevention measure	Medium

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
			• Ensure measures for the adherence to a maximum speed limit. • Develop an effective dust suppression system to limit dust fallout risks.		
12	Clearing of vegetation and disturbance during the construction of roads and mining activities; alterations to watercourse habitat characteristics.	Broad-scale ecological processes	• Implement best practise principles to minimise the footprint of transformation, by keeping to existing roads and earmarked areas where possible. • Apply for the relevant permits from DENC and DAFF relating to terrestrial flora and fauna. • Employ sound rehabilitation measures to restore characteristics of all affected habitats. • Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings.	Avoidance/Prevention measure	Medium
Closure & decommissioning phase					
13	Rehabilitation of mining site	Improvement of habitat through revegetation/ succession over time	• Plant vegetation species for rehabilitation that will effectively bind the loose material and which can absorb run-off from the mining areas. • Rehabilitate all the land where infrastructure has been dismantled. • Diversion trenches and storm water measures must be maintained. • The mining areas will be shaped to make it safe. • All the monitoring and reporting on the management and rehabilitation issues to the authorities will continue until closure of the mine is approved.	Enhancement	Medium
14	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site	Soil erosion and sedimentation	Refer to mitigation measures for the construction and operational phases needed during the decommissioning phase that are similar.	Control/reduction measure	Medium
15	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site	Spreading and establishment of alien invasive species	Refer to mitigation measures for the construction and operational phases needed during the decommissioning phase that are similar.	Control/reduction measure	Medium
16	Heavy machinery and vehicle movement on site	Alteration of soil character and quality	Refer to mitigation measures for the construction and operational phases needed during the decommissioning phase that are similar.	Avoidance/Prevention measure	Medium
17	Heavy machinery and vehicle movement on site	Disturbance, displacement and killing of fauna	Refer to mitigation measures for the construction and operational phases needed during the decommissioning phase that are similar.	Avoidance/Prevention measure	Low
Post-closure & rehabilitation phase					
18	Natural Successional processes	Improvement of habitat through revegetation / succession over time	• Plant vegetation species for rehabilitation that will effectively bind the loose material and which can absorb run-off from the mining areas. • Rehabilitate all the disturbed areas and footprints. • Monitor the establishment of the vegetation cover on the rehabilitated sites	Enhancement	Low

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
			to the point where it is self-sustaining. • Protect rehabilitation areas until the area is self-sustaining. • Diversion trenches and storm water measures must be maintained. • Water management facilities will stay operational and maintained and monitored until such a stage is reached where it is no longer necessary. • The mining areas will be shaped to make it safe. • All the monitoring and reporting on the management and rehabilitation issues to the authorities will continue till closure of the mine is approved.		
19	Exposed surfaces / unrehabilitated areas on site post closure / poor monitoring during LoM	Soil erosion and sedimentation	• Diversion trenches and storm water measures must be maintained. • Water management facilities will stay operational and maintained and monitored until such a stage is reached where it is no longer necessary. • Refer to mitigation measures for the construction and operational phases needed during the decommissioning phase that are similar.	Control/reduction measure	Low
20	Exposed surfaces / poor monitoring of revegetation on site	Spreading and establishment of alien invasive species	• Monitor and manage invader species and alien species on the rehabilitated land until the natural vegetation can outperform the invaders or aliens.	Control/reduction measure	Low
Soil, agricultural potential and land capability impacts					
Construction / development phase					
21	Topsoil & subsoil stripping	Soil destruction and sterlization	• Conservation of topsoil should be prioritized on site and done as follows: o The topsoil needs to be stockpiled separately from the overburden to preserve soil organisms and propagules. o Topsoil stockpiles should not exceed a height of 3 meters where possible. The topsoil outer layer should be protected from wind erosion by the use of wind nets and soil binders. If topsoil needs to be stockpiled for longer than 12 months, seeding will improve long term stability and help to keep the soil in an active state. o ·Double handling of topsoil must be avoided as far as possible. Double handling will severely damage the underground structures such as roots and bulbs that contribute significantly to effective rehabilitation. o Stockpile topsoil separately from subsoil; o Stockpile in an area that is protected from storm water runoff and wind; o Maintain topsoil stockpiles in a weed free condition; o Topsoil should not be compacted in any way, nor should any object be placed or stockpiled upon it.	Avoidance/Prevention measure	High
22	Heavy machinery and vehicle movement on site	Soil compaction	• Soil should be handled when dry during removal and placement to reduce the risk of compaction. • Vegetation (grass and small shrubs) should not be cleared from the site prior to mining activities or construction (except if vegetation requires relocation as determined through an ecological assessment). This material is to be stripped together with topsoil as it will supplement the organic and possibly seed content of the topsoil stockpile depending on the time of soil stripping (whether plants are in seed or not).	Control/reduction measure	High

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
			• During construction, sensitive soils with high risk of compaction must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. • Rip and/or scarify all compacted areas. Do not rip and/or scarify areas under wet conditions, as the soil will not loosen.		
23	Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation of water courses	Soil erosion and sedimentation	• When possible, topsoil stripping and excavation activities should be scheduled for the low rainfall season (winter). • Cover disturbed soils as completely as possible, using vegetation or other materials. • Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas. • Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth.	Control/reduction measure	Medium
24	Heavy machinery and vehicle movement on site	Spillages of harmful substances	• Ensure that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries and associated buffer zones. • This risk of spillages of reagents and hydrocarbons on the soil during transportation can be reduced with proper maintenance of vehicles. This would include a rigorous and proactive maintenance program. • Hydrocarbons should be stored in a concrete lined and bermed facility that has been designed to contain 110% of the volume of the tanks in the event of a spill. This eliminates the potential impacts to soils from spills of hydrocarbons. • All employees will be trained in cleaning up of a spillage. The necessary spill kits containing the correct equipment to clean up spills will be made available at strategic points in the plant area.	Avoidance/Prevention measure	Medium
25	Topsoil & subsoil stripping	Loss of land capability	Disturbance and clearing should be confined to the footprint areas of the mine and not over the larger area. This can be done in the following ways: • Corridors should be secured around the mining footprint areas to ensure the current land use (grazing and agriculture) can continue in a functional way during mining. • Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area. • All development activities should be restricted to specific recommended areas and strict buffer zones should be applied around the sensitive areas. The Environment Control Officer (“ECO”) should demarcate and control these areas. Unnecessary bulldozing through the veld should be avoided.	Avoidance/Prevention measure	High
Operational phase					

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
26	Topsoil & subsoil stripping, opencast mining	Soil destruction and sterlization	• The most desired approach during all of the mining phases is to continually rehabilitate the soils to the best possible state – taking into account the current technology and knowledge available and the financial means to conduct such rehabilitation. • Refer to mitigation measures needed during the Operational phase that are similar to the mitigation measures for impacts during the construction phase.	Remediation/corrective measure	High
27	Heavy machinery and vehicle movement on site, mine residue and topsoil facilities	Soil compaction	• During operation, sensitive soils with high risk of compaction must be avoided by vehicles and equipment, wherever possible, in order to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. Vehicles should stick to haul roads when dumping of overburden and topsoil are done. • Rip and/or scarify all compacted areas on a continuous basis. • Refer to mitigation measures needed during the construction phase that are similar to the mitigation measures for impacts during the Operational phase.	Control/reduction measure	High
28	Mine residue and topsoil facilities, crushing and stockpiling	Increased soil erosion and sedimentation	• Rehabilitation: revegetate or stabilise all disturbed areas as soon as possible. Indigenous trees can be planted in the buffer zone of the proposed development to enhance the aesthetic value of the site and stabilize soil conditions; • The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust); • Refer to mitigation measures that are similar for impacts during the construction phase.	Control/reduction measure	Medium
29	Heavy machinery and vehicle movement on site	Spillages of harmful substances to the soils	• Vehicle maintenance only done in designated areas – spill trays, sumps to be used and managed according to the correct procedures. • Vehicles and machines must be maintained properly to ensure that oil spillages are kept to a minimum. • Fuel and oil storage facilities should be bunded with adequate storm water management measures. • Routine checks should be done on all mechanical instruments for problems such as leaks, overheating, vibration, noise or any other abnormalities. All equipment should be free of obstruction, be properly aligned and be moving at normal speed. Mechanical maintenance must be according to the manufacturer's instructions • Refer to mitigation measures needed during the Operational phase that are similar to the mitigation measures for impacts during the construction phase	Avoidance/Prevention measure	Medium
30	Topsoil & subsoil stripping	Loss of land capability	• Refer to mitigation measures needed during the Operational phase that are similar to the mitigation measures for impacts during the construction phase.	Remediation/corrective measure	High
Closure & decommissioning phase					
31	Demolition of mining infrastructure; Heavy machinery and vehicle movement on site	Improvement of eroded soils and compaction	• Plant vegetation species for rehabilitation that will effectively bind the loose material and which can absorb run-off from the mining areas.	Enhancement	Medium

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
			• Rehabilitate all the land where infrastructure has been demolished. • Monitor the establishment of the vegetation cover on the rehabilitated sites to the point where it is self-sustaining. • Protect rehabilitated areas until the area is self-sustaining. • Diversion trenches and storm water measures must be maintained • Water management facilities will stay operational and maintained and monitored until such a stage is reached where it is no longer necessary. • The mining areas will be shaped to make it safe. • All the monitoring and reporting on the management and rehabilitation issues to the authorities will continue until closure of the mine is approved. • Refer to mitigation measures for the construction and operational phases needed during the decommissioning & closure phase that are similar.		
32	Demolition of mining infrastructure / Cessation of mining / rehabilitation of mining site	Soil erosion and sedimentation	Refer to mitigation measures for the construction and operational phases needed during the decommissioning & closure phase that are similar	Control/reduction measure	Medium
33	Demolition of mining infrastructure, Heavy machinery and vehicle movement on site	Soil compaction	• During closure, sensitive soils with high risk of compaction (e.g. clayey soils) must be avoided by vehicles wherever possible, in order to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. • Rip and/or scarify all compacted areas on a continuous basis. • Soil should be sampled and analysed prior to replacement during rehabilitation. If necessary, and under advisement from a suitably qualified restoration ecologist, supplemental fertilisation may be necessary. • Refer to mitigation measures for the construction and operational phases needed during the decommissioning & closure phase that are similar	Control/reduction measure	Medium
34	Heavy machinery and vehicle movement on site	Spillages of harmful substances	Refer to mitigation measures for the construction and operational phases needed during the decommissioning & closure phase that are similar.	Avoidance/Prevention measure	Medium
Post-closure & rehabilitation phase					
35	Rehabilitation	Improvement of land capability	• Once mining activities have ceased, disturbed areas should be rehabilitated and the grazing/agricultural capacity restored as far as possible. • Refer to mitigation measures for the other mining phases needed during the closure phase that are relevant.	Enhancement	Medium
36	Rehabilitation	Soil erosion and sedimentation	• Rehabilitation.	Remediation/corrective measure	Medium
Heritage impacts					

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
Planning phase					
37	Siting of beneficiation plant, open pits and mine roads	Impact on historical homestead and graveyard	Plan for a heritage conservation buffer of 200m to be kept around the historical homestead and graveyard.	Avoidance/Prevention measure	Low
Construction / development phase					
38	Siting of beneficiation plant, open pits and mine roads	Impact on historical homestead and graveyard	A 200m heritage conservation buffer must be kept around the historical homestead and graveyard. A site management plan must be compiled and implemented detailing site management conservation measures. Strict and continuous monitoring of the heritage site should construction take place nearby. In the event that the graves will be relocated the necessary grave relocation permits will need to be submitted for SAHRA and approval will be required before any graves are impacted. General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and an archaeological specialist should be notified immediately.	Avoidance/Prevention measure	Low
Operational phase					
39	Mine operation, heavy machinery movement on site	Impact on historical homestead and graveyard	The 200m heritage conservation buffer must be kept around the historical homestead and graveyard. General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during operational activities, all activities should be suspended and an archaeological specialist should be notified immediately.	Avoidance/Prevention measure	Low
Closure & decommissioning phase					
40	Rehabilitation of plant, open pit and mine road footprints	Impact on historical homestead and graveyard	The 200m heritage conservation buffer must be kept around the historical homestead and graveyard. General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during operational activities, all activities should be suspended and an archaeological specialist should be notified immediately.	Avoidance/Prevention measure	Low
Post-closure & rehabilitation phase					
41	Rehabilitation of plant, open pit and mine road footprints	Impact on historical homestead and graveyard	The 200m heritage conservation buffer must be kept around the historical homestead and graveyard. General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during operational activities, all activities should be suspended and an archaeological specialist should be notified immediately.	N/A	Low
Palaeontological impacts					

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
Construction & operational phase					
42	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of stromatolites	Stromatolites may be encountered in the dolomitic limestone and chert formations. The ECO should take responsibility for supervising the development and should follow the Chance Find Procedure if a significant fossil discovery is made.	Avoidance/Prevention measure	Low
Hydrogeological impacts					
Construction phase					
43	Contamination to ground- and surface water systems from oil, grease and diesel spillages from construction vehicles	Contamination to ground- and surface water systems	Roads should be compacted. Vehicle maintenance in designated areas – use of spill trays, sumps and managed according to Standard Operating Procedures (SOP's). A rigorous, proactive vehicle maintenance program must be implemented. A Hydrocarbon and Emergency Spill Procedure Method Statement must be developed. Spill kits to be used onsite and employees given spill containment training. Spills on impermeable surfaces (i.e. cement or concrete), must be contained using oil absorbent materials. Contaminated soils and remediation materials must be removed carefully and stored in adequate containers and disposed at a hazardous waste disposal facility. Polluting materials must be handled with care. Prepare clear procedures for workers to deal with these products. All waste oils and grease to be stored in sealed drums for recycling/reuse. Refuelling to be done in appropriate locations on site. Fuel storage, maintenance, refuelling of vehicles/equipment to be carried out >150 m from watercourses. Storage areas accommodating hazardous substances (fuel, oils and chemicals), must have an impermeable surface and be suitably bunded to retain 110% of all the container volumes. All solid waste to be stored in covered waste skips/bins until disposal at a licence waste disposal facility. Waste must not be burned or buried on site.	Avoidance/Prevention measure	Low
44	On-site sanitation	Contamination to ground- and surface water systems	Monitoring systems to detect leaking and visual observations of facilities conditions.	Avoidance/Prevention measure	Low
45	Storage of chemicals and building materials during construction of mine infrastructure	Contamination to ground- and surface water systems	Monitoring systems to detect leaking and visual observations of facilities conditions	Avoidance/Prevention measure	Low
Operational phase					
46	On-site sanitation	Contamination to ground- and surface water systems	Monitoring systems to detect leaking and visual observations of facilities conditions.	Avoidance/Prevention measure	Low

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
47	Spillages of hydrocarbons & reagents, use of explosives	Contamination to ground- and surface water systems	Effective stormwater management would need to be done to mitigate impacts. Implement construction phase mitigation measures with regards to oil, grease and diesel spillage prevention.	Control measure	Low
48	Mass transport and seepage from overburden facility at the proposed mine	Contamination to ground- and surface water systems	Water quality monitoring and seepage capturing from boreholes and effective stormwater management would need to be done.	Avoidance/Prevention measure	Medium
Closure & decommissioning phase					
49	Seepage and mass transport from mine residue facilities and mine residue facilities on groundwater quality	Contamination to ground- and surface water systems	Water quality monitoring and seepage capturing	Control measure	Medium
Post-closure & rehabilitation phase					
50	Seepage and mass transport from mine residue facilities and mine residue facilities on groundwater quality	Contamination to ground- and surface water systems	Water quality monitoring and seepage capturing	Control measure	Medium
Air quality impacts					
Construction / development phase					
51	Transport and general construction activities	Gaseous and particulate emissions; fugitive dust	Maintenance of vehicles and wet suppression or chemical treatment on unpaved road surfaces.	Control/reduction measure	Medium
52	Clearing of groundcover and levelling of area	Particulate emissions; fugitive dust	Wet suppression where feasible. Minimise extent of disturbed areas. Reduction of frequency of disturbance. Early re-vegetation of disturbed areas.	Control/reduction measure	Medium
53	Materials handling	Particulate emissions; fugitive dust	Wet suppression where feasible on materials handling activities and reducing drop height.	Control/reduction measure	Medium
54	Wind erosion from open areas	Particulate emissions; fugitive dust	Wet suppression where feasible. Minimise extent of disturbed areas. Reduction of frequency of disturbance. Early re-vegetation of disturbed areas.	Control/reduction measure	Medium
Operational phase					
55	Vehicle activity on paved and unpaved roads	Gaseous and particulate emissions; fugitive dust	Maintenance of vehicles and wet suppression or chemical treatment on unpaved road surfaces.	Control/reduction measure	Medium
56	Crushing and screening	Particulate emissions; fugitive dust	Maintenance of vehicles and wet suppression or chemical treatment on unpaved road surfaces.	Control/reduction measure	Medium

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
57	Materials handling	Particulate emissions; fugitive dust	Wet suppression where feasible on materials handling activities and reducing drop height. Enclosure or wet suppression of crushing activities.	Control/reduction measure	Medium
58	Wind erosion	Particulate emissions; fugitive dust	Wet suppression where feasible. Stabilisation (chemical, rock cladding or vegetative) of mine residue facilities.	Control/reduction measure	Medium
Closure & decommissioning phase					
59	Dust generated during rehabilitation activities	Particulate emissions; fugitive dust	Wet suppression where feasible.	Control/reduction measure	Medium
60	Demolition of infrastructure	Particulate emissions; fugitive dust	Wet suppression where feasible.	Control/reduction measure	Medium
61	Tailpipe emissions from the vehicles used during the closure phase	Gaseous and particulate emissions; fugitive dust	Maintenance of vehicles and wet suppression on unpaved road surfaces.	Control/reduction measure	Medium
Post-closure & rehabilitation phase					
62	Wind erosion from open areas	Particulate emissions; fugitive dust	Vegetation of open and disturbed areas.	Remediation/corrective measure	Medium
Noise impacts					
Construction / development phase					
63	Various construction activities	Increase in ambient sound levels. Noise levels above the acceptable rating level	• Noise measurements to be taken. • Noise monitoring protocol to be implemented. • Management of activities to limit simultaneous activities near receptors.	Control/reduction measure	Low
Operational phase					
64	Various operational activities at night	Increase in ambient sound levels. Noise levels above the acceptable rating level	• Measurements as per construction phase. • Placement of berms and dumps.	Control/reduction measure	Low
Closure & decommissioning phase					
65	Decommissioning activities	Increase in ambient sound levels. Noise levels above the acceptable rating level	Mitigation not required	Control/reduction measure	Low
Post-closure & rehabilitation phase					
66	Maintenance activities	Increase in ambient sound levels. Noise levels above the acceptable rating level	Mitigation not required	Control/reduction measure	Low
Visual impacts					
Construction / development phase					
67	• Removal of vegetation, the building of access roads, earthworks, and exposure of earth to establish the areas to be developed. • The physical presence of construction camps and the movement of construction vehicles within the site and along local roads. • Generation of dust by construction activities.	Construction of roads, exposure of earth to create place for the construction activities - the building of the plant and offices. The exposure of earth and rock (contrast with existing landscape character) results in the altering of the visual quality and sense of place of the study area.	• With the preparation of the portions of land onto which activities will take place the minimum amount of existing vegetation and topsoil should be removed. • Ensure, wherever possible, natural indigenous vegetation is retained and incorporated into the site rehabilitation. • All topsoil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use. The construction contract must include the stripping and stockpiling of topsoil. Topsoil would be used later during the rehabilitation phase of disturbed areas. The presence of degraded areas and	Control/reduction measure	Medium

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
			disused construction roads, which are not rehabilitated, will increase the overall visual impact. • Adopt responsible construction practices aimed at strictly containing the construction/establishment activities to specifically demarcated areas. • Building or waste material discarded should be undertaken at an authorised location, which should not be within any sensitive areas.		
Operational phase					
68	**Removal of vegetation, topsoil** and waste rock from mining (open pit) areas. Preparation of earthworks and the construction of the offices, plant and infrastructure.	The exposure of earth and rock (contrast with existing landscape character) results in the altering of the visual quality and sense of place of the study area.	• Earthworks should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed activities are exposed. In all other areas, the naturally occurring vegetation should be retained, especially along the periphery of the sites. • All cut and fill slopes (if any) and areas affected by construction work should be progressively top soiled and re-vegetated as soon as possible. • Any soil must be exposed for the minimum time possible once cleared of vegetation to avoid prolonged exposure to wind and water erosion and to minimise dust generation. • Progressive rehabilitation of all construction areas should be carried out immediately after they have been established. • "Housekeeping" procedures should be developed for the project to ensure that the Project site and lands adjacent to it are kept clean of debris, garbage, fugitive trash, or waste generated onsite; procedures should extend to control of "track out" of dirt on vehicles leaving the active sites and entering the public domain.	Control/reduction measure	Medium
Closure & decommissioning phase					
69	Final grading, laying of topsoil in selected areas and hydroseeding.	The final shaping (dust creation) and rehabilitation process that alters the visual quality and sense of place of the study area.	Final grading of the excavation to avoid harsh excavated lines to blend with the slope of the surrounding topography. Rehabilitation of the disturbed footprints. Use only plants indigenous to the sub-region.	Remediation/corrective measure	Medium
Post-closure & rehabilitation phase					
70	Rehabilitation of exposed areas and growth of grasses and vegetation (management and maintenance)	Improvement of the visual quality and sense of place.	Effective management of rehabilitated areas such that the grassed areas are established and permanently sustainable.	Enhancement	Medium
Socio-economic Impacts					
Planning phase					
71	In-migration of job seekers	Increase pressure on and demands for local social services, and to cause conflict and competition between various social groups competing for employment and services	• Develop Labour Recruiting Plan • Collaborate with Authorities and other local businesses to manage change processes	Avoidance/Prevention measure	Medium
Construction / development phase					
72	Employment of staff	Expectation of employment for local residents	Develop Local Hiring and Purchasing Plan that favours local residents	Avoidance/Prevention measure	Medium

No	Activity	Potential impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk [without mitigation]
73	External job seekers moving to the area to look for work	In-migration and increased levels of communicable diseases, esp. Sexually Transmitted diseases	• Develop Labour Recruiting Plan • Collaborate with Authorities and other local businesses to manage change processes	N/A	Medium
74	In-migration of job seekers	Increase pressure on and demands for local social services, and to cause conflict and competition between various social groups competing for employment and services	• Develop Labour Recruiting Plan • Collaborate with Authorities and other local businesses to manage change processes	Control/reduction measure	Medium
75	Mine creating new employment opportunities	Increase in incomes and spending in local communities	Not applicable	N/A	Medium
76	Payment of taxes and purchase of goods and services by the mine and its employees	Indirect increase in local, regional, and national income and economic transactions	Not applicable	N/A	Medium
Operational phase					
77	Mining and processing activities	Sustainable stimulation of economy	•Where feasible, procure goods and services required for the operation of the mine from the local economy.	Enhancement	Medium
78	Mining and processing activities	Creation of employment	•Where feasible, aim to fill all the positions with labour from the local community	Enhancement	Medium
79	Mining and processing activities	Impact on government revenue	•No mitigation measures are required.	N/A	Medium
80	Mining and processing activities	Increase in household income during operation	•Where feasible, aim to fill all the positions with labour from the local community	Enhancement	Medium
81	Mining and processing activities	Improved living standards of positively affected households	•Employing locally will increase benefit to local households and the local area.	Enhancement	Medium
82	Mining and processing activities	Skills development of permanently employed workers	•In order to maximise the positive impact, it is suggested that the project company provide training courses for employees where feasible to ensure that employees gain as much as possible from the work experience. •Facilitate the transfer of knowledge between experienced employees and the local staff. •Perform a skills audit to determine the potential skills that could be sourced in the area. •Where possible train and empower local communities for employment in the operations of the mine.	Enhancement	Medium
83	Mining and processing activities	Local economic development benefits derived through mine's social responsibility programme	•No mitigation measures are required.	N/A	Medium
Closure, decommissioning, post-closure & rehabilitation phase					
84	Loss of employment opportunities due to mine closure	Decrease in incomes and spending in local communities.	Develop & implement a local hiring and purchasing plan.	Control/reduction measure	Medium

11.4. The outcome of the site selection matrix – final site layout plan

In line with the DMRE requirements, the proposed site layout plan is provided in Figure 61 below. The site selection matrix is provided as part of the alternatives discussion earlier in the document (refer to Section 8 and Table 12).

Please note that this layout plan might still change depending on the findings of the specialists during the EIA phase, and in particular the hydrological investigation and mine residue facility design report.

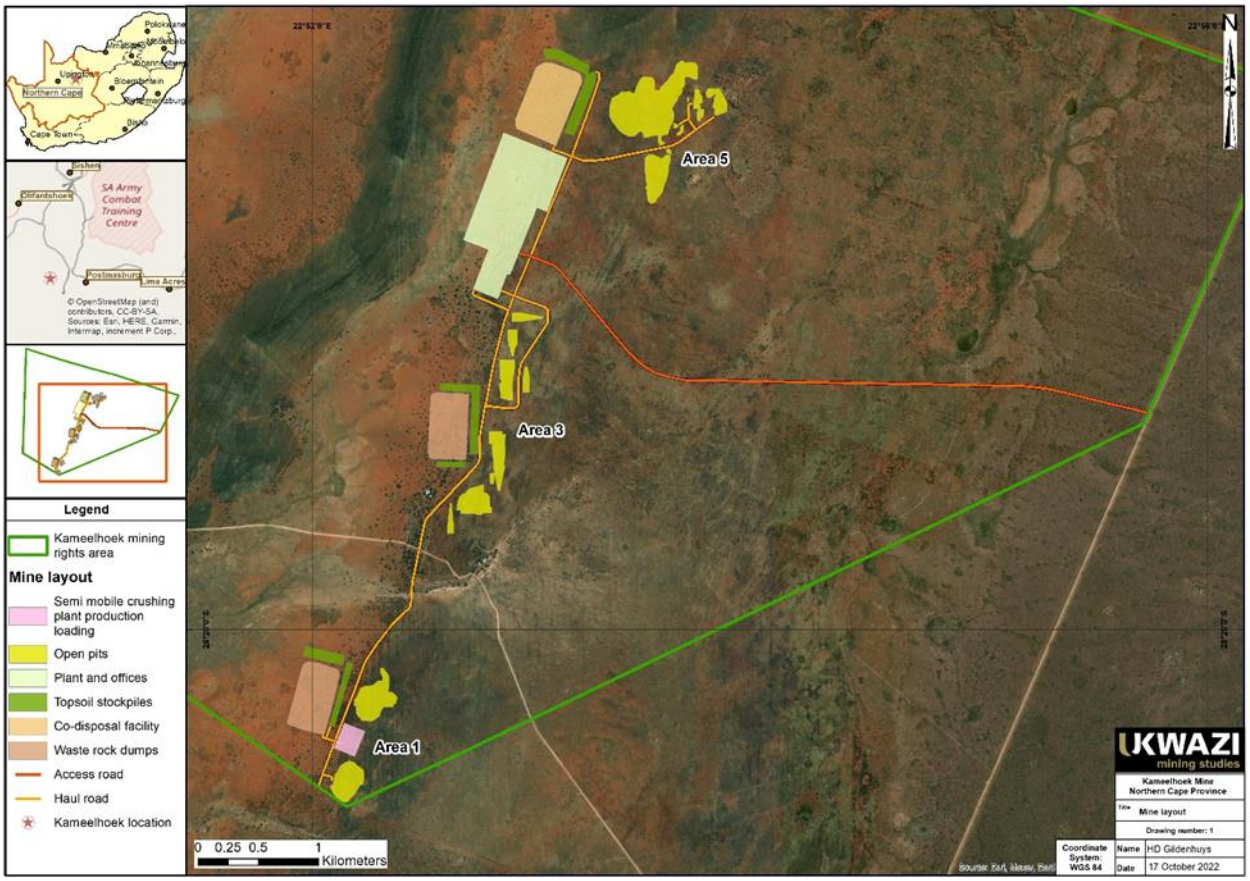

Figure 61: Site layout plan

11.5. Motivation where no alternative sites were considered

Not applicable. Refer to Section 8.1.2 for alternatives considered.

11.6. Statement motivating the preferred site

A site selection matrix summarising the specialist recommendations and other practical considerations of the various sites are indicated inTable 12.

12. Plan of study for the environmental impact assessment process

12.1. Description of alternatives to be considered including the option of not going ahead with the activity

In the case of the proposed development, possible alternatives were identified through reviewing of existing environmental data, specialist input and the design team. Alternatives relevant to this mining development can be categorised into the following:

- Site location alternatives
  - Mine residue facility location alternatives
  - Beneficiation plant location alternatives
- Layout alternatives

  - Open pit layout alternatives
  - Haul and access road layout alternatives
- Technology alternatives
  - Tailings disposal alternatives
- No-go alternative
  - To be assessed per environmental aspect/area.

Please refer to Section 8 for a description of the above-mentioned alternatives.

12.2. Description of the aspects to be assessed as part of the environmental impact assessment process

Key aspects identified by the EAP and specialists to be assessed as part of the EIA include inter alia:

- Air quality and health related aspects (dust and emissions)
- Climate change aspects
- Socio-economic aspects (job creation, social investment, health, skills training, change of land use, etc.)
- Communication and interaction with local community (public participation)
- Biodiversity aspects (flora, fauna and wetlands)
- Heritage and palaeontological aspects
- Groundwater aspects including impacts on groundwater quality and quantity, and potential mine dewatering
- Mine water supply
- Impact on soils, land use and land capability (including hydropedology)
- Visual impacts
- Traffic related aspects
- Flood line delineation and stormwater management
- Surface water aspects
- Noise pollution
- Rehabilitation and associated financial provision for closure.

12.3. Description of aspects to be assessed by specialists

The above identified aspects will be assessed in the following proposed specialist studies:

- Air quality impact assessment and health screening
- Climate change impact assessment
- Socio-economic impact assessment
- SLP update
- Biodiversity and wetland assessment
- Heritage assessment
- Palaeontology assessment
- Hydrogeological impact assessment, waste classification and mine water balance
- Agricultural compliance statement and hydropedological assessment
- Visual impact assessment
- Hydrology assessment and stormwater management plan
- Noise impact assessment
- Traffic impact assessment
- Geotechnical investigation.

12.4. Proposed method of assessing the environmental aspects including the proposed method of assessing alternatives

Assessment of environmental aspects and alternatives will be based on the Department of Environmental Affairs Guideline Document: EIA Regulations 2014. The significance of the aspects/ impacts of the proposed activities will be rated by using the matrix as defined in Section 11.1. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

Refer to Section 8 for the method used to assess alternatives.

12.5. Proposed method of assessing duration significance

The significance of the impacts will be determined through a synthesis of the criteria described in Section 11.1.

12.6. The stages at which the competent authority will be consulted

The DMRE will be consulted upon submission of the following reports:

- Final scoping report ("SR")
- Draft EIA & EMPR
- Final EIA & EMPR.

12.7. Particulars of the public participation process with regard to the impact assessment process that will be conducted

12.7.1. Steps to be taken to notify interested and affected parties

12.7.1.1. Stakeholder identification

The key stakeholders for this assessment were identified. These include:

- The owners and occupiers of the site where the activity is proposed
- The owners and occupiers of land adjacent to the site where the activity proposed
- ZFMDM
- TLM
- Councillor for Ward 7
- Northern Cape Department agriculture, environmental affairs, land reform and rural development
- SAHRA: Northern Cape
- DHSWS: Northern Cape
- DAFF: Northern Cape
- SANRAL Western Region
- Northern Cape Department of Roads and Public Works
- Eskom
- Tshiping water user association
- Sedibeng water
- Other stakeholders.

12.7.1.2. Stakeholder engagement

Stakeholder engagement forms an integral part of the EIA process and will be conducted throughout the scoping and EIA phases of the project. The comments received and issues raised during the public open day and during the review of the draft reports will be incorporated into the final reports that will be submitted to the DMRE. The aim of public participation and consultation is to achieve the following:

- Provide for public input and facilitate negotiated outcomes
- Create trust and partnerships
- Minimise negative impacts and enhance positive impacts
- Provide up-front indication of issues that may prevent project continuation or can cause costly delays at a later stage
- Enhanced and shared benefits.

I&APs will be notified of the PPP by newspaper advertisement, site notices, direct notification by email and registered mail. The draft Scoping Report will be placed out for review for a period of at least 30 calendar days.

The proof of correspondence and notification will be attached to Appendix 5 of the final scoping report.

12.7.1.3. Interested and affected parties communication

Stakeholders will be encouraged to contact Ukwazi to register as I&APs, raise issues or concerns or ask questions. Each issue, concern and question identified through communication with Ukwazi will be logged and a response provided in the comments and response table.

12.7.2. Details of the engagement process to be followed

12.7.2.1. Public review of the draft scoping report and draft EIA and EMPr report

The draft SR has been made available for public comment. The review period of the draft SR was made known to potential I&APs via written notification.

The draft EIA & EMPr report will be made available for public review. Registered I&APs will be informed once the report becomes available.

12.7.2.2. Comments and response reporting

A comments and response register is being created and kept up to date as the project progresses. The register will include all comments, concerns, questions and statements received.

The name(s) of the person(s) who raised the comment, and the date that the comment was raised will appear in the register. The register contains the EIA team's answer and/or a reference to where more information can be obtained in the relevant reports.

12.7.2.3. Public feedback meetings

Public open days will be held during the review period of the draft SR and the draft EIA and EMPr report. The open days will provide I&APs with the opportunity to raise issues and comments and ask specific questions in the presence of the relevant consultants on the project, while providing the consultants the opportunity to explain the authorisation process and associated timelines. The scoping phase public open day was advertised in the Noord Kaap Bulletin and the Kathu Gazette on 17 and 19 November 2022 respectively.

Issues raised by I&APs during the public open days will be included in the final SR to be submitted to the DMRE. The scoping phase public open day will be held at the Postmasburg Inn at 1 Kromme Street in Postmasburg from 12h00 to 18h00 on 30 November 2022.

12.7.3. Description of the information to be provided to interested and affected parties

The following information will be provided to I&APs:

- The site plan
- List of activities to be authorised
- Scale and extent of activities to be authorised
- Typical impacts of activities to be authorised (e.g. surface disturbance, dust, noise, groundwater impacts, visual impacts etc.)
- The duration of the activity
- Sufficient detail of the intended operation to enable I&APs to assess what impact the activities will have on them or on the use of their land.

In addition, the following reports were or will be provided to I&APs:

- Draft SR
- Draft EIA and EMPR report.

12.8. Description of the tasks that will be undertaken during the environmental impact assessment process

Tasks to be undertaken during the EIA process:

- Upon completion of the completion of the PPP on the draft SR the comments received from I&APs will be included and assessed in the EIA & EMPR
- The identified specialists will be appointed to undertake the EIA level specialist studies as identified in this SR
- The results of the specialist studies will be incorporated into the draft EIA and EMPr report
- The draft EIA and EMPR will be circulated to key I&APs for comment for a period of at least 30 days
- The EIA and EMPR report will be updated by addressing and responding to the issues raised in by I&APs
- The final EIA and EMPR report will be published with the various specialist reports appended and submitted to the DMRE for consideration.

12.9. Measures to avoid, reverse, mitigate, or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored

These aspects are already addressed in Table 34 above.

12.10.Other information required by the competent authority

12.10.1. Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the NEMA (Act 107 of 1998). the EIA report must include the:

12.10.1.1. Impact on the socio-economic conditions of any directly affected person

A socio-economic impact assessment is currently being undertaken by Ursula Pape from Solarys. The following potential socio-economic impacts were identified and will be further assessed in the EIA phase by Solarys:

- Increase pressure on and demands for local social services due to in-migration of job seekers that may cause conflict and competition between various social groups competing for employment and services
- Expectation of employment for local residents
- In-migration and increased levels of communicable diseases, especially sexually transmitted diseases as external job seekers move to the area to look for work
- Increased pressure on and demands for local social services, and conflict and competition between various social groups competing for employment and services due to in-migration of job seekers
- Increase in incomes and spending in local communities as a result of the mine creating new employment opportunities
- Indirect increase in local, regional, and national income and economic transactions from payment of taxes and purchase of goods and services by the mine and its employees
- Sustainable stimulation of economy
- Creation of employment
- Impact on government revenue
- Increase in household income
- Improved living standards of positively affected households
- Skills development of permanently employed workers
- Local economic development benefits derived through the mine's social responsibility programme
- Loss of employment opportunities due to mine closure that would lead to a decrease in income and spending in local communities.

The relevant preliminary mitigation measures are provided in Table 34 of this report. The socio-economic impact assessment will be completed in the EIA phase and the abovementioned impacts and mitigation measures will be updated based on consultation that took place with the I&APs. The socio-economic impact assessment report will be submitted along with the EIA and EMPR report.

12.10.1.2. Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act

A heritage assessment was undertaken for the MRA by G&A Heritage Management Consultants (Gaigher, 2022). A historic homestead and family graveyard is located in the southern central part of the MRA. The farmhouse on dates back to the late 1800s. On the northern side of the homestead is the family graveyard. A 200m buffer zone will be kept around the historic homestead and cemetery in line with the archaeologist's recommendations. Two open pits that were originally proposed in this area were removed from the application as they were within 200m from the homestead and cemetery (Gaigher, 2022).

A site with unique LSA artifacts were found around two pans in the north-east of the MRA. The archaeologist recommended that a phase 2 archaeological impact assessment should be undertaken to do a detailed analysis of the site should it be impacted by the mining development. This site is however not proposed to be developed. The nearest proposed structure will be more than 2km away from any of these two pans (Gaigher, 2022).

12.11.Other matters required in terms of sections 24(4)(a) and (b) of the act

Please refer to the alternatives assessment in section 8.

13. Undertaking regarding correctness of information

I, **Herman Gildenhuys,** herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected parties have been correctly recorded in the report.

_____
Signature of the EAP

_____
Date:

14. Undertaking regarding level of agreement

I, **Herman Gildenhuys**, herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

_____
Signature of the EAP

_____
Date:

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