Draft Environmental Impact Assessment and Environmental Management Programme and EMPr Amendment for Public Comment for the Kudumane Manganese Resources Expansion Project on the Properties Kipling 271, Devon 277 and Hotazel 280

Report Prepared for

Kudumane Manganese Resources

KUDUMANE
MANGANESE RESOURCES

Report Number: 574378/IEA/DEIA/EMPR_H,D &K

DMRE Reference Number: NC 30/5/1/2/2/10053 MR

Report Prepared by

srk consulting

October 2021

Draft Environmental Impact Assessment and EMPr Amendment Report for Public Comment for the Kudumane Manganese Resources Expansion Project on the Properties Kipling 271, Devon 277 and Hotazel 280

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SRK Project Number 574378/IEA/DEIA/EMPR_H,D &K

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mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

DRAFT

ENVIRONMENTAL IMPACT ASSESSMENT REPORT
AND
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

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

NAME OF APPLICANT: Kudumane Manganese Resources (Pty) Ltd

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FILE REFERENCE NUMBER SAMRAD: NC 30/5/1/2/2/10053 MR

Executive Summary

Kudumane Manganese Resources (Pty) Ltd (KMR) is situated approximately 3 km south-west of the town of Hotazel within the John Taolo Gaetsewe District Municipality in the Northern Cape (Figure 1-1). The KMR mining operations commenced in June 2013 under the Mining Right NC/30/5/1/2/2/0268 MR covering the farms York A 279 and Telele 312. The initial operation which were approved in 2010 included the following mining related infrastructure:

- An opencast and future underground mining operation;
- Associated residue handling and disposal facilities;
- A crushing and screening plant;
- Rail and road infrastructure;
- Water and electrical reticulation infrastructure; and
- Various other supporting infrastructure and services, such as offices, waste storage areas and sewage treatment facilities.

In 2015, the mine expanded its operation through the application of another mining right (Mining Right Ref: NC/ 30/5/1/2/2/10053 MR) over the farms Devon 277, Hotazel 280 and Kipling 271. Under this mining right, the following main mining related activities and infrastructure were approved:

- Mining and removal of manganese ore from a historical pit and tailings storage facility (TSF) on the farm Devon 227;
- Mining and removal of manganese ore from an historical pit on the farm Hotazel 280, along with the establishment of haul road, utilisation of existing roads including the establishment and utilisation of a conveyor system between the farms Hotazel 280 and York A 279; and
- Potential future mining on the farm Kipling 271.

The KMR mining operation therefore operates under two Environmental Authorisations (EAs) and associated Environmental Management Programmes (EMPrs) as approved by the Northern Cape Province Department of Environment and Nature Conservation (DENC) in June 2013 and October 2015 respectively.

KMR also has a Water Use Licence (WUL) that was issued in 2016 by the Department of Water and Sanitation (DWS) and an amended WUL authorised in 2018.

As part of the previous WUL conducted the following activities were applied for:

- Section 21 (a): Abstraction of groundwater
- Section 21 (b): Storing water
- Section 21 (c&i): Impeding or diverting the flow of water in a water course; and Altering the bed, banks, course or characteristics of watercourse
- Section 21 (f): discharging waste or water containing waste into a water resource through a pipe, canal or other conduit
- Section 21 (g): Disposing of water containing waste
- Section 21 (j): Removing water found underground

SRK Consulting (South Africa) (Pty) Ltd (SRK) were appointed by KMR as the independent environmental assessment practitioner (EAP) to manage and facilitate the integrated EA and associated public participation process in accordance with National Environmental Management Act (Act No. 107 of 1998) (NEMA), National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA), National Water Act (Act No. 36 of 1998) (NWA) and Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA).

KMR expansion project

It is the intension of KMR to expand its existing operations and construct additional infrastructure in order to improve production capacity. The EMPrs and associated EAs therefore need to be amended. The proposed expansion will be located within the existing KMR mining rights on York A 279, Telele 312, Kipling 271, Devon 277 and Hotazel 280. However, as the KMR operations fall under two Mining Rights, two amendments process will be undertaken for the KMR Expansion Project. One EMPr amendment will be conducted for Mining Right NC/30/5/1/2/2/0268 MR and another EMPr amendment will be conducted for Mining Right NC/ 30/5/1/2/2/10053 MR (this report).

The infrastructure and activities associated with the proposed KMR Expansion Project, for properties Hotazel 280, Devon 277 and Kipling 271, requires an Environmental Authorisation for new activities as well as the amendment of the mine's existing EMPrs, a Waste Management Licence (WML) and a WUL to authorise the following key infrastructure:

- A new opencast pit mine on Kipling 271;
- Expansion of the Hotazel 280 opencast mine; and
- An attenuation dam in the Ga-Mogara River, to allow for the expansion of the Hotazel Pits.

The above key infrastructure will have secondary infrastructure and activities associated with them, which includes:

- Establishment of water storage tank and pipelines;
- Development and expansion of waste rock dumps;
- Establishment and expansion of ore stockpiles;
- New roads and expansion of existing roads;
- Development of a sewerage treatment plant in property Hotazel 280;
- Supporting infrastructure such as administration offices ancillary infrastructure;
- Waste and fuel storage areas;
- Two pollution control dams;
- Upgrade of a tarred, provincial road (R380 intersection with KMR deliver and collection road;
- Contractor's camp; and
- Extension of existing powerlines.

The infrastructure and activities associated with the proposed KMR Expansion Project will take place on the following farms and associated farm portions:

- York A 279: Portion 2/279 & Portion 11/279;
- Telele 312: Portion RE/312 & Portion 1/312;
- Devon 277: Portion RE/277;
- Hotazel 280: Portion RE/280 & Portion 4/280;and
- Kipling 271: Portion RE/271.

For the purposes of this Environmental Authorisation process, the only properties which will form part of this Draft EIA Report are:

- Devon 277: Portion RE/277;
- Hotazel 280: Portion RE/280 & Portion 4/280;and
- Kipling 271: Portion RE/271.

Outcomes of the impact assessment

The impact assessment undertaken by the EAP, as part of the integrated environmental authorisation process for the KMR Expansion Project, followed due process to inform the findings of the EIA study in accordance with the EIA Regulations of 2014, as amended in 2017 and 2021. The EIA process included an assessment of potential impacts identified, further investigations by specialists in their respective fields, and the undertaking of the legislated required participation with interested and affected parties.

The impact assessment considered both the biophysical and socio-economic aspects of the environment within which the KMR Expansion Project will be located.

Based on the review of the potential environmental, social and economic impacts associated with the proposed project,

The social impacts can be mitigated where negative, however by enhancing the positive impacts, the mine will have an overall positive impact, through the implementation of KMR policies and the proposed management measures as detailed in the EMPr.

Significant impacts identified relates to the following environmental aspects:

- Soil, land use and land capability;
- Social;
- Ground and surface water resources;
- Archaeological and cultural resources; and
- Biodiversity

Assuming all phases of the project adhere to the mitigation and management commitments stipulated in this EIA/EMPr, it is believed that significant impacts identified during the impact assessment phase can be mitigated and managed to reduce the level of significance of the initial impact.

It is therefore the EAP's opinion that based on the process that has been followed and the findings of the impact assessment, in conjunction with the proposed mitigation measures, impacts can be effectively managed.

Over the operational life of KMR, additional permanent job opportunities may be created as the open pit mining operations are ramped up at Kipling. Apart from the direct opportunities such a potential employment during construction, there are opportunities for indirect benefits such as providing goods and services to the construction project and operational phase.

Should the proposed KMR Expansion Project not be implemented, KMR will continue to operate until the ore resource which is currently approve has been mined and any additional local economic development opportunities associated with the procurement of local goods and services to support the mine activities will not be realised

Conclusion

The environmental authorisation process associated with the proposed KMR Expansion Project for KMR was undertaken in terms of the relevant environmental authorisation requirements as detailed in Section 5. The environmental authorisation process was underpinned by an stakeholder engagement process with in-depth consultation undertaken through various forms of engagement as detailed in Section 11.

During the consultation processes, comments were received as detailed in the CRR in Appendix G. The specialists' studies as detailed in Section 12 were undertaken and the findings took into account and addressed (as far as practically possible) the project-specific issues which were raised.

In terms of the locality of the proposed project related infrastructure, areas of sensitivity were taken into consideration during the design phase and were avoided as far as practically possible. Where avoidance could not be achieved in terms of the design requirements of the proposed infrastructure, appropriate mitigation measures were developed to be implemented to reduce the impacts on the environment, as detailed in Section 16. The proposed mitigation measures were developed based on the nature, duration, severity and probability of the impact and based on the recommendations made by the specialists, as presented in Appendix I.

In addition, since KMR is an existing operational mine, mine personnel are presently managing impacts in line with exiting environmental management requirement. These impacts are of a similar nature to the proposed KMR Expansion Project.

It is SRK's reasoned opinion that this project should be authorised based on the following:

- The impacts which have been identified can be mitigated through the implementation of the identified management measures in Section 16;
- The proposed KMR Expansion Project is unlikely to result in the generation of any significant cumulative impacts when managed in accordance with the management measures specified in Section 16; and
- Should the proposed KMR Expansion Project not be implemented, KMR will continue to operate until the ore resource which is currently approve has been mined and any additional local economic development opportunities associated with the procurement of local goods and services to support the mine activities will not be realised. In addition to this, projected temporary employment opportunities during the construction phase will not be fulfilled.

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Disclaimer

The opinions expressed in this report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by Kudumane Mineral Resources (Pty) Ltd (KMR). SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

Protection of Personal Information Act 4 of 2013 (POPIA)

The Protection of Personal Information Act 4 of 2013 (POPIA), which aims to promote protection of personal information, came into effect on 1 July 2021. The EIA Regulations, 2014 require, inter alia, transparent disclosure of registered stakeholders and their comments. In terms of the EIA Regulations, 2014, stakeholders who submit comment, attend a meeting or request registration in writing are deemed registered stakeholders who must be added to the project stakeholder database. By registering, stakeholders are deemed to give their consent for relevant information (including contact details) to be processed and disclosed, in fulfilment of the requirements of the EIA Regulations, 2014 and the National Appeal Regulations, 2014.

List of Abbreviations

CA	Competent Authority
CRR	Comment and response report
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DENC	Department of Environment and Nature Conservation
DMRE	Department of Mineral Resources and Energy
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EA	environmental authorisations
EAP	environmental assessment practitioner
ECA	Environment Conservation Act, (Act No. 73 of 1989)
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programmes
FSR	Final Scoping Report
GNR	Government Notice Regulation
IDP	Integrated Development Plan
I&APs	Interested and Affected Parties
JTGDM	John Taolo Gaetsewe District Municipality
KMF	Kalahari Manganese Field
KMR	Kudumane Manganese Resources
LoM	Life of mine
MHSA	Mine Health Safety Act, 1996 (Act No. 29 of 1996)
MPRDA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEM:AQA	National Environmental Management Air Quality Act (Act No. 39 of 2004)
NEM:BA	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NFA	The National Forestry Act, 1998 (Act No. 84 of 1998)
NHRA	National Heritage Resources Act 25 of 1999
NWA	National Water Act (Act No. 36 of 1998)
PAJA	The Promotion of Administrative Justice Act, (Act No. 3 of 2000)
PAIA	The Promotion of Access to Information Act, (Act No. 2 of 2000)
PCD	Pollution Control Dam

POPIA	Protection of Personal Information Act 4 of 2013
RoM	Run of Mine
SRK	SRK Consulting (South Africa) (Pty) Ltd
S&EIR	Scoping and Environmental Impact Reporting
SPLUMA	Spatial Planning and Land Use Management Act, (Act No. 16 of 2013)
ToR	terms of reference
WULs	Water Use Licenses
WML	Waste Management Licenses
WULA	Water Use License Application
WHCA	The World Heritage Convention Act, (Act No. 49 of 1999)

1 Introduction and Scope of Report

1.1 Introduction, background and scope of the environmental impact assessment and management programme

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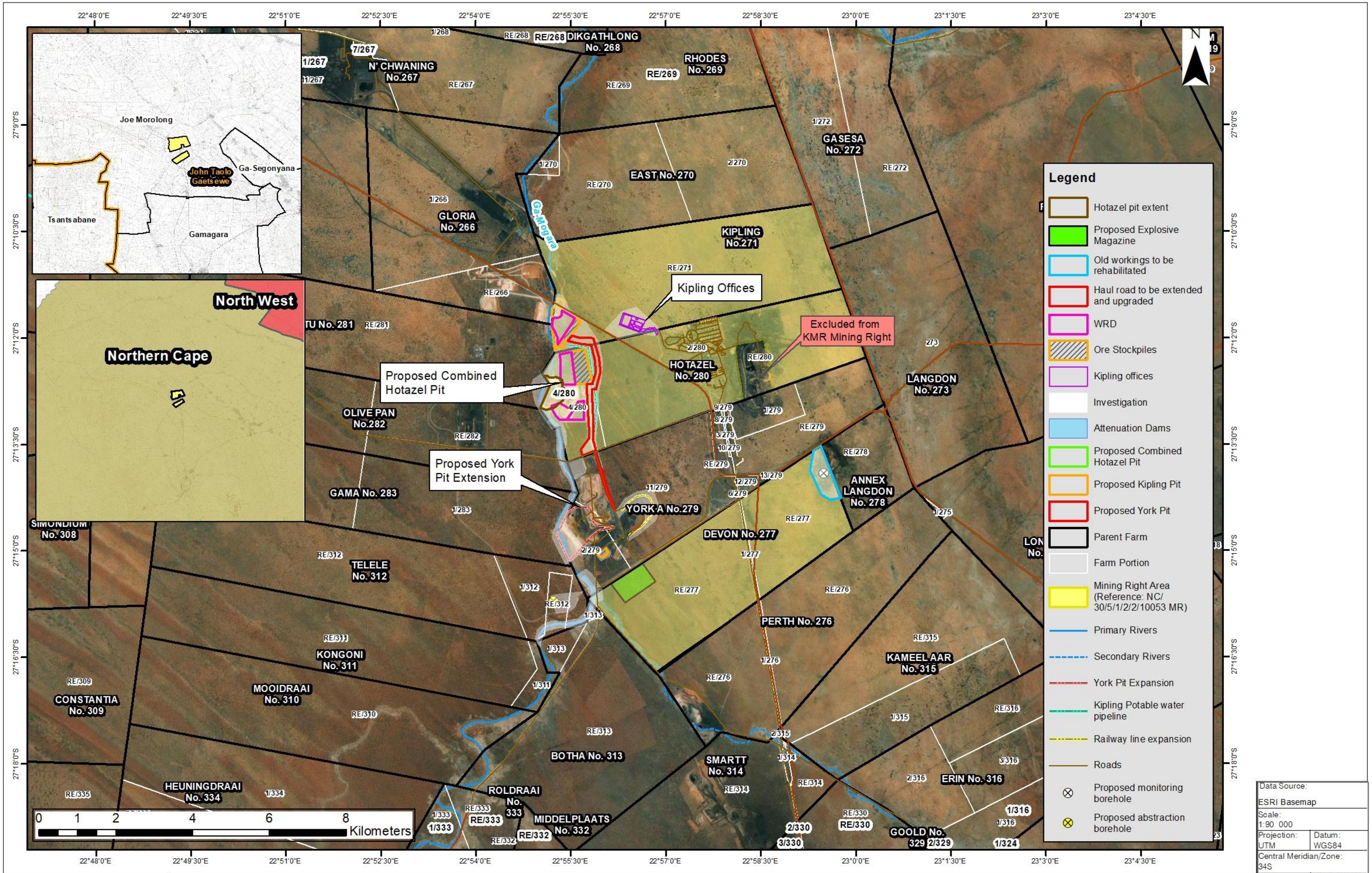

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Scale: 1:90 000
Projection: UTM | Datum: WGS84
Central Meridian/Zone: 34S
Date: 21/09/2021 | Compiled by: SCHB
Project No: 574378 | Fig No: 1-1
Revision: A Date: 04 2021

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KUDUMANE MANGANESE RESOURCES

LOCALITY MAP FOR MINING RIGHT NUMBER NC/ 30/5/1/2/2/10053 MR

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1.2 KMR expansion project

It is the intension of KMR to expand its existing operations and construct additional infrastructure in order to improve production capacity. The EMPrs and associated EAs therefore need to be amended. The proposed expansion will be located within the existing KMR mining rights on York A 279, Telele 312, Kipling 271, Devon 277 and Hotazel 280. However, as the KMR operations fall under two Mining Rights, two amendments process will be undertaken for the KMR Expansion Project. One EMPr amendment will be conducted for Mining Right NC/30/5/1/2/2/0268 MR and another EMPr amendment will be conducted for Mining Right NC/ 30/5/1/2/2/10053 MR (this report).

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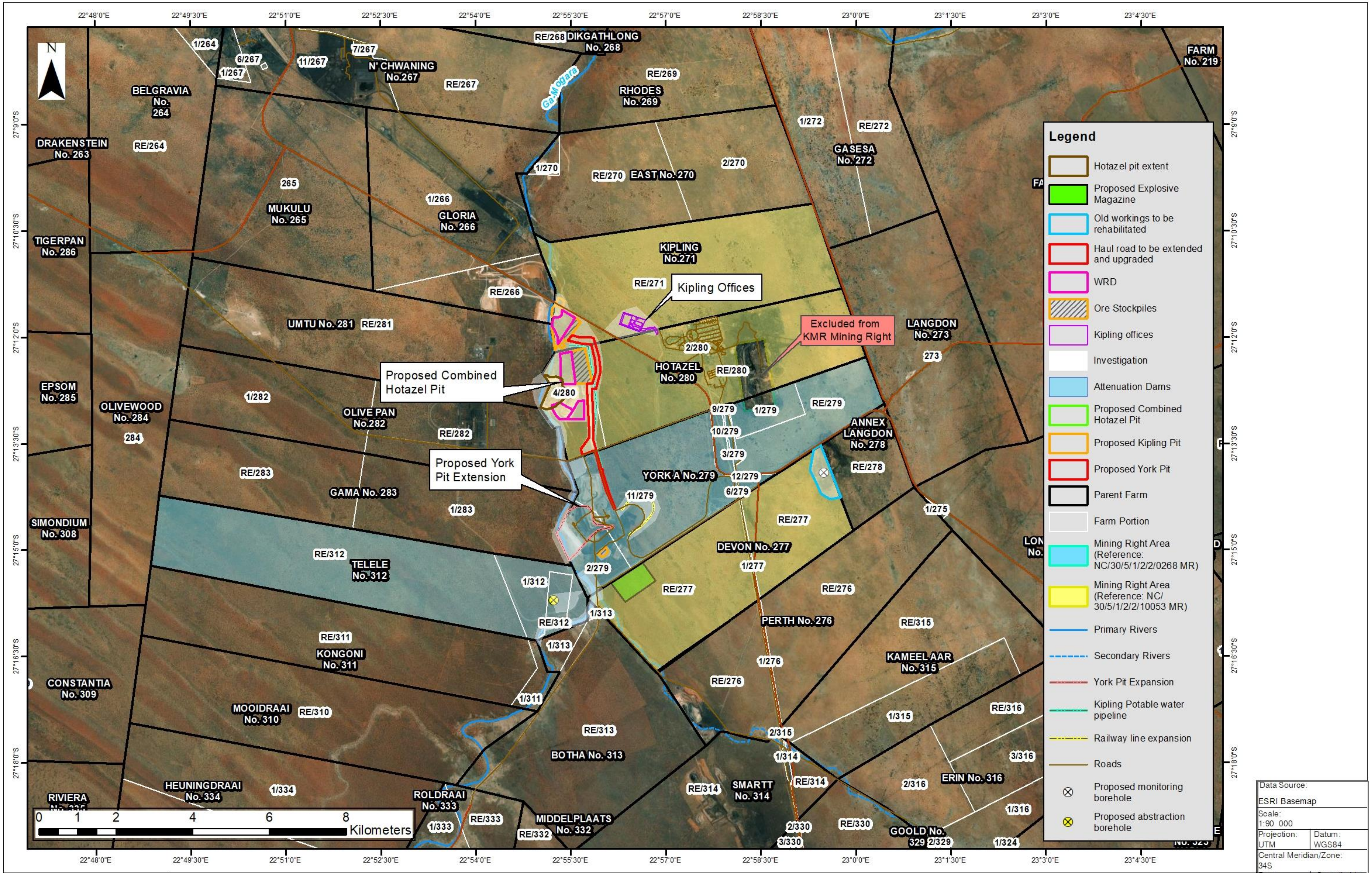
- Telele 312: Portion RE/312 & Portion 1/312;
- Devon 277: Portion RE/277;
- Hotazel 280: Portion RE/280 & Portion 4/280;and
- Kipling 271: Portion RE/271.

Figure 1-2 provides a map showing the location of the proposed infrastructure within KMR's mining right areas.

For the purposes of this Environmental Authorisation process, the only properties which will form part of this Draft EIA Report are:

- Devon 277: Portion RE/277;
- Hotazel 280: Portion RE/280 & Portion 4/280;and
- Kipling 271: Portion RE/271.

Refer to Figure 3-1and Figure 3-3 for the specific infrastructure related to properties Hotazel 280, Devon 277 and Kipling271.



KUDUMANE MANGANESE RESOURCES

PROPOSED EXPANSION PROJECT LAYOUT

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Data Source: ESRI Basemap	
Scale: 1:90 000	
Projection: UTM	Datum: WGS84
Central Meridian/Zone: 34S	
Date: 20/07/2021	Compiled by: SCHB
Project No: 574378	Fig No: 1-1
Revision: A	Date: 04 2021

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1.3 EMPr amendment and related permitting requirements

KMR currently has two mining rights one for properties York A 279 and Telele 312 (2013) and another mining right for properties Hotazel 280, Devon 277 and Kipling 271 (2015). In accordance with the two Mining Rights KMR currently operates under two EMPrs, an EMPr for York A 279 and Telele 312 and an EMPr for Hotazel 280, Devon 277 and Kipling 271.

As indicated in Section 1.2, it is the intension of KMR to expand their operation which are currently being undertaken at Hotazel. In addition to expanding the mining operations at Hotazel, KMR intends to add additional infrastructure in support of its existing mining right as well as start mining on the property Kipling. Due to this, this application will be to amend the existing EMPr for Hotazel, Devon and Kipling as well as add other activities and infrastructure.

Prior to KMR commencing with development of any of the additional activities and infrastructure, an amendment to their existing authorisations is required in terms of the following key national legislations (see Section 5 for details on each legislative requirement for the project):

- The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA): For any amendments EMPr in accordance with Section 102 of the MPRDA;
- The National Environmental Management Act (Act No. 107 of 1998) (NEMA): For any project-related listed activities stipulated in the NEMA Environmental Impact Assessment (EIA) Regulations of 2014, as amended in 2017;
- The National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA): For any project-related waste management activities stipulated in GN R 921, promulgated under NEM:WA; and
- The National Water Act (Act No. 36 of 1998) (NWA): For any project related water uses stipulated under Section 21 of NWA.

The environmental, water and waste authorisation as required by the above key legislation is being undertaken in an integrated environmental authorisation process . A schematic showing the integrated environmental authorisation process is provided in Figure 1-3. The authorisations in terms of NEMA, NEM:WA and MPRDA have been applied for from the Northern Cape Province's Department of Mineral Resources and Energy (DMRE), whilst authorisation in respect of the NWA will be applied for from the Department of Water and Sanitation (DWS). Both of these competent authorities (CA) are located in Kimberley.

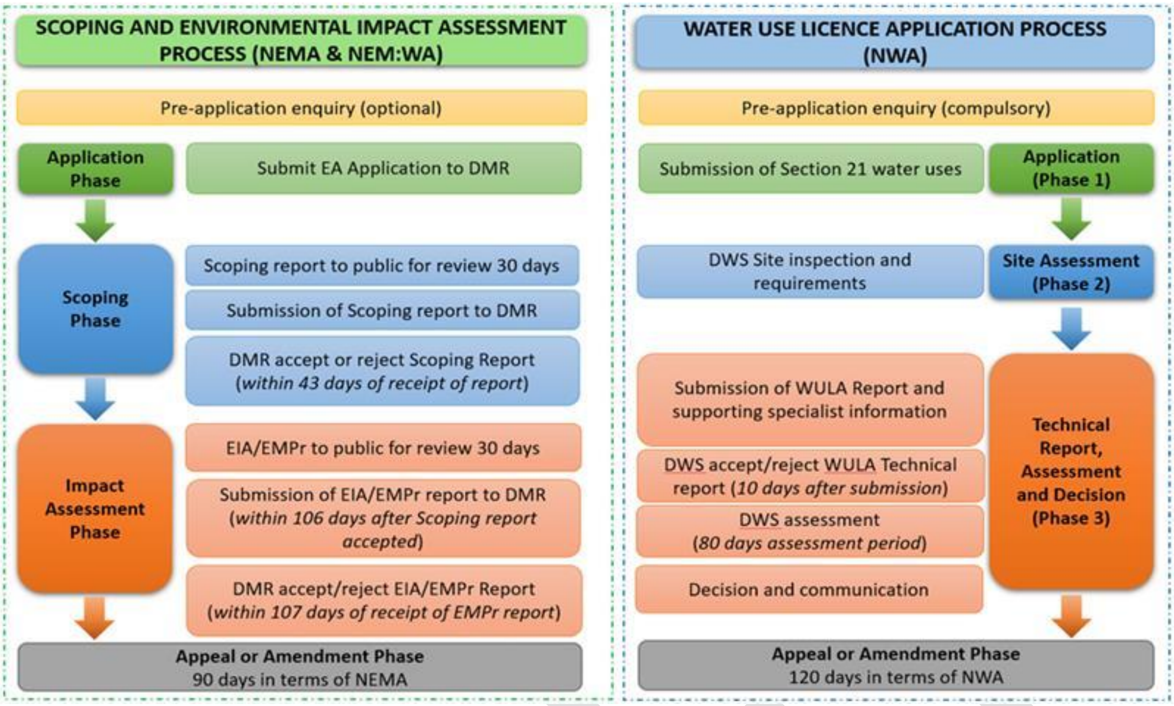


Figure 1-3: Integrated authorisation process

1.4 Purpose and structure pf the report

This Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) has been compiled in terms of the provisions of Appendix 3 and 4 of the NEMA EIA Regulations of 2014, as amended (GNR 982), as well as the requirements of the EIA/EMPr template issued by the DMRE. A summary of the requirements of an EIA/EMPr report including cross-references to sections in this report where these requirements have been addressed is provided in Table 1-1 for the EIA and Table 27-1 for the EMPr.

Prior to the EIA phase and the compilation of the Draft EIA/EMPr, all comments received during the review of the draft scoping report for public comment have been incorporated into the final scoping report which was submitted for approval to the DMRE. The DMRE have issued a letter of acceptance of the Environmental Application (Appendix B).

Specific requirements for the DWS for the waste disposal sites in terms of the Waste Management Licence Application (WMLA) (included as a combined application with the NEMA application attached in Appendix A).

This report is titled "Draft Environmental Impact Assessment and Environmental Management Programme and EMPr Amendment for Public Comment for the Kudumane Manganese Resources Expansion Project on the Properties Kipling 271, Devon 277 and Hotazel 280" and fulfils the requirements for an EIA/EMPr as contemplated in the NEMA 2014 EIA Regulations, as amended.

Table 1-1: Structure of the EIA reporting in terms of Legislation Requirements as detailed in Appendix 3 (contents of an EIA report) of GNR 982

Appendix 3	Legislated requirements as per the NEMA GNR 982 in Appendix 3	Relevant Report Section
(1)(a)	details of-	
	(i) the EAP who prepared the EMPr	Section 2.1
	(ii) the expertise of the EAP, including a curriculum vitae;	Section 2.2
(1)(b)	The location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:	Section 1.1
	(i) The 21-digit Surveyor General code of each cadastral land parcel	Section 3
	(ii) where available, the physical address and farm name; and	Section 3
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	N/A
(1)(c)	a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is -	Section 6, Figure 1-2 and Figure 6-1
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken	N/A
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.	N/A
(1)(d)	A description of the scope of the proposed activity, including	Section 6
	(i) a listed and specified activities triggered and being applied for; and	Section 6.1
	(ii) a description of the associated structures and infrastructure related to the development	Section 6.2
(1)(e)	A description of the policy and legislation context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context	Section 5
(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 development footprint within the approved site as contemplated in the accepted scoping report.	Section 7
(1)(g)	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report	Section 10
(1)(h)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:	
	(i) details of the development footprint considered	Section 10.1
	(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 11

Appendix 3	Legislated requirements as per the NEMA GNR 982 in Appendix 3	Relevant Report Section
	(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 11.6
	(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Section 12
	(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts including the degree to which these impacts – (aa) can be reversed (bb) may cause irreplaceable loss of resources and (cc) can be avoided, managed or mitigated	Section 16
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of the potential environmental impacts and risks	Section 16.3
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Section 16.4
	(viii) the possible mitigation measures that could be applied and the level of residual risk	Section 16.4
	(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and	Section 14
	(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report.	Section 15
(1)(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity including -	Section 16.1
	(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process, and	Section 16.2
	(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	Section 16.2
(1)(j)	An assessment of each identified potentially significant impact and risk, including -	Section 16.4
	(i) cumulative impacts	
	(ii) the nature, significance and consequences of the impact and risk	
	(iii) the extent and duration of the impact and risk	
	(iv) the probability of the impact and risk occurring	
	(v) the degree to which the impact and risk can be reversed	

Appendix 3	Legislated requirements as per the NEMA GNR 982 in Appendix 3	Relevant Report Section
	(vi) the degree to which the impact and risk may cause irreplaceable loss of resources	
	(vii) the degree to which the impact and risk can be mitigated	
(1)(k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	Section 17
(1)(l)	An environmental impact statement which contains-	Section 18
	(i) a summary of the key findings of the environmental impact assessment	
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided including buffers and	Section 18.1 and Appendix J
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Section 16.2
(1)(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact assessment outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorization	Section 16.2
(1)(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment	Section 19.1
(1)(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorization	Section 27
(1)(p)	A description of any assumptions, uncertainties and gaps in the knowledge which relate to the assessment and mitigation measures provided.	Section 19.3
(1)(q)	A reasoned opinion as to whether the proposed activity should or should not be authorized and if the opinion is that it should be authorized, any conditions that should be made in respect of that authorisation	Section 20
(1)(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorization is required and the date on which the activity will be conducted, and the post construction monitoring requirements finalized.	Section 20.1
(1)(s)	An undertaking under oath or affirmation by the EAP in relation to:	Section 29.8
	(i) the correctness of the information provided in the reports	
	(ii) the inclusion of comments and inputs from stakeholders and I&APs	
	(iii) the inclusion of inputs and recommendations from the specialists reports where relevant and	
	(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties	

Appendix 3	Legislated requirements as per the NEMA GNR 982 in Appendix 3	Relevant Report Section
(1)(t)	Where applicable, details of any financial provisions for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts	Section 28
(1)(u)	An indication of any deviation from the approved Scoping Report, including the plan of study, including-	Section 22
	(i) and deviation from the methodology used in determining the significance of potential environmental impacts and risks, and	N/A
	(ii) a motivation for the deviation	N/A
(1)(v)	Any specific information that may be required by the competent authority; and	Section 23
(1)(w)	Any other matters required in terms of section (24)(4)(a) and (b) of the Act	N/A
(2)	Where a government notice gazette by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.	N/A

2 Contact Person and Correspondence Address

SRK Consulting (South Africa) (Pty) Ltd (SRK) have been appointed by KMR as the independent environmental assessment practitioner (EAP) to manage and facilitate the integrated EA and associated public participation process in accordance with NEMA, NEM:WA, NWA and MPRDA. The section below provide the details of the EAP, KMR contact person, specialist, provincial authorities, municipal and ward contacts.

2.1 Details of EAP who prepared the report

The details of the EAPs involved in the compilation of this draft scoping report are provided in Table 2-1.

Table 2-1: EAP contact details

EAP Name	Contact Number	Fax Number	Email Address
Darryll Kilian	011 441 1111 (x1297)	086 506 1737	dkilian@srk.co.za
Selma Nel	011 441 1111 (x1127)	083 999 4690	snel@srk.co.za
Michelle Miles	011 441 1111	083 602 4988	mmiles@srk.co.za

2.2 Expertise of the EAP

2.2.1 Qualifications of the EAP

The qualifications of the EAPs are provided in Table 2-2.

Table 2-2: EAP qualifications

EAP Name	Qualifications	Years' Experience
Darryll Kilian	MA (Environmental and Geographical Science)	27
Selma Nel	MA (Environmental Management)	14
Michelle Miles	B.Sc Hons (Environmental Water Management)	5

2.2.2 Summary of EAPs past experience

The EAPs' expertise is provided for in Table 2-3. Detailed curricula vitae (CVs) of the project team are provided in Appendix C.

Table 2-3: EAP expertise

EAP Name	Expertise
Darryll Kilian	Darryll Kilian has been involved in environmental management, development and research in Africa for over 27 years. His expertise includes: • Environmental and social impact assessment; • Due diligence reviews; • Project performance monitoring and review; • Environmental reporting; • Strategy and policy development; • Environmental and social research; and • Stakeholder facilitation and engagement.
Selma Nel	Selma Nel has been involved in the field of environmental management for the past 14 years. Her expertise includes: • project management and coordination of integrated environmental impact assessments, environmental management programmes;

EAP Name	Expertise
	• environmental impact assessments and basic assessments for mining and energy related projects in South Africa; • specialist team co-ordination and drafting Terms of Reference (ToR); • compliance audits in respect of environment, waste and water as well as international standards; • analysis of environmental and social impacts assessment (ESIA) and environmental and social management plan/programmes (ESMP) prepared by other consultancies (outside South Africa) for African projects to determine level of upgrading required to meet international standards; • compilation of technical environmental documents, programmes and reports; • conducting environmental control officer work environmental projects; • environmental pre-feasibility and feasibility assessment input; • site selection assessment input; • environmental compliance audits in terms of NEMA, MPRDA, NEM: WA and NWA; • stakeholder engagement; and • vendor due diligence
Michelle Miles	Michelle has 5 years' experience within the environmental science and management field. She has been involved in a various aspect of projects ranging from concept studies all the way through to environmental construction management. Her experience include: • Environmental authorisations; • Environmental baseline assessments; • Environmental design criteria as well as permitting strategies; • Construction environmental management plans; • Independent audit report for construction; • Legislative reviews of various countries; • Geographical information systems (GIS) analyses; • Waste management plans; • Water monitoring sampling and analysis; and • Environmental compliance auditing.

2.3 KMR details

The physical and postal address of KMR is provided in Table 2-4 and details of the responsible persons at KMR are presented in Table 2-5.

Table 2-4: Physical and postal address for KMR

Address	Details
Physical address:	Farm York A279, Hotazel, Northern Cape
Postal address:	Suite 201 D, 11 Crescent Drive, Melrose Arch, Melrose, 2196

Table 2-5: KMR responsible persons

Name	Designation
Eric Chung	President, Asia Minerals South Africa (Pty) Ltd
Siviwe Ntlonti	Mine Manager
Tshifhiwa Nemakhavhani	Safety, Health, Environment, Risk and Quality (SHERQ) Manager
Tshekedi Montshusi	Environmental Officer

2.4 Details of specialists

Specialists were appointed to undertake various specialist investigations. The studies investigated the baseline environment and the potential impact (including cumulative impacts) of each component of the proposed KMR Expansion Project in relation to the construction, operational, closure, decommissioning and rehabilitation phases. All specialists have developed appropriate and implementable mitigation measures to avoid, reduce and/or mitigate the potential impacts that have been identified in support of the development of the management program, with the appropriate measures being included in Section 27. The specialists also addressed (as far as practically possible) the comments and recommendations obtained through the stakeholder engagement process which has been undertaken to date. Table 2-6 outlines the specialist studies that have been undertaken for the proposed KMR Expansion Project.

An example of the specialist terms of reference is provided for in Appendix D. The specialists impact assessment methodology used to assess the potential impacts is described in Section 16.1

Table 2-6: Specialist studies undertaken for the proposed KMR Expansion Project

Specialist Study	Specialists	Qualifications/registrations
Closure and Lability Shangoni Management Services	Ms Emma Fourie	• BSc. (Hons) Environmental Management • LaRSSA
Socio-Economic SRK Consulting (Pty) Ltd	Ms Vassie Maharaj	• BSc, Biochemistry and Physiology • International Association of Public Participation • International Association of Impact Assessment SA • Institute of Directors of Southern Africa
	Mr Anton Hough	• MA, Sociology, University of Stellenbosch, 2011
	Ms Karabo Maruapula	• MSc, Environmental Management, University of Johannesburg, 2020 • IAIA
Noise and Vibration Acusolv	Mr Ben van Zyl	• MSc (Eng) PhD • FSAAI
Blasting and Vibration Blast Management and Consulting (Pty) Ltd	Mr JD Zeeman	To be provided on request.
Surface water SRK Consulting (Pty) Ltd	Mr Peter Shepherd	• BSc (Hons), Hydrology, University of Natal, 1990 • Pr Sci Nat (South Africa), 400104/95
	Ms Natasha Ramdass	• MBA, University of KwaZulu Natal, 2019 • Pr Eng, ECSA, 202001465 • PMP, PMI, 2648066 • Member, SAICE, 201500843
	Mr Mehmetcan Ozkadioglu	• MSc, Hydrogeological Engineering, Hacettepe • University, Ankara, Turkey, 2018 • Cand.Sci.Nat., SACNASP, Water Resource Science, 120662/19
Air Quality AirShed	Mr Nick Grobler	• BEng (Hons): (Environmental Engineering) 2010, (with Distinction) University of Pretoria.
	Ms Hanlie Liebenberg-Enslin	• MSc

Specialist Study	Specialists	Qualifications/registrations
Heritage and Palaeontology PGS Heritage	Mr Polke Birkholtz	• BA Hons (Archaeology) (cum laude)
	Ms Cherene de Bruyn	• MA in Archaeology 2016/2017. University College London, United Kingdom
Traffic Siyazi Consulting Services (Pty) Ltd	Mr Paul Chris van der Westhuizen	• Civil Engineering Diploma (Unisa)
	Mr Leon Roets	• B Eng. (Civil Eng) University of Pretoria,1988 • Engineering Council of South Africa (ECSA)
Freshwater Scientific Aquatic Services	Mr Stephen van Staden	• MSc Environmental Management • SACNASP, SASSO, LARSA and IAIA
	Ms Christel du Preez	• MSc Environmental Sciences • SACNASP
	Ms Amanda Mileson	• Advanced Diploma: Nature Conservation • South African Wetland Society, the International Society of Wetland Scientists and the Gauteng and Northern Cape Wetland Forums
Terrestrial Biodiversity Scientific Terrestrial Services	Ms Nelanie Cloete	• MSc Botany and Biotechnology • SACNASP
	Ms Christien Steyn	• MSc • SACNASP
	Mr Christopher Hooton	• Btech Nature Conservation
Soils, Land use and Land Capability Zimpande Research Collaborative	Mr Stephen van Staden	• MSc Environmental Management • SACNASP, SASSO, LARSA and IAIA
	Mr Braveman Mzila	• BSc Hons Environmental Hydrology
	Mr Tshiamo Setsipane	• MSc Soil Science • SACNASP

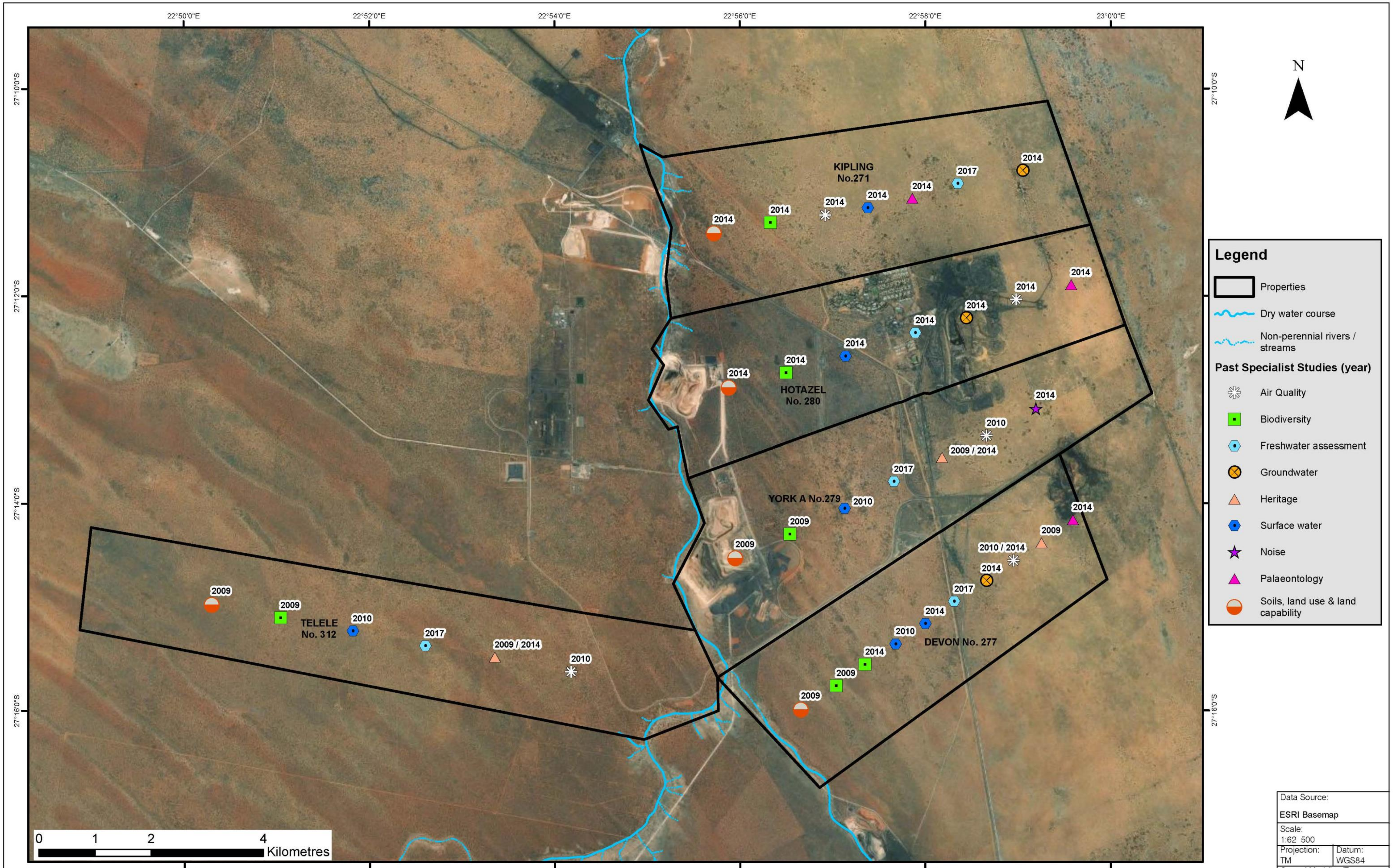
It is important to note that the areas investigated in previous KMR specialist studies have been highlighted in Figure 2-1 to show the geographic spread of these investigations and highlight where the gaps are located. Previous specialist studies and the year they were conducted in are summarised in Table 2-7. This table distinguishes the specialist studies that were conducted more than five years ago from studies that were conducted less than five years ago.

Table 2-7: Summary of specialist studies conducted on KMR farm properties

	Devon 277	Telele 312	Kipling 271	Hotazel 280	York A 279
Heritage Impact Assessment (2009)					
Heritage Impact Assessment (2014)					
Palaeontological Assessment (2014)					
Soils, land use and land capability (2009)					

	Devon 277	Telele 312	Kipling 271	Hotazel 280	York A 279
Soils, land use and land capability (2014)					
Biodiversity Assessment (2009)					
Biodiversity Assessment (2014)					
Hydrological Assessment (2010)					
Surface water study (2014)					
Noise Impact Assessment (2014)					
Air Quality Assessment (2010)					
Air Quality Assessment (2014)					
Groundwater Assessment (2014)					
Freshwater Assessment (2017)					

Key	Study conducted older than 5 years	Study conducted less than 5 years	No study conducted



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Projection: TM	Datum: WGS84
Central Meridian/Zone: 23	
Date: 12/05/2021	Compiled by: LOUA
Project No: 571395	Fig No:
Revision:	Date:

srk consulting

KUDUMANE IEA

PAST SPECIALIST STUDIES

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2.5 Provincial authorities' details

The environmental authorisation for the proposed KMR Expansion Project is required through the DMRE whose details are provided in Table 2-8.

Table 2-8: Competent authority details

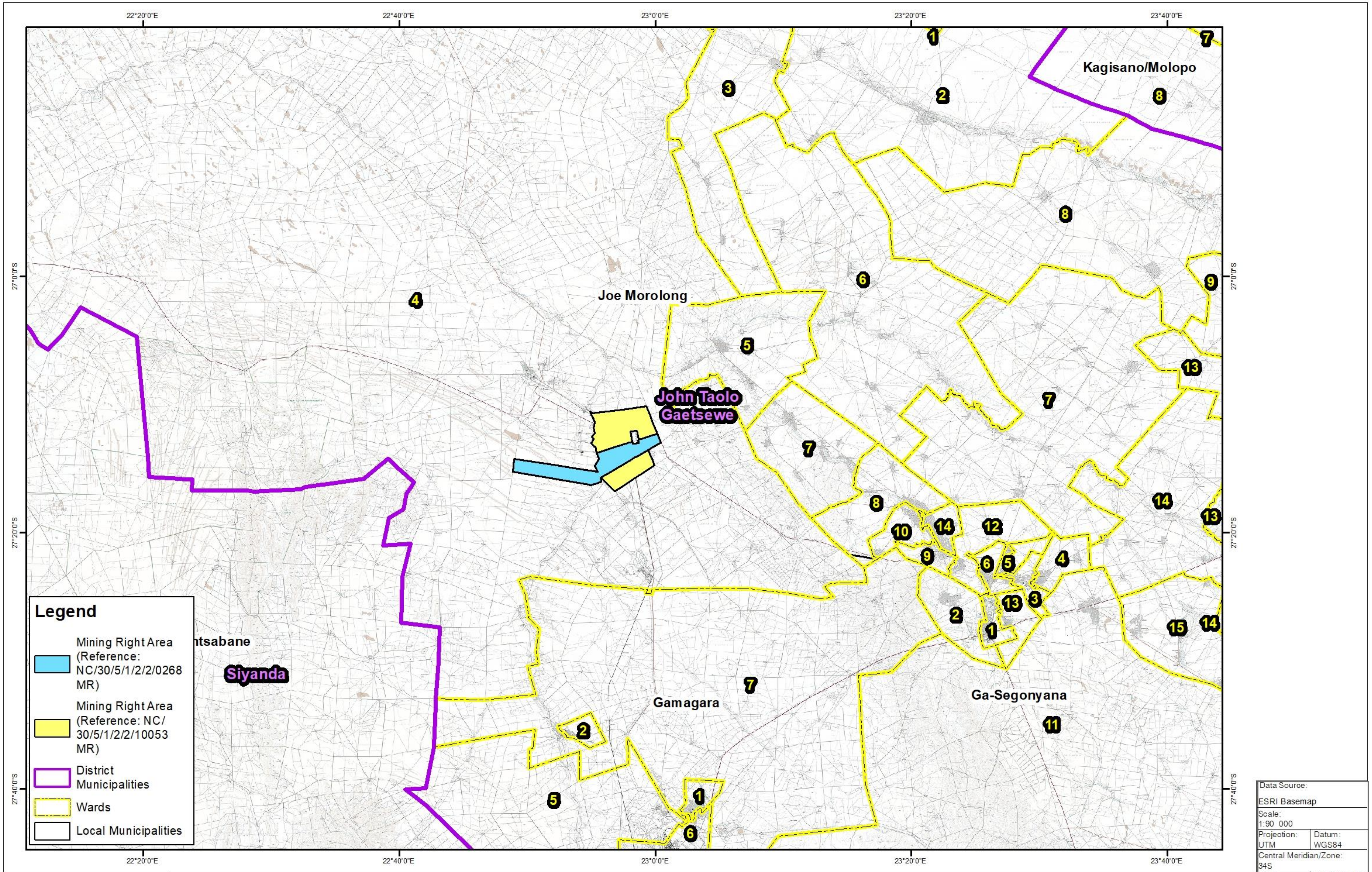
Department	Contact Person
DMRE (Kimberley)	Johannes Nematatani

2.6 Municipality and ward details

KMR is situated within the Joe Morolong Local Municipality, which is part of the John Taolo Gaetsewe District Municipality within the Northern Cape. Details of the relevant municipalities and wards are provided in Table 2-9 and shown in Figure 2-2

Table 2-9: Local and district municipality details

Municipality	Contact Person	Designation
John Taolo Gaetsewe District Municipality	Ms Molemoeng Bokgwathile	Municipal Manager
Joe Morolong Local Municipality	Mr Thapelo Tlhaoele	Municipal Manager
Joe Morolong Local Municipality	TBC	Ward Councillor (Ward 4)
Joe Morolong Local Municipality	Mr Kemothibile Phiri	Director: Planning and Development



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ESRI Basemap	
Scale: 1:90 000	
Projection: UTM	Datum: WGS84
Central Meridian/Zone: 34S	
Date: 21/09/2021	Compiled by: SCHB
Project No: 574378	Fig No: 1-1

srk consulting

KUDUMANE MANGANESE RESOURCES

MUNICIPALITY AND WARD MAP

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Revision: A Date: 04 2021

3 Description of Property

This section provides a description of the properties comprising the KMR operation for mining right NC/ 30/5/1/2/2/10053 as well as adjoining properties.

The information relating to properties, ownership, and mining and surface rights associated with the KMR mining right areas is summarised in Table 3-1. The infrastructure and activities associated with the proposed KMR Expansion Project will take place on the following farms and associated farm portions:

- Farm Devon 277;
- Farm Hotazel 280; and
- Farm Kipling 271.

Table 3-1: Properties associated with KMR's Mining Rights and proposed Expansion Project areas

Farm Name	Farm Portions	SG Code	Title Deed	Owner	Area (ha)
Devon 277	Portion RE/277	C04100000000027700000	T3044/2012	Kudumane Manganese Resources Pty Ltd	1656.9938
Hotazel 280	Portion 2/280	C04100000000028000002	T1414/1991	TELKOM S A LTD	1 938.82
	Portion 0/280	C04100000000028000000	T3049/2010	HOTAZEL MANGANESE MINES PTY LTD	1342.4025
Kipling 271	Portion RE/271	C04100000000027100000	T953/1968	ASSMANG LTD	1 899.96

3.1 Adjacent properties associated with KMR

The proposed KMR Expansion Project borders the following properties:

- Umtu 281;
- Olive Pan 282;
- Gama 283;
- Gloria 266;
- East 270; and
- Botha 313,

The property which will be affected by the proposed KMR Expansion Project is Umtu as the Hotazel opencast pit will extent into this property (Figure 1-2). An agreement has been entered into between the affected landowners and KMR.

3.2 Details of the closest towns to KMR

Table 3-2 includes the distance of the mine to the closest major towns in the area as measured from the KMR York Office.

Table 3-2: Project area in relation to adjacent towns

Major town	Approximate Distance and Direction to major towns in relation to the project
Hotazel	4km in a north easterly direction
Black Rock	15km in a north westerly direction
Kathu	52km in a south-easterly direction

3.3 Details of the affected surface areas of KMR

Table 3-3 provides a summary of the properties that have been and are likely to be affected by the current and proposed infrastructure and activities associated with the KMR operations, i.e. Devon 277, Hotazel 280 and Kipling 271. The location of infrastructure related to the proposed KMR Expansion Project is provided in Figure 3-1 to Figure 3-3 respectively.

For ease of reference, the activities associated with the proposed KMR Expansion Project are highlighted in grey while existing authorised activities and infrastructure remain un-highlighted.

Table 3-3: Properties on which existing and proposed KMR mining related activities and infrastructure occur

Farm name: **Devon 277** Portion: **Portion RE/277** Surface rights owner: **Kudumane Manganese Resources Pty Ltd** Title deeds: **T3044/2012** SG code (21-digit code): **C04100000000027700000**	
EMPr/EMP Reference	**Mining Related Infrastructure**
Second EMPr (NC/EIA/OS/JTG/HOT/KUD/2013) approved on the 15 October 2015	• Re-mining of historic open pits as well as the associated haul roads • Water Management infrastructure • Soil and overburden stockpiles (WRDs) • Access and internal roads • Tailings storage facility
KMR Expansion Project 2021	• Rehabilitation activities at the pit • Establishment of monitoring boreholes
Farm name: **Hotazel 280** Portion: **Portion 0/280** Surface rights owner: **Kudumane Manganese Resources Pty Ltd** Title deeds: **T3049/2010** SG code (21-digit code): **C04100000000028000000**	
EMPr/EMP Reference	Mining Related Infrastructure
Second EMPr (NC/EIA/OS/JTG/HOT/KUD/2013) approved on the 15 October 2015	• Re-mining of historic open pits as well as the associated haul roads • Water Management infrastructure • Soil and overburden stockpiles (WRDs) • Access and internal roads • Tailings storage facility
KMR Expansion Project 2021	• Expansion of the Hotazel Pit • Run of Mine (RoM) Stockpile • Waste Rock Dump North, South and East • Attenuation dam within the Ga-Mogara River to allow for the expansion of the Hotazel Pit • Potable water tank • Sewage Treatment Plant Lilliput style • Rehabilitation of road due to construction of New Waste Rock Dump • Relocation of Admin offices and security building.
Farm name: **Kipling 271** Portion: **Portion RE/271** Surface rights owner: **ASSMANG LTD** Title deeds: **T953/1968** SG code (21-digit code): **C04100000000027100000**	
EMPr/EMP Reference	**Mining Related Infrastructure**

Second EMPr (NC/EIA/OS/JTG/HOT/KUD/2013) approved on the 15 October 2015	Kipling was included as part of the project description as was included as part of the existing mining right, however, Kipling was not included as part of the impact assessment thus no mining related infrastructure was included in the EMPr approved in 2015.
KMR Expansion Project 2021	• Opencast Pits • Waste rock dump • RoM Stockpiles • Haul road (approx. 1.2km) • Sewerage Treatment Facility • Potable water tank • Potable water pipeline from York to Hotazel to Kipling • Admin Offices • Diesel bay and fuel storage • Temporary waste storage • Crushing facility • Pollution control dam • Ancillary infrastructure (e.g. Weighbridge) • Construction and upgrading of access gravel road to Kipling offices • Diversion of a 1.2km section of the tarred provincial road (R380) • Bridge associated with diversion of road over the river • Powerlines and associated infrastructure

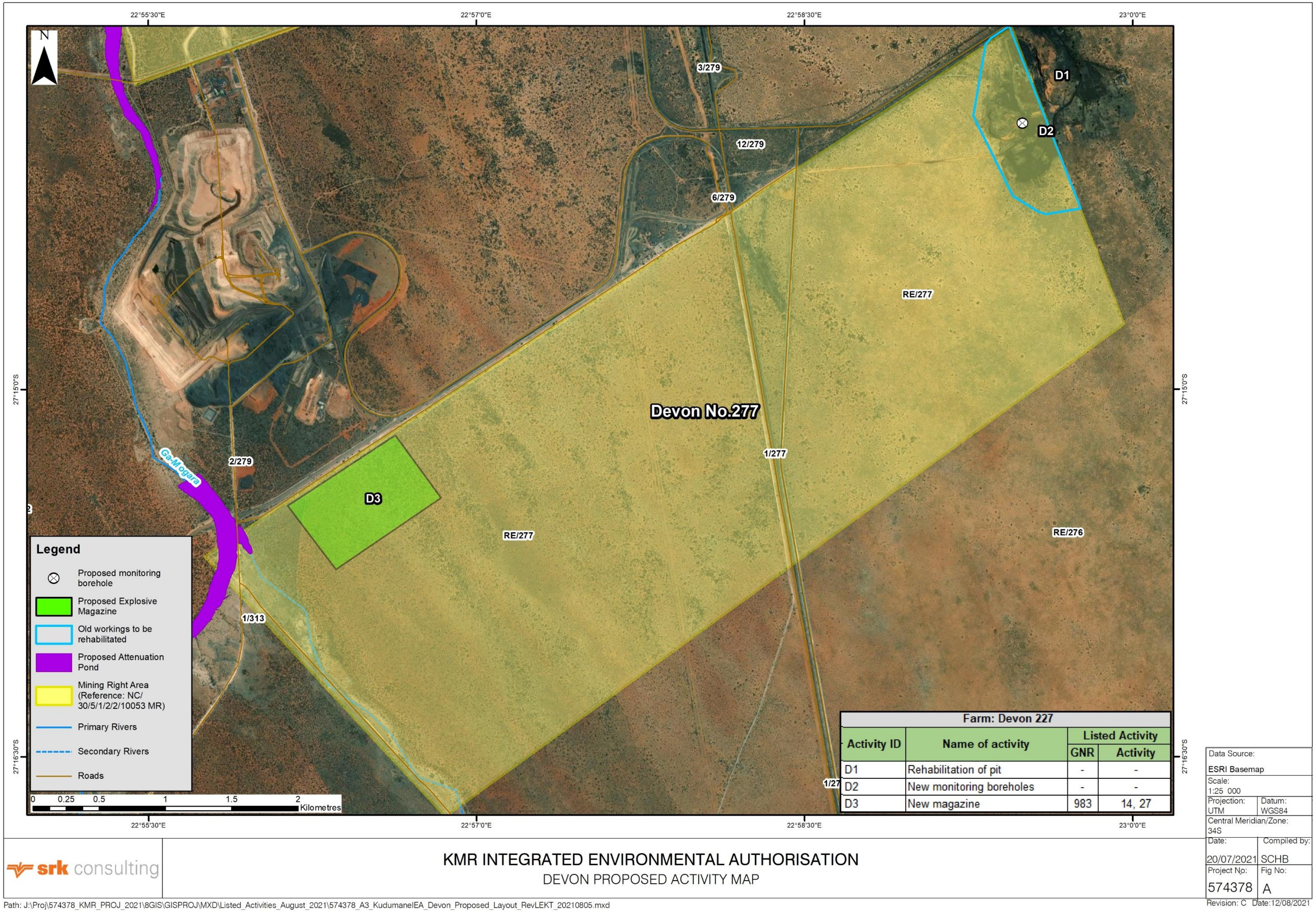

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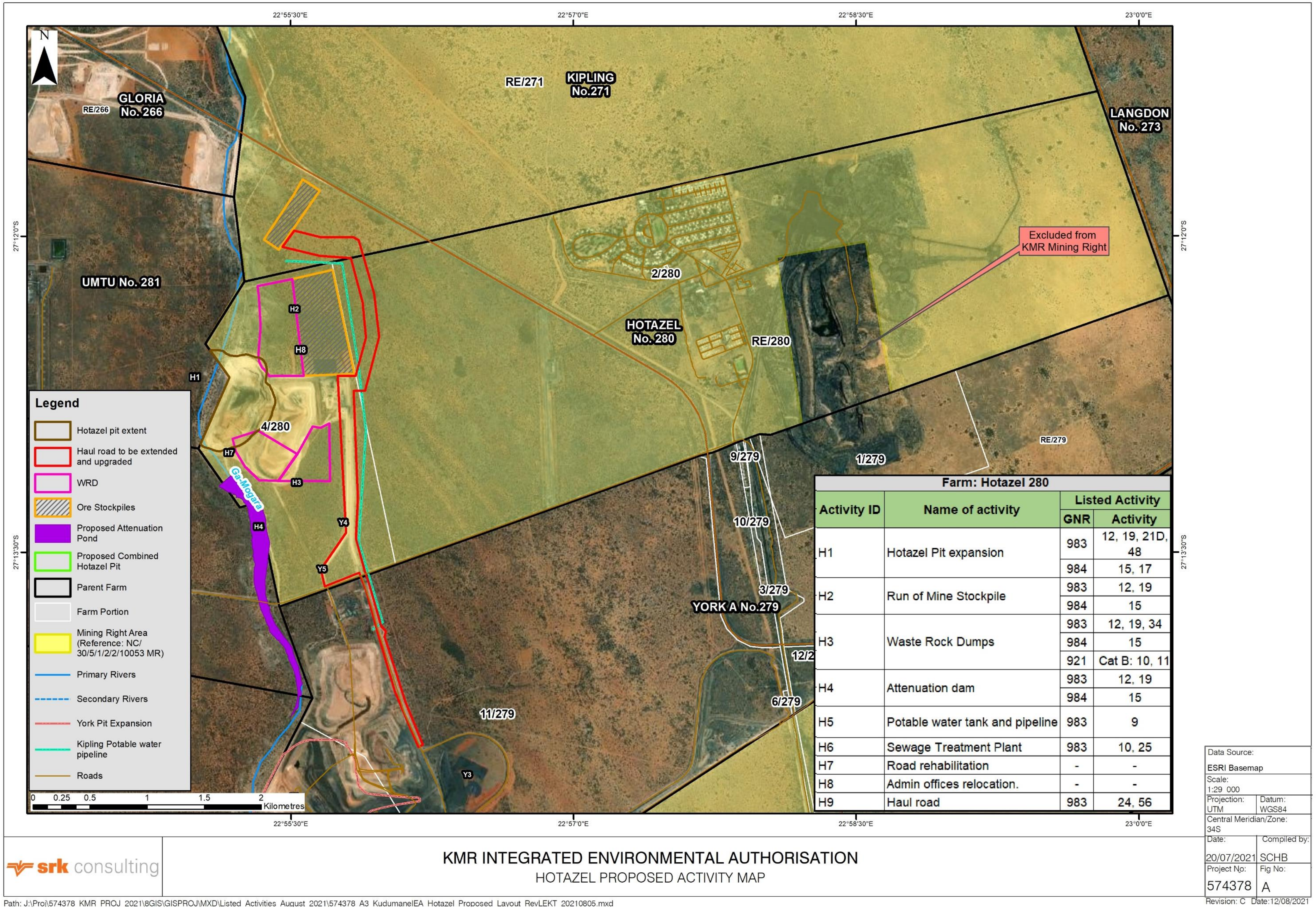
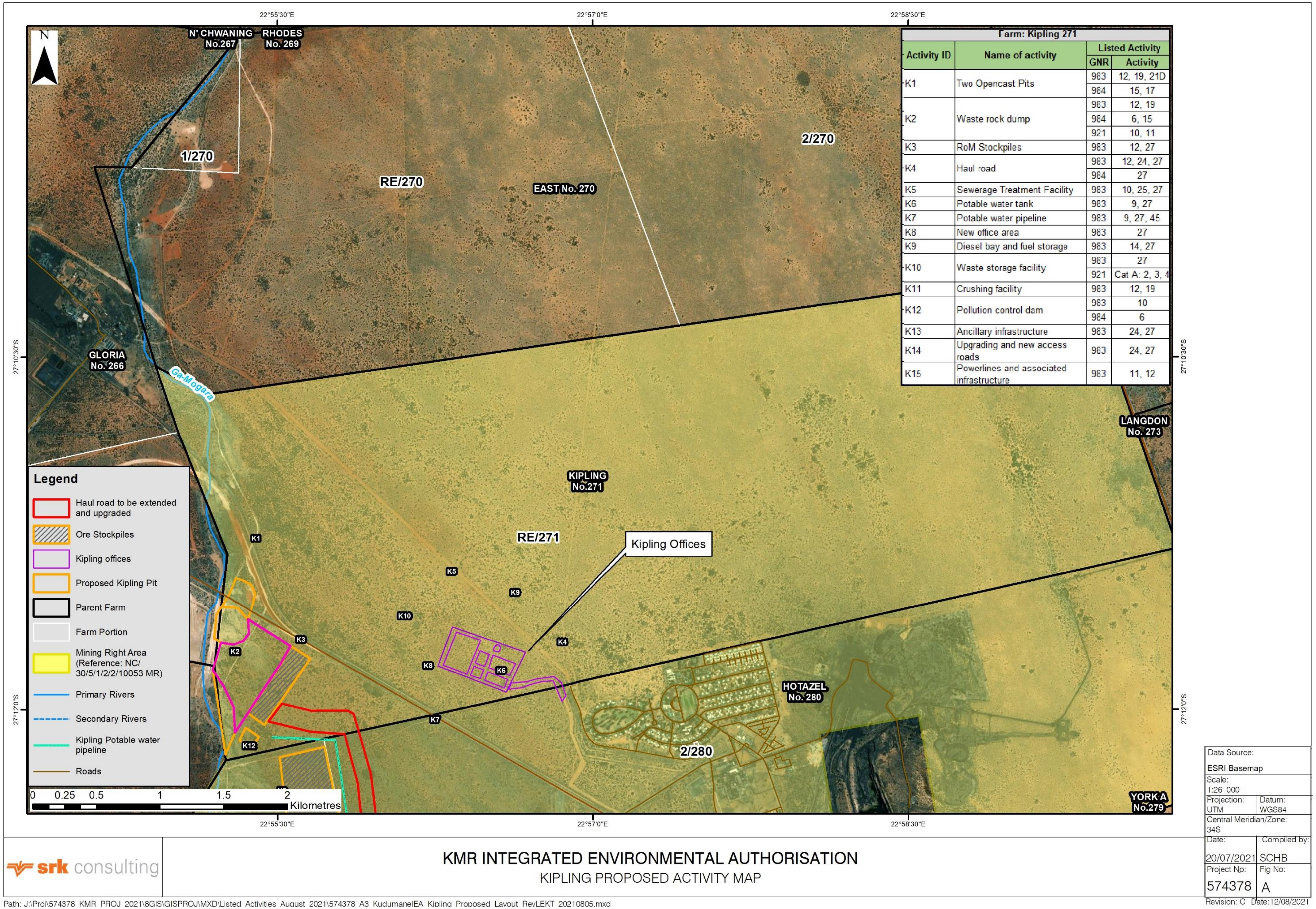
Figure 3-1: Proposed infrastructure and activities on the farm Devon 277



Farm: Hotazel 280

Activity ID	Name of activity	Listed Activity	
		GNR	Activity
H1	Hotazel Pit expansion	983	12, 19, 21D, 48
		984	15, 17
H2	Run of Mine Stockpile	983	12, 19
		984	15
H3	Waste Rock Dumps	983	12, 19, 34
		984	15
		921	Cat B: 10, 11
H4	Attenuation dam	983	12, 19
		984	15
H5	Potable water tank and pipeline	983	9
H6	Sewage Treatment Plant	983	10, 25
H7	Road rehabilitation	-	-
H8	Admin offices relocation.	-	-
H9	Haul road	983	24, 56

Figure 3-2: Proposed infrastructure and activities on the farm Hotazel 280



Farm: Kipling 271			
Activity ID	Name of activity	Listed Activity	
		GNR	Activity
K1	Two Opencast Pits	983	12, 19, 21D
		984	15, 17
K2	Waste rock dump	983	12, 19
		984	6, 15
		921	10, 11
K3	RoM Stockpiles	983	12, 27
K4	Haul road	983	12, 24, 27
		984	27
K5	Sewerage Treatment Facility	983	10, 25, 27
K6	Potable water tank	983	9, 27
K7	Potable water pipeline	983	9, 27, 45
K8	New office area	983	27
K9	Diesel bay and fuel storage	983	14, 27
K10	Waste storage facility	983	27
		921	Cat A: 2, 3, 4
K11	Crushing facility	983	12, 19
K12	Pollution control dam	983	10
		984	6
K13	Ancillary infrastructure	983	24, 27
K14	Upgrading and new access roads	983	24, 27
K15	Powerlines and associated infrastructure	983	11, 12

Figure 3-3: Proposed infrastructure and activities on the farm Kipling 271

4 Background and Overview of KMR

4.1 KMR background

KMR mines manganese at two opencast mine operations, namely the York and Hotazel mines. KMR has future plans for underground mining on the farm Telele 312, which has already been authorised as indicated in Table 4-1, but not yet commenced. The manganese ore mined at these mining operations is crushed, screened and stockpiled on site. The ore is then loaded and transported via rail to Durban and Gqeberha ports where it is exported.

KMR is currently operating under two mining rights, two EMPrs, a WUL and amended WUL, as summarised in Table 4-1.

Table 4-2 lists the NEMA Listed Activities previously authorised for KMR in terms of previously applicable EIA Regulations of 2006 and 2010, respectively.

Table 4-1: Summary of existing authorisations

Applicable legislation	Authorisation

National Environmental Management Act (Act No. 107 of 1998) (NEMA)	• Metago EMPr (KC/KGA/JTG/HOT-KUR/16/2010) approved on the 07 June 2011
	  ○ Initial Metago EMPr included the Mining Right for York (opencast) and Telele (underground) and approved infrastructure for York
	• The SLR EMPr(NC/EIA/OS/JTG/HOT/KUD/2013) approved on the 15 October 2015
	  ○ The SLR EMPr is the second environmental authorisation process which added Devon, Hotazel and Kipling with additional infrastructure to the York /Telele operation and additional activities to the new Mining Right areas (Devon, Hotazel and Kipling).

Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA)	• Mining Right NC/30/5/1/2/2/0268 for farms York and Telele; and • Mining Right NC/ 30/5/1/2/2/10053 for farms Devon, Hotazel and Kipling
National Water Act (Act No. 36 of 1998) (NWA)	• WUL No. 07/D41K/ABCFGIJ/4533 issued on 29th May 2016; and • Amended WUL (Issued under the same WUL No.) issued on 23 July 2018.

Table 4-2: Listed activities authorised in terms of KMR's current operations

2010 EMPr (approved in 2011)	2014 EMPr (approved in 2015)

Listing Notice 1 (GNR 386 of 2006), **Activities**:
• **1(b)** → The above ground storage of 1000 tons or more, but less than 100 000 tons of ore;
• **1(k)** →The bulk transportation of sewage and water, including storm water, in pipelines-
  (i) With an internal diameter of 0.36m or more; or
  (ii) A peak throughput of 120 litre per second or more;
• **1(l)** → The transmission and distribution of electricity above the ground with a capacity of more than 33kV and less than 120kV;
• **7** → The above ground storage of a dangerous good in containers with a combined capacity of more than 30m^3 but less than 1000 m^3 at any one location on site;
	Listing Notice 1 (GNR 544 of 2010), **Activities**:
	• **1(i)** → The construction of facilities or infrastructure for the generation of electricity where: (i) the electricity output is more than 20MW;
	• **9(i)(ii)** → The construction of facilities or infrastructure exceeding 1000m in length for the bulk transportation of water, sewage or storm water-
	  (i) With an internal diameter of 0.36m or more; or
	  (ii) A peak throughput of 120 litre per second or more;
	• **10(i)** → The construction of facilities or infrastructure for the transmission and distribution of electricity, (i) outside urban areas or industrial

2010 EMPr (approved in 2011)	2014 EMPr (approved in 2015)
• **13** → The abstraction of groundwater at a volume where, any general authorisation issued in terms of NWA, will be exceeded; • **14** → The construction of a mast of any material or type and of any height, excluding – (a) Mast of 15m or lower, exclusively used (i) By radio amateurs; or (ii) For lighting purposes (b) Flag poles; and (c) Lighting conductor poles; • **15** → The construction of a road that is wider than 4m or that has a reserve wider than 6m excluding access roads of less than 30m.	complexes with a capacity of more than 33 but less than 275kV; • **11(iii)** → The construction of (iii) bridges; where such construction occurs within a watercourse or within 32m of a watercourse, measured from the edge of a watercourse; • **12** → The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000m3 or more, unless such storage falls within the ambit of Activity 19 of Listing Notice 2; • **13** → The construction of facilities or infrastructure for the storage , or for the storge and handling, of dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500m3; • **22(i)(ii)** → The construction of a road, outside urban areas, (i) With a reserve wider than 13.5m; or (ii) Where no reserve exists where the road is wider than 8m; and • 26 → Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, Act 10 of 2004.
Listing Notice 2 (GNR 387 of 2006), **Activities**: **1(c)** → The above ground storage of a dangerous good in containers with a combined capacity of 1000m^3 or more at any one location on site; **1(h)** → The manufacturing, storage or testing of explosives, including ammunition, but excluding licensed retail outlets and the legal end use of such explosives; **1(l)** → The transmission and distribution of electricity above the ground with a capacity of 120kV or more; **1(s)** → Rail transportation, excluding railway lines and sidings in industrial areas and underground railway lines in mines, but including- (i) Railway lines; (ii) Stations; or (iii) Shunting yard; **2** → Any development activity, including associated structures and infrastructure, where the total area of the developed area, is or intended to be 20 ha or more; **3** → The construction of a filling station, including associated structures and infrastructure, or any other facility for the underground storage of dangerous good; **7** → Reconnaissance, exploration, production and mining as provided for the MPRDA as amended in respect of such permits and rights; **8** → In relation to permits and rights granted in terms of Activity 7 (Listing Notice 2) or any other right granted in terms of the previous mineral legislation, the undertaking of reconnaissance, exploration, production or mining activity or operation within an exploration or mining area, as defined in the MRPDA.	Listing Notice 2 (GNR 545 of 2010), **Activities**: **5** → The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Listing Notice 1 or included in the list of waste management activities published in terms of section 19 of NEM:WA in which case that Act will apply; **15** → Physical alteration or undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 ha or more; 20 → Any activity which requires a mining right or renewal thereof as contemplated in sections 22 and 24 respectively of the MPRDA; 22 → Any activity which requires a production right or renewal thereof as contemplated in sections 83 and 85 respectively of the MPRDA; 26 → Commencing of an activity, which requires an atmospheric emission license in terms of section 21 of the National Environmental Management: Air Quality Act, Act 39 of 2004). Listing Notice 3 (GNR 546 of 2010), **Activities**: **2a(iii),bb** → The construction of reservoirs for bulk water supply with a capacity of more than 250 m^3; **3(a)(ii)** → The construction of masts or towers of any material or type used for telecommunication, broadcasting or radio transmission purposes where the mast (a) is to be placed on a site not previously used for this purpose; **4a(ii) cc** → The construction of a road wider than 4m with a reserve less than 13.5m; **9a(ii)** → The construction of above ground cableways and funiculars;

2010 EMPr (approved in 2011)	2014 EMPr (approved in 2015)
	10a(ii)(cc) → The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good with combined storage is 30 but not exceeding 80m^3; **14a(i)** → The clearance of an area of 5ha or more of vegetation where 75% or more of the vegetation cover constitute indigenous vegetation; **16(iii)and (iv) - a(ii)dd** → The construction of (iii) buildings with a footprint exceeding 10m^2 in size; or (iv) infrastructure covering 10m^3 or more where such construction occurs within a watercourse or within 32m of a watercourse, measured from the edge of the watercourse.

4.2 Overview of existing activities and infrastructure at KMR

Table 4-3 provides an overview of the current mining and process operations including the mine residue facilities and ore stockpiles at KMR. Table 4-4 provides a summary of the water uses and water management infrastructure associated with the KMR operations.

Table 4-3: Overview of the KMR operations and water and waste management systems

Aspect	Description
Mining operations	
Target mineral	Manganese
Ore body	Kalahari Manganese Field
Products	Ore is crushed and screened on site where it is transported via rail to Durban and Gqeberha for export
Life of mine	The current Life of Mine (LoM) is estimated to by 22 years (end 2043). During the EIA phase the number of months/years the LoM will be extended by will be calculated and provided to all stakeholders.

Mining methods	• Open cast mining in two opencast pits, namely
	  ○ Hotazel
	  ○ York
	• An open pit was assessed and approved in 2015 on the farm Devon 277 (mining of a historic pit), however, it was found to be unviable and the pit is to be rehabilitated
	• Underground mining has been assessed and approved in 2015 in respect of the farm Telele 312. However, no mining has commenced to date on this property.

Waste and residue disposal	
Waste Rock Dumps	• Hotazel waste rock dump which is situated adjacent to the Hotazel opencast pit. • York Waste rock dump • Devon waste rock dump (approved but not constructed)
Ore Stockpiles	• York RoM and ore stockpile
Sewage treatment plants	• York Lilliput Sewerage treatment plant
Domestic, general and hazardous waste disposal	• York temporary waste storage and handling area • York waste management complex
Pollution control dams	• York Pollution control dam
Crushing and Screening	• York crushing and screening plant of high grade manganese ore
Other mine infrastructure	

Aspect	Description
Water management infrastructure	• York water infrastructure – pipeline and storage tanks • Hotazel water infrastructure – pipeline and storage tanks
Roads	• York access roads • Hotazel access road • Haul road between York and Hotazel
Rail loop	• Rail infrastructure to connect the mine to the existing Transnet network East of KMR properties • Rail loop including stack reclaimers and silo to load the ore

Table 4-4: Water management infrastructure and associated authorised water uses at KMR

Property	Water Use	Water use activities	Purpose
Portion 0 of farm Hotazel 280	Section 21 (a) - Abstraction of groundwater	Dewatering borehole curtain • Borehole HDW01 • Borehole HDW02 • Borehole HDW03 • Borehole HDW04 • Borehole HDW05 • Borehole HDW06 • Borehole HDW07 • Borehole HDW08	Water to be used in mining processes and dust suppression
		Taking of water from Hotazel open pit (dewatering)	
	Section 21 (j) - Removing water found underground	• Borehole HDW01 • Borehole HDW02 • Borehole HDW03 • Borehole HDW04 • Borehole HDW05 • Borehole HDW06 • Borehole HDW07 • Borehole HDW08	Safe continuation of mining
		Dewatering of Hotazel open pit	
	Section 21 (b) – Storage of water	Storage of water from Sedibeng Water Board in water storage tank	Storage of potable water in a tank
	Section 21 (c) and (i) - Impeding or diverting the flow of water in a water course & Altering the bed, banks, course or characteristics of watercourse	Flood defence berm to be located within 1:100 year floodline of the Ga-Mogara drainage channel	Clean storm-water diversion berm to prevent ingress of stormwater into pit during a 1:100 yr storm event
		Encroachment of the Hotazel Pit into the 100m regulated zone of Ga-Mogara River	To allow mining of Manganese
	Section 21 (g) - Disposing of water containing waste	Storage of waste rock material in waste rock dump	Waste rock disposal
		Use of waste rock material to backfill Hotazel open pit	Rehabilitation of Hotazel open pit
		Dust suppression using excess mine water (dewatering water) along haul road at Hotazel	Suppressing dust (site wide)
		Storing RoM ore from Hotazel into stockpiles	Run of mine ore storage before processing
		Storing Water collected during dewatering of the pit and from dewatering boreholes in a steel tank	Storage of water to be used for dust suppression
Portion 2 and 11 of farm York A279	Section 21 (a) - Abstraction of groundwater	Taking water from the York open pit (dewatering) for re-use in the process	Water to be used in mining processes and dust suppression
		Taking of water from borehole YGWO1	Re-use in the processing, for

Property	Water Use	Water use activities	Purpose
			domestic use and for dust suppression
		Taking of water from borehole BH2	Re-use in the processing, for domestic use and for dust suppression
	Section 21 (j) - Removing water found underground	Dewatering of water from the York Pit	Safe continuation of mining
	Section 21 (c) and (i) - Impeding or diverting the flow of water in a water course & Altering the bed, banks, course or characteristics of watercourse	Flood defence berm to be located within 1:100 year floodline of the Ga-Mogara drainage channel	Clean storm-water diversion berm to prevent ingress of stormwater into pit during a 1:100 yr storm event
		Encroachment of the York Pit into the 100m regulated zone of Ga-Mogara River	To allow mining of manganese
	Section 21 (g) - Disposing of water containing waste	Storage of Low Grade ore into Low Grade Ore Stockpile (LGOS)	Grading of ore
		Use of dirty water for dust suppression (site wide)	Suppressing dust (site wide)
		Disposal of waste rock material into opencast pit (backfilling)	Rehabilitation of York open pit
		Disposal of waste rock onto Waste Rock Dump at York	Waste rock disposal
		Disposal of dirty storm water runoff to Rail Loop Pollution Control Dam	Stormwater/ Pollution Management
		Disposal of dirty storm water to South West Pit Pollution Control Dam	Stormwater/ Pollution Management
		Silt trap capturing suspended solids from storm water runoff into Rail Loop Pollution Control Dam	Stormwater/ Pollution Management
		Silt trap capturing suspended solids from storm water runoff into South West Pit Pollution Control Dam	Stormwater/ Pollution Management
		Dust suppression using treated sewage effluent	Suppressing dust (site wide)
Portion 11 of farm York A279	Section 21 (a) - Abstraction of groundwater	Taking water from game farm borehole	For watering game
	Section 21 (b) – Storage of water	Storage of water from Sedibeng Water Board in water storage tank 2	Storage of potable water in a tank
	Section 21 (c) and (i) - Impeding or diverting the flow of water in a water course & Altering the bed, banks, course or characteristics of watercourse	Destruction of second unnamed tributary of Ga-Mogara for the progression of York Pit	To allow mining of manganese
Portion 2 of farm York A279	Section 21 (b) – Storage of water	Storage of water from Sedibeng Water Board in water storage tank 1	Storage of potable water in a tank
	Section 21 (c) and (i) - Impeding or diverting the flow of water in a water course & Altering the bed,	Destruction of first unnamed tributary of Ga-Mogara for the progression of York Pit	To allow mining of manganese

Property	Water Use	Water use activities	Purpose
	banks, course or characteristics of watercourse		
	Section 21 (f) – Discharge of water	Discharging of dewatered pit water into the Ga-Mogara	Emergency purpose (Should there be surplus water in the pit which cannot be used as process water)

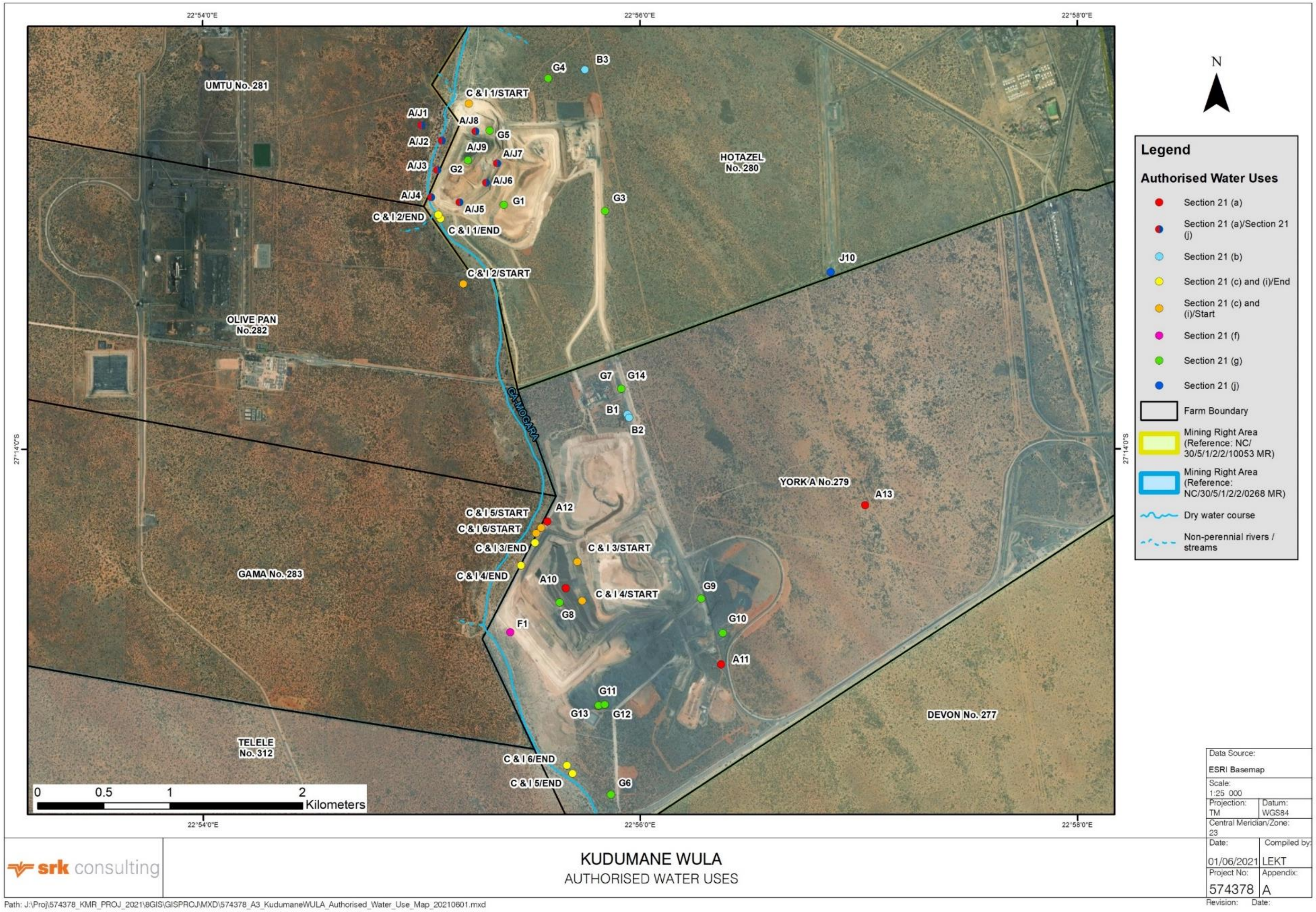


Figure 4-1: Water management infrastructure and associated authorised water uses at KMR

5 Policy and Legislative Context

This section provides an overview of the policy and legislative context within which the proposed KMR Expansion Project will operate. It identifies 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, which may be applicable or have relevance to the proposed KMR Expansion Project.

5.1 The Constitution of South Africa, 1996 (Act No. 108 of 1996)

The Bill of Rights is the cornerstone of democracy in South Africa, ensuring the rights of all people and affirming the democratic values of human dignity, equality and freedom. Section 24 is directly relevant to environmental law and states that everyone has the right to:

"An environment that is not harmful to their health or well-being; and have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: Prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".

The Constitution of South Africa is the overarching framework legalisation driving the NEMA principles and therefore EIA process. The right to a safe environment and the right to information are addressed in the EIA process through stakeholder engagement, where available information pertaining to the environment and proposed activities are disclosed.

5.2 Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)

The MPRDA makes provision for equitable access to and sustainable development of South Africa's mineral resources. The MPRDA requires that the environmental management principles set out in NEMA shall apply to all mining operations and serves as a guideline for the interpretation, administration and implementation of the environmental requirements of NEMA.

The MPRDA requires that a reconnaissance permission, prospecting right, Mining Right, mining permit, retention permit, technical corporation permit, reconnaissance permit, exploration right, production right, prospecting work programme; exploration work programme, production work programme, mining work programme, environmental management programme, or an environmental authorization issued in terms of the National Environmental Management Act, 1998, as the case may be, may not be amended or varied (including by extension of the area covered by it or by the addition of minerals or a share or shares or seams, mineralized bodies, or strata, which are not at the time the subject thereof) without the written consent of the Minister.

5.3 National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)

Listed Activities are activities identified in terms of Section 24 of the NEMA, which are likely to have a detrimental impact on the environment, and which may not commence without Environmental Authorisation (EA) from the Competent Authority (CA). EA required for Listed Activities is subject to the completion of either a Basic Assessment (BA) process or full Scoping and Environmental Impact Assessment (S&EIA) with applicable timeframes associated with each process. The EA must be obtained prior to the commencement of those listed activities.

5.4 National Water Act, 1998 (Act No. 36 of 1998) (NWA)

Provides for the protection of the quality of water and water resources in South Africa, for the establishment of Water Management Areas to be managed by Catchment Management Agency's (CMAs) and describes the actions that can be taken by the CMAs to enforce the requirements of the NWA.

Section 19 of the NWA sets out the principles for "an owner of land, a person in control of land or a person who occupies or uses land" to:

- Cease, modify or control any act or process causing pollution;
- Comply with any prescribed waste standard or management practice;
- Contain or prevent the movement of pollutants;
- Eliminate any source of pollution;
- Remedy the effects of the pollution; and
- Remedy the effects of any disturbance to the bed and banks of a watercourse.

In terms of Section 21 of the NWA there are eleven water uses that may require authorisation including:

- (a) taking of water from a water resource;
- (b) storing of water;
- (c) impeding or diverting the flow of water in a water course;
- (d) engaging in a stream flow reduction activity;
- (e) engaging in a controlled activity, such as, irrigation of any land with waste or water containing waste generated through any industrial activity or by a waterworks;
- (f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- (g) disposing of waste in a manner which may detrimentally impact on a water resource;
- (h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial process or power generation process;
- (i) altering the bed, bank, course or characteristics of water courses;
- (j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people;
- (k) use of water for recreational purposes.

5.5 Other applicable legislation

5.5.1 The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)

The National Heritage Resources Act aims to promote good management of cultural heritage resources and encourages the nurturing and conservation of cultural legacy so that it may be bestowed to future generations.

The Act requires all developers (including mines) to undertake cultural heritage studies for any development exceeding 0.5 ha. It also provides guidelines for impact assessment studies to be undertaken where cultural resources may be disturbed by development activities.

5.5.2 The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA)

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA) provides for the management and conservation of South Africa's biodiversity within the framework of NEMA, as well as the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.

5.5.3 National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA)

The National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM:WA) commenced on 1 July 2009. In terms of this Act, all listed waste management activities must be licensed and in terms of Section 44 of the Act, the licensing procedure must be integrated with the environmental impact assessment process. Government Notice 921, which commenced on 29 November 2013, lists the waste management activities that require licensing in terms of the NEM:WA. Licence applications for activities involving hazardous waste must be submitted to the national authority, the Department of Environmental Affairs (DEA) and those for general waste to the provincial authority.

NEM:WA previously excluded mine residues controlled under the MPRDA but the NEM:WA Amendment Act (NEM:WAA) came into effect on 2 June 2014 (Act No 26 of 2014, Government Gazette 37714) and makes provision for inclusion of mine residue deposits and stockpiles under Schedule 3 (defined wastes) of NEM:WA. Although the Minister of the Department of Mineral Resources (DMR) is the licensing authority for residue stockpiles and residue deposits, their management must be in accordance with the NEM:WA Regulations as prescribed by the Minister of the Department of Environmental Affairs (DEA). The list of Waste Management Activities that may require licensing in terms of NEM:WA include:

- 29 November 2013 (Government Notice (GN) 921, Government Gazette No 37083) List of waste management activities that have, or are likely to have, a detrimental effect on the environment,
- 24 July 2015 (Government Gazette GG 39020, GN: R632). Regulations regarding the planning and management of residue stockpiles and residue deposits[1];

Part 8 of Chapter 4 of the NEM:WA came into effect on the 2 May 2014 (Government Gazette 37547, Proclamation no. 26). This section of the NEM:WA pertains to land contamination where “contaminated’’, in relation to Part 8 of Chapter 4, means the “*presence in or under any land, site, buildings or structures of a substance or micro-organism above the concentration that is normally present in or under that land, which substance or micro-organism directly or indirectly affects or may affect the quality of soil or the environment adversely*”. The NEM:WA requires the land owner to register land that is contaminated with the Department of Environmental Affairs (DEA).

Regulations and National Norms and Standards that have relevance to the planning and management of mine residues and stockpiles and general waste and contaminated land management include the following:

- Government Gazette No. 39020, GN: R632, 24 July 2015: deals with characterisation and classification of the residue; investigation and the selection of sites; design; assessment/prediction of impacts; analysis of risk relating to the management of residue stockpiles and deposits; duties of permit holders; monitoring and reporting; dust management; and decommissioning, closure and post-closure management.
- Government Gazette 41777, GN: 715, 18 July 2018: Waste Exclusion Regulations for the exclusion of a waste stream or portion of waste stream for beneficial use from the definition of waste.
- Government Gazette 41920, GN: R990, 21 Sep 2018: Amendment to GNR632 to allow for pollution control measures required for residue stockpiles and deposits to be determined on a case by case basis, based on a risk analysis conducted by a competent person.
- National Norms and Standards in Government Gazette No. 36784, 23 August 2013 for Waste Classification and Management (GN R364), Assessment of Waste for Landfill Disposal (GN R365) and Disposal of Waste to Landfill (GN R636).

[1] The requirements in terms of this regulation have been addressed in the various sections of this report.

- National Norms and Standards in Government Gazette No 37083, 29 November 2013 for Storage of Waste (GN 926). GN926 require that general and hazardous waste storage facilities that can handle in excess of 100 m^3 and 80 m^3 of waste continuously, respectively should be registered. Biannual internal audits and biennial external audits of the registered facilities against the requirements of GN926 are required. This has relevance to the salvage yard at Hackney shaft.
- National Norms and Standards in Government Gazette No. 37603, 2 May 2014 for Remediation of Contaminated Land and Soil Quality in the Republic of South Africa (GN331). A Site Assessment Report may be required for the land where the soil contamination is assessed in regard to the Norms and Standards.

5.5.4 National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA)

The main objectives of NEM:AQA are to protect the environment by providing reasonable legislative and other measures to:

- Prevent air pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development in alignment with Sections 24a and 24b of the Constitution of the Republic of South Africa.

The Act has devolved the responsibility for air quality management from the national sphere of government to local spheres of government (district and local municipal authorities), who are tasked with baseline characterisation, management and operation of ambient monitoring networks, licensing of listed activities, and development of emissions reduction strategies. The National Ambient Air Quality Standards (NAAQS) for common pollutants, as set in terms of the NEM:AQA.

The National Dust Control Regulations (GN R.827), which were promulgated on 1 November 2013, define acceptable dust fall rates for residential areas as <600 (mg/m^2/day) taken over a 30 day average (with no more than 2 exceedances per year, in non-sequential months), and non-residential areas as dust fallout >600<1200 (mg/m^2/day) taken over a 30 day average (with no more than 2 exceedances per year, in non-sequential months).

The National Greenhouse Gas Emission Reporting Regulations (promulgated in April 2017) were released to introduce a single national GHG reporting system that would enable the implementation of the Carbon Tax Act. In addition to this, the reporting system is part of South Africa's Intended Nationally Determined Contribution under the Paris Climate Accord. According to Annexure 1 of the regulations, KMR is required to report according to activity 1A2i of Annexure 1. Mining is a key category for South Africa and thus reporting of emissions on either Tier 2 or Tier 3 is required. Mining has a specific stationary combustion category within the IPCC Regulations (1A2i Mining and Quarrying). However, emissions produced by a mining company are not all unique to this category of emissions. All stationary combustion emissions (from fuel use for example) should be reported in this sector.

5.5.5 The National Forestry Act, 1998 (Act No. 84 of 1998) (NFA)

The NFA protects against the cutting, disturbance, damage, destruction or removal of protected trees.

5.6 Municipal plans and policies

5.6.1 John Taolo Gaetsewe Municipality Integrated Development Plan

The John Taolo Gaetsewe Municipal Area is mainly dominated by agricultural and mining activities with mining accounting for almost 65% of the local economy of the municipality. Majority of the job opportunities are created within the mining, agricultural and retail sectors with mining being the largest employer (JTGDM IDP, 2021).

Most of the mining activities within the municipality occur between Sishen and Hotazel. According to the John Taolo Gaetsewe Municipality Integrated Development Plan (IDP) (JTGDM IDP, 2021), there has been an increase in people within the municipality moving to mining area in search of employment opportunities. The IDP indicates that mining activities have an impact on the surrounding environment such as the loss of vegetation and soil quality.

5.6.2 KMR environmental policy

KMR recognises that occupational health, safety, environmental, quality and railway safety and security is integral part of business success. Some of the key commitments outlined in the KMR SHERQ policy are to:

- Identifying and assessing environmental aspects and impacts, health and safety hazards and risks, railway operational and security hazards and risks and activities impacting the quality and quantity of our products and services;
- Eliminate, prevent or mitigate our impact on the environment and neighbouring communities through optimisation of resource consumption, protection of environmental biodiversity, minimisation of release of effluent and emissions, protection of cultural heritage, waste minimisation and rehabilitation of disturbed land;
- Comply with all applicable Occupational Health, Safety, Environmental and Railway Safety and Security legal requirements, and other requirements as determined by KMR and other industrial bodies that KMR subscribes to;
- Implement and maintain an effective and transparent stakeholder engagement process, where stakeholders are treated fairly and with dignity; and
- Support meaningful and sustainable local community development programmes, in line with relevant applicable legislation.

5.6.3 Other environmental planning and management guidelines

A number of planning and management guidelines have been developed that need to be considered as part of the process, including:

- DWS, 2010. Operational Guideline: Integrated Water and Waste Management Plan. Resource Protection and Waste;
- Department: Water Affairs and Forestry, 2007. Best Practice Guideline A2: Water Management for Mine Residue Deposits;
- Department: Water Affairs and Forestry, 2007. Best Practice Guideline A4: Pollution control dams;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline A6: Water Management for Underground Mines;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G1 Storm Water Management;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G2: Water and Salt Balances;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G3. Water Monitoring Systems;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline G4: Impact Prediction;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline H1: Integrated Mine Water Management;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline H3: Water Reuse and Reclamation;

- DEAT. 2002. Integrated Environmental Management, Information series 2: Scoping. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 3: Stakeholder Engagement. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 4: Specialist Studies. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 12: Environmental Management Programmes. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEA. 2012. Companion to the EIA Regulations 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs; and
- DEA. 2017. Guideline on Need and Desirability, Department of Environmental Affairs (DEA), Pretoria, South Africa.

Table 5-1 outlines the legislation applicable to the proposed KMR Expansion Project.

Table 5-1: Policy and legislative context for the proposed KMR Expansion Project

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
Constitution of the Republic of South Africa, (No. 108 of 1996).	Throughout the scoping and EIA process.	Chapter 2 – Bill of Rights. Section 24 – Environmental rights. The Constitution of South Africa is the overarching framework legalisation driving the NEMA principles and therefore EIA process. The right to a safe environment and the right to information are addressed in the EIA process through stakeholder engagement, where available information pertaining to the environment and proposed activities are disclosed. The proposed activities shall be conducted in such a manner that significant environmental impacts are avoided, where significant impacts cannot all together avoided be minimised and mitigated in order to protect the environmental rights of South Africans.	Government of the Republic of South Africa.
Minerals and Petroleum Resources Development Act 28 of 2002.	Throughout the scoping and EIA process.	KMR has been operational since 2012. The original EMPr was undertaken by Metago in 2011 in terms of NEMA and the MPRDA (Act No. 28 of 2002). In addition, a second EIA process was undertaken by SLR in 2013 and approved in 2015.	Department of Mineral Resources and Energy, Northern Cape.
National Environmental Management Act (No. 107 of 1998).	• Throughout the scoping report; • Section 5 of this report details the proposed project developments and associated listed activities triggered; and • Table 6-1 details the listed activities to be authorised according to NEMA.	Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment). Section 28 – Duty of care and remediation of environmental damage. Environmental management principles.	Department of Mineral Resources and Energy, Northern Cape.
National Environmental Management Act, 1998 (Act 107 of 1998) and the 2014 EIA Regulations (Government Notice (GN) 984), as amended in 2017 and 2021.		KMR has EAs authorised under NEMA. The KMR Expansion Project triggers activities listed in GNR 983 and 984 and will require an EA from the DMRE. According to GNR 982 of the NEMA, activities listed in GNR 984 require that a full S&EIA be undertaken. **Applicable Listing Notice 1 (GNR983) activities:** **Activity 9** The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water; **Activity 10** The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes; **Activity 11:** The development of facilities or infrastructure for the transmission and distribution of electricity either outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or inside urban areas or industrial complexes with a capacity of 275 kilovolts or more; **Activity 12** The development of dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or infrastructure or structures with a physical footprint of 100 square metres or more, within 32m of a watercourse;	Department of Mineral Resources and Energy, Northern Cape.

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
		Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014; **Activity 14:** The development 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 m^3 but not exceeding 500 m^3; **Activity 16**: The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the highwater mark of the dam covers an area of 10 hectares or more; **Activity 19** The infilling or depositing of any material of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse; **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, as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required for such amendment; **Activity 24:** The development of a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; **Activity 25:** The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2000m^3 but less than 15000m^3; **Activity 27** The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation; **Activity 34** The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution; **Activity 45**: The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure has an internal diameter of 0.36m or more; or has a peak throughput of 120l/s or more; and where the facility or infrastructure is expanded by more than 1000m in length; or where the throughput of the facility or infrastructure will be increased by 10% or more; **Activity 47:**The expansion of facilities or infrastructure for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase;	

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
		Activity 48: The expansion of infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more within a watercourse; and **Activity 56** Widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre. **Applicable Listing Notice 2 (GNR984) activities:** **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; **Activity 11:** The development of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of water catchments, water treatment works or impoundments; **Activity 15** The clearance of an area of 20 hectares or more of indigenous vegetation; **Activity 16** The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the highwater mark of the dam covers an area of 10 hectares or more; **Activity 17** Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the MPRDA; and **Activity 27:** The development of a road with a reserve wider than 30 metres; or catering for more than one lane of traffic in both directions.	
Department of Environmental Affairs (DEA) Integrated Environmental Management Guideline Series, Guideline 5: Assessment of the EIA Regulations, 2012 (Government Gazette 805).	Throughout the authorisation process.	Environmental impacts will be generated primarily in the construction phase of this project with associated operational phase impacts. These will be assessed as part of the proposed project.	
Integrated Environmental Assessment Guideline Series 11, published by the DEA in 2004.		An Environmental Assessment is required for the proposed project as activities are triggered under GN R984.	
Review in Environmental Impact Assessment, Integrated Environmental			

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
Management, Information Series 13, Department of Environmental Affairs and Tourism (DEAT), Pretoria.			
DEA 2017, Public Participation guideline in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa.	Throughout the authorisation process.	Public participation is a requirement of the scoping/EIA process and will be conducted for the proposed project.	
National Water Act, 1998 (Act 36 of 1998).	Throughout the scoping and EIA process, including the WULA – pertaining to all water related aspects	KMR water activities are authorised by a WUL (No: . 07/D41K/ABCFGIJ/4533) issued on 29 May 2016. This WUL was amended in 2018 to include additional activities. The KMR Expansion Project will require a Section 21 (a, b, c & I, j and g) WULA **21 (a):** Taking groundwater ingress from open pits for potable and process water use; **21 (b):** Storing of water in an attenuation dams; **21 (c)&(i):** Impeding, diverting and altering the flow of water in a watercourse; Altering the bed, banks, course or characteristics of a watercourse: All activities taking place within 500 m of a wetland or 100 m of a watercourse, including the attenuation ponds will be licensed under Section 21 c and i; **21(g):** Disposing of waste in a manner which may detrimentally impact on a water resource; and **21 (j):** Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.	Department of Water, Sanitation and Human Settlement, Kimberley
National Environmental Management Waste Act (Act No. 36 of 1998) (NEM:WA).	Throughout the scoping report Section 4 of this report details the proposed project developments and associated listed activities triggered Table 6-1 details the listed activities to be authorised.	It is expected that the following GNR 921 listed activities (Category B and C) will be triggered by the proposed Expansion Project and will require a waste management licence: • **Category A (2):** The sorting, shredding, grinding, crushing, screening or bailing of general waste at a facility that has an operational area in excess of $1000m^{2;}$ • **Category A (3):** The recycling of general waste at a facility that has an operational area in excess of $500m^2$, excluding recycling that takes place as an integral part of an internal manufacturing process within the same premises; • **Category A (4):** The recycling of hazardous waste in excess of 500kg but less than 1 ton per day calculated as a monthly average, excluding recycling that takes place as an integral part of an internal manufacturing process within the same premises; • **Category B (10):** The construction of a facility for a waste management activity listed in Category B of GNR 921; and	Department of Mineral Resources and Energy, Northern Cape through the integrated application process.

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
		• **Category B (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).	
National Environmental Management Air Quality Act (Act No. 39 of 2004) (NEM:AQA).	Specialist studies, baseline description.	Air quality management: • Section 32 – Dust control; • Section 34 – Noise control; and • Section 35 – Control of offensive odours.	Department of Environmental Affairs.
The National Forestry Act, 1998 (Act No. 84 of 1998) (NFA).	Throughout the authorisation process Biodiversity assessment Baseline description section 12.	The NFA protects against the cutting, disturbance, damage, destruction or removal of protected trees. A biodiversity assessment will be conducted as part of the EIA, which will identify protected trees, which may be affected by the KMR Expansion Project. Should there be any protected trees that are affected by the project, KMR will apply for the required permit for the removal and/or relocation of the trees.	Department of Agriculture, Forestry and Fisheries (DAFF).
The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA).	Throughout the authorisation process Biodiversity Assessment Baseline description section 12.	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA) provides for the management and conservation of South Africa's biodiversity within the framework of NEMA, as well as the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources. The Act provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered, endangered, vulnerable or protected. During the EIA process, biodiversity hotspots and bio-regions will be investigated to determine the potential impacts that the project may have on the receiving environment. The management and control of alien invasive species on the impacted areas during all the phases of the project will be governed by the NEM:BA. The NEM:BA ensures that provision is made by the site developer to remove any alien species, which have been introduced to the site or are present on the site.	Department of Environmental Affairs.
Mine Health Safety Act, 1996 (Act No. 29 of 1996) (MHSA).		The Mine Health and Safety Act (Act No. 29 of 1996) (MHSA) aims to provide for protection of the health and safety of all employees and other personnel at the mines of South Africa. The proposed project is located within a mining area and KMR will therefore need to ensure that employees, contractors, sub-contractors and visiting personnel, adhere to this Act and subsequent amendment regulations on site.	Department of Mineral Resources.
Environment Conservation Act, (Act No. 73 of 1989) (ECA).	Throughout the Scoping report Specialist studies.	The ECA (Act 73 of 1989) was, prior to the promulgation of the NEMA, the backbone of environmental legislation in South Africa. To date the majority of the ECA has been repealed by various other acts, however Section 25 of the Act and the noise regulations (GNR 154 of 1992) promulgated under this section are still in effect. These regulations serve to control noise and general prohibitions relating to noise impact and nuisance	Department of Environmental Affairs.

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
		Requires the landowner to manage: • Agricultural resources i.e. the removal of invasive species; • Protection of soils against water and wind erosion; and • Management of water resources.	
Conservation of Agricultural Resources Act (Act No. 43 of 1983).	Throughout the authorisation process Biodiversity Assessment Baseline description section 12.	• Control measures for erosion; and • Control measures for alien and invasive plant species.	Department of Agriculture.
National Heritage Resources Act 25 of 1999 (NHRA).	Heritage assessment Baseline description section 12.	Heritage permit for structures 60 years or older. A heritage assessment will be conducted as part of the EIA to identify whether there are any areas of historical importance.	Northern Cape Heritage Resource Authority.
The World Heritage Convention Act, (Act No. 49 of 1999) (WHCA).	Heritage assessment Baseline description section 12.	South Africa became a signatory to and ratified the *World Heritage Convention*, 1972 (WHC) in 1997. It thereby voluntarily agreed to identify and conserve world heritage areas of universal value for the benefit of mankind. South Africa currently has eight world heritage sites (WHS) in its territory. Governance of these sites is regulated in terms of an extensive legal framework, mainly consisting of environmental and incidental laws. The primary act is the World Heritage Convention Act (WHCA) which incorporated the WHC into South African law. It provides for the recognition, establishment and management of WHS in South Africa. Baseline permits will be required for the destruction or removal of any heritage resources affected by the development; this will include all buildings and graves that will be impacted by this project.	
Spatial Planning and Land Use Management Act, (Act No. 16 of 2013) (SPLUMA).	Throughout the authorisation process.	The Spatial Planning and Land Use Management Act (Act 16 of 2013) (SPLUMA) was promulgated in May 2015. SPLUMA is a framework act for all spatial planning and land use management legislation in South Africa. It seeks to promote consistency and uniformity in procedures and decision-making in this field. SPLUMA will also assist municipalities to address historical spatial imbalances and the integration of the principles of sustainable development into land use and planning regulatory tools and legislative instruments. The need for SPLUMA authorisation will be determined during the EIA/EMPr process.	Municipality.
The Promotion of Administrative Justice Act, (Act No. 3 of 2000) (PAJA).	Throughout the authorisation process.	This Act gives effect to the constitutional right to administrative action that is lawful, reasonable and procedurally fair. It also gives effect to the right to written reasons for administrative action as contemplated in section 33 of the Constitution. The Act aims to promote an efficient administration and good governance and to create a culture of accountability, openness and transparency in the public administration or in the	

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
		exercise of a public power or the performance of a public function by giving effect to the right to just administrative action. In terms of the Act, administrative action which materially and adversely affects the rights or legitimate expectations of any person must be procedurally fair. "Administrative action" as defined in section 1 of PAJA means any decision taken, or any failure to take a decision, by- (a) an organ of state, when (i) exercising a power in terms of the Constitution or a provincial constitution; or (ii) exercising a public power or performing a public function in terms of any legislation; or (b) a natural or juristic person, other than an organ of state, when exercising a public power or performing a public function in terms of an empowering provision, which adversely affects the rights of any person and which has a direct, external legal effect, excluding certain classes of executive, legislative and quasi-judicial functions set out in the act. The stakeholder engagement process will be undertaken in line with the NEMA requirements throughout the authorisation process to keep registered stakeholders notified of the process and any decisions taken by the competent authorities.	
The Promotion of Access to Information Act, (Act No. 2 of 2000) (PAIA).	Throughout the authorisation process.	This Act gives effect to Section 32 of the Constitution by providing mechanisms to ensure access to certain information held by a public body as well as to information held by private bodies (in the latter case, as long as this information is required in order to exercise or protect any rights). The act allows for access to records, regardless of when such records came into existence. The Act specifically retains Sections 31 (1) and (2) of NEMA which also deal with access to information from a public or private body. While the Act confers specific rights of access to information, I&APs should not forego the normal public participation process and only try to obtain information through the PAIA provisions. As registered I&APs, they have specific rights (and responsibilities) in terms of being afforded an opportunity to "access" all the information to provide comments and to be informed of the outcome. The stakeholder engagement process will be undertaken in line with the NEMA requirements throughout the authorisation process to keep registered stakeholders notified of the process and any decisions taken by the competent authorities.	
Noise standards.	Baseline description section 12.	There are a few South African Scientific Standards (SABS) relevant to noise from mines, industry and roads. They are: • South African National Standard (SANS) 10103:2008. The measurement and rating of environmental noise with respect to annoyance and to speech communication; • SANS 10210:2004. Calculating and predicting road traffic noise; • SANS 10328:2008. Methods for environmental noise impact assessments;	Municipality

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
		• SANS 10357:2004. The calculation of sound propagation by the concave method; • SANS 10181:2003. The measurement of noise emitted by road vehicles when stationary; and • SANS 10205:2003. 'The measurement of noise emitted by motor vehicles in motion. The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful per se.	

6 Description of the Scope of the Proposed Overall Activity

6.1 Listed and specified activities

6.1.1 NEMA Listed Activities associated with the proposed KMR Expansion Project

The listed activities associated with the proposed KMR Expansion Project in respect of NEMA and NEM:WA are provided in Table 6-1. The location of the infrastructure that will trigger these listed activities is provided in Figure 6-1 and Appendix E respectively.

Figure 6-1 provides a map showing the location of the proposed infrastructure in relation to the two mining right areas of KMR (MR10053 & MR268), for a holistic overview of the entire proposed project.

Based on the nature and extent of the listed activities shown in Table 6-1, KMR is currently undertaking an integrated EA process. The process which is being followed is a comprehensive Scoping and Environmental Impact Reporting (S&EIR), interchangeably referred to as a "full" EIA in terms of NEMA, NEM:WA and the MPRDA.

The proposed KMR Expansion project is currently in the process of conducting a Water Use Licence Application (WULA) in accordance with the NWA. The WULA process will be undertaken as part of the integrated environmental authorisation process.

Authorisation in terms of NEMA, NEM:WA and MPRDA is currently being applied for through the Northern Cape DMRE, whilst authorisation in respect of the NWA is being applied through DWS.

Table 6-1: Listed activities triggered by the Expansion Project

Name of activity	Aerial extent of the activity	Listed activity	Applicable listing notice	Waste management authorisation
(E.g. For prospecting - drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route etc…etc…etc *E.g. for mining,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and Boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)*	*Ha or m²*	*(Mark with an X where applicable or affected).*	*(GNR 983, GNR 984 or GNR 985)/ NOT LISTED*	*(Indicate whether an authorisation is required in terms of the Waste Management Act).* *(Mark with an X)*
Devon 227				
Rehabilitation activities at the pit	58	X	GNR 983: Activity 22 and 31	
Establishment of monitoring boreholes	Less than 1 ha	None		
Development of explosives magazine (within previously disturbed area) – final location on Devon farm still pending	1 ha	X	GNR 983: Activity 14 and 27	
Kipling 271				
Two Opencast Pits	Combined 16 ha (5 ha and 11 ha)	X	GNR 983: Activity 21, 19 and 24	
			GNR 984: Activity 15, 17 and 19	
Waste rock dump	25 ha	X	GNR 983: Activity 12, 24 and 19	GNR 921: Category B – Activity 10 & 11
			GNR 984: Activity 15	
RoM Stockpiles	11 ha	X	GNR 983: Activity 12 and 27	
			GNR 984: Activity 19	
Haul road (approx. 1.2km)	1.6 ha	X	GNR 983: Activity 12, 24 and 27	
			GNR 984: Activity 27	
Sewerage Treatment Facility within the proposed new Kipling Office area	0.4 ha	X	GNR 983: Activity 10, 25 and 27	
	0.3 ha	X	GNR 983: Activity 9 and 27	

Name of activity	Aerial extent of the activity	Listed activity	Applicable listing notice	Waste management authorisation
Potable water tank within the proposed new Kipling Office area			GNR 984: Activity 11	
Potable water pipeline from York to Hotazel to Kipling	2.2 ha	X	GNR 983: Activity 9, 27 and 45	
New Kipling office area	20ha	X	GNR 983: Activity 27	
Diesel bay and fuel storage within the proposed new Kipling Office area	0.7 ha	X	GNR 983: Activity 27 GNR 984: Activity 4	
Waste storage facility within the proposed new Kipling Office area	0.8	X	GNR 983: Activity 27	GNR 921: Category A Activity 2, 3, 4
Crushing facility within the proposed new Kipling Office area	5.5 ha	X	GNR 983: Activity 12, 19, 19A and 24 GNR 984: Activity 15	
Pollution control dam	1.5 ha	X	GNR 983: Activity 10 and 12	
Ancillary infrastructure (e.g. Weighbridge)	1.2 ha	X	GNR 983: Activity 24 and 27	
Construction and upgrading of access gravel road to Kipling offices	2 ha	X	GNR 983: Activity 24 and 27	
Powerlines and associated infrastructure	Final routes to be determine during scoping	X	GNR 983: Activity 11, 12 and 47 GNR 984: Activity 9	
Hotazel 280				
Expansion of the Hotazel Pit	To be confirmed	X	GNR 983: Activity 12, 19 and 48 GNR 984: Activity 15	
RoM Stockpile	36 ha	X	GNR 983: Activity 12, 19 and 48 GNR 984: Activity 15 and 19	
Waste Rock Dump North, South and East • North – 28 ha • South – 6 ha	48.5 ha in total	X	GNR 983: Activity 12, 24 and 19 GNR 984: Activity 15	GNR 921: Category B – Activity 10 & 11

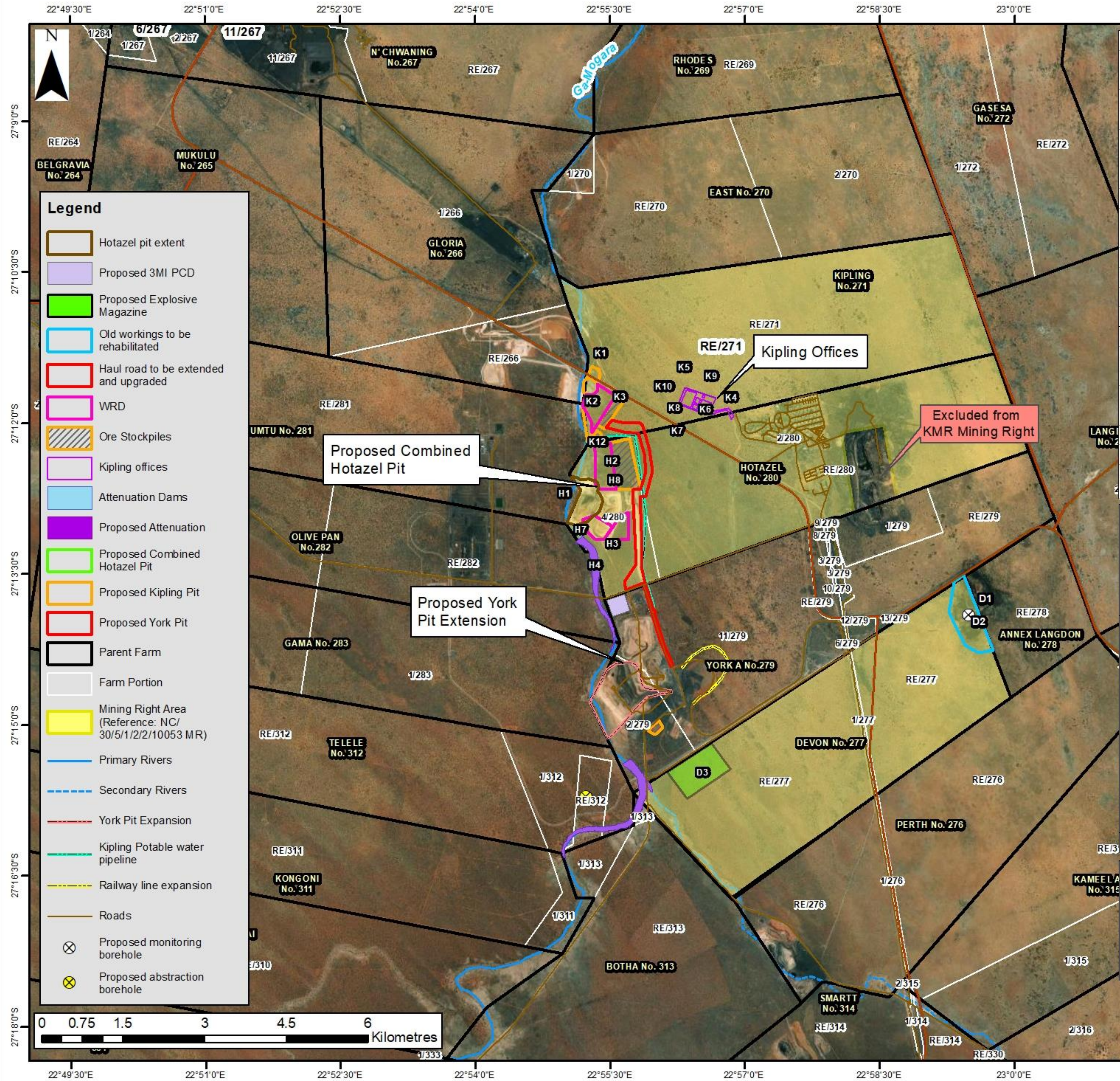
Name of activity	Aerial extent of the activity	Listed activity	Applicable listing notice	Waste management authorisation
• East – 14.5 ha				
Attenuation dam	20 ha	X	GNR 983: Activity 19 GNR 984: Activity 15 and 16	
Potable water tank	0.5 ha	X	GNR 983: Activity 9 GNR 984: Activity 11	
Sewage Treatment Plant Lilliput style	0.3 ha	X	GNR 983: Activity 10, 25 and 27	
Rehabilitation of road due to construction of New Waste Rock Dump	To be confirmed	Not Listed	No Listed activity, however, this is an EMPr amendment	
Relocation of Admin offices and security building.	Less than 1 ha	Not Listed	No Listed activity, however, this is an EMPr amendment	
Establishment of Truck Parking Area	5 ha	X	GNR 983: Activity 27	

6.1.2 Water uses associated with the proposed KMR Expansion Project

Table 6-2 lists the NWA Section 21 water uses that are proposed on properties Hotazel, Devon and Kipling as part of the Expansion Project and which will be applied for as part of the WULA process.

Table 6-2: NWA Water Uses based on the proposed project changes

Section 21 water use	Water Use Description	Mine Activity that may trigger the Water Use
a	Taking underground water from open pits	Abstraction of groundwater ingress from open pits to ensure safe continuation of mining
b	Storing water	Attenuation dams
c	Impeding or diverting the flow of water in a watercourse	Any infrastructure within 100 m of a watercourse, including: Opencast pits Attenuation dams Waste rock dumps
i	Altering the beds, banks, course or characteristics of a water course	
g	Disposing of waste in a manner which may detrimentally impact on a water resource	Waste Rock Dumps including expansion RoM Stockpiles Pollution Control Dams (PCDs) Backfilling of Devon Open Pit
j	Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people	Removal of groundwater ingress from pits



Farm: Kipling 271

Activity ID	Name of activity	Listed Activity GNR	Listed Activity Activity
K1	Two Opencast Pits	983	12, 19, 21D
		984	15, 17
K2	Waste rock dump	983	12, 19
		984	6, 15
		921	10, 11
K3	RoM Stockpiles	983	12, 27
K4	Haul road	983	12, 24, 27
		984	27
K5	Sewerage Treatment Facility	983	10, 25, 27
K6	Potable water tank	983	9, 27
K7	Potable water pipeline	983	9, 27, 45
K8	New office area	983	27
K9	Diesel bay and fuel storage	983	14, 27
K10	Waste storage facility	983	27
		921	Cat A: 2, 3, 4
K12	Pollution control dam	983	10
		984	6
K13	Ancillary infrastructure	983	24, 27
K14	Upgrading and new access roads	983	24, 27
K15	Powerlines and associated infrastructure	983	11, 12

Farm: Hotazel 280

Activity ID	Name of activity	Listed Activity GNR	Listed Activity Activity
H1	Hotazel Pit expansion	983	12, 19, 21D, 48
		984	15, 17
H2	Run of Mine Stockpile	983	12, 19
		984	15
H3	Waste Rock Dumps	983	12, 19, 34
		984	15
		921	Cat B: 10, 11
H4	Attenuation dam	983	12, 19
		984	15
H5	Potable water tank and pipeline	983	9
H6	Sewage Treatment Plant	983	10, 25
H7	Road rehabilitation	-	-
H8	Admin offices relocation.	-	-
H9	Haul road	983	24, 56

Farm: Devon 227

Activity ID	Name of activity	Listed Activity GNR	Listed Activity Activity
D1	Rehabilitation of pit	-	-
D2	New monitoring boreholes	-	-
D3	New magazine	983	14, 27

srk consulting

KMR INTEGRATED ENVIRONMENTAL AUTHORISATION

KMR PROPOSED ACTIVITY MAP: MINING RIGHT NC/30/5/1/2/2/10053 MR

Data Source: ESRI Basemap	
Scale: 1:80 000	
Projection: UTM	Datum: WGS84
Central Meridian/Zone: 34S	
Date: 30/09/2021	Compiled SCHB
Project No: 574378	Fig No: A
Revision: A	Date: 30/09/20

Path: J:\Proj\574378_KMR_PROJ_2021\8GIS\GISPROJ\MXD\574378_A3_KudumaneIEA_Proposed_Layout_NC_30_5_1_2_2_10053 MR_20210930.mxd

6.2 Description of the existing activities currently being undertaken by KMR and proposed activities to be undertaken

Currently, KMR is authorised under two EIA/ EMPrs which were authorised in 2010 and 2014. Figure 6-2 illustrates the approved infrastructure and mining area which was approved in 2010 and Figure 6-3 illustrates the infrastructure and mining area which was proposed in the 2014 EIA/EMPr.

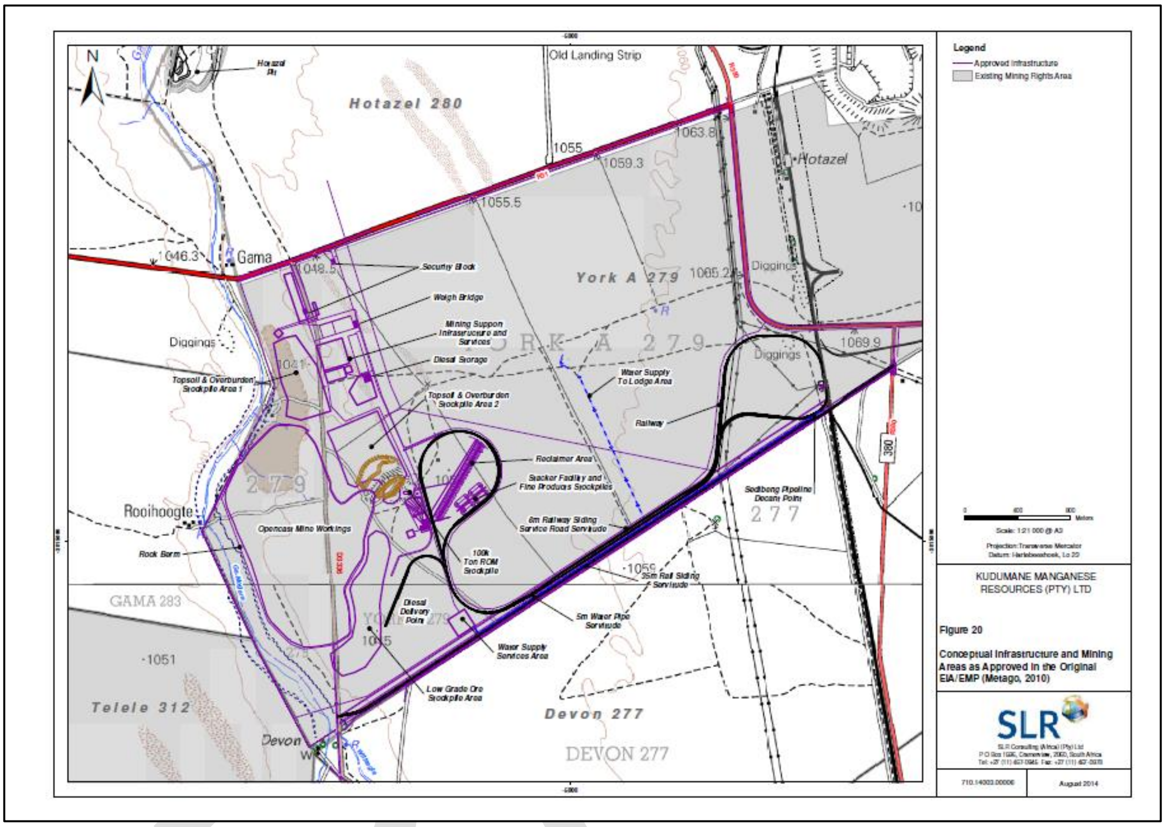


Figure 6-2: Infrastructure and mining area approved as part of the 2010 EIA/EMPr

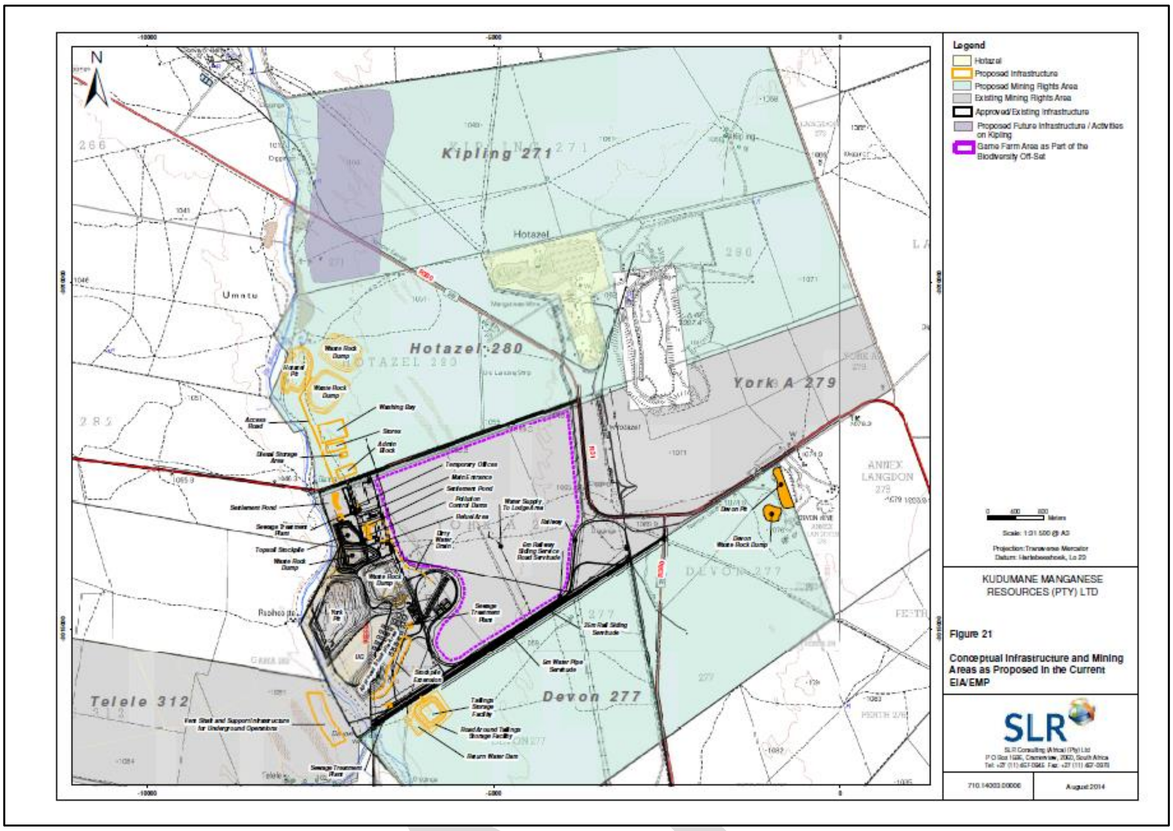


Figure 6-3: Infrastructure and mining area approved as part of the 2014 EIA/EMPr

This section outlines the proposed project changes and new developments that will be included in this integrated EA process for properties Hotazel 280, Devon 277 and Kipling 271. These proposed project changes and new developments are indicated in Table 6-3. Appendix E provides information on the locality of each proposed change or new development in relation to KMR's Mining Right areas.

Table 6-3: Proposed activities to occur on each property

Kudumane Property	Activities to be undertaken
Devon 277	• Rehabilitation activities at the pit (historical pit) • Establishment of monitoring boreholes
Kipling 271	• Establishment of a two new opencast Pits • Establishment of a new Waste rock dump • Establishment of a new RoM Stockpiles • Construction of haul road (approx. 1.2km) • Sewerage Treatment Facility • Potable water tank • Admin Offices • Diesel bay and fuel storage • Waste storage • Crushing facility • Pollution control dam • Ancillary infrastructure (e.g. Weighbridge) • Construction and upgrading of access gravel road to Kipling offices • Potable water pipeline from York to Hotazel to Kipling • Powerlines and associated infrastructure
Hotazel 280	• RoM Stockpile • Waste Rock Dump North, South and East • Expansion of the Hotazel Pit • Attenuation dam within the Ga-Mogara River to allow for the expansion of the Hotazel Pit • Potable water tank • Proposed location • Sewage Treatment Plant Lilliput style

Kudumane Property	Activities to be undertaken
	• Rehabilitation of road due to construction of New Waste Rock Dump • Relocation of Admin offices

6.2.1 Open pit mining

Current opencast pits

The information provided in this section was provided to SRK by KMR and the approved EIA/EMPr's (Metago, 2010 and SLR, 2014).

In light of the above, and in order to clearly describe the mining methodology, specific distinction has been made between the following areas:

- Approved mining rights area: mining will continue to be undertaken as has been approved in the existing EIA/EMP (i.e. opencast mining at York, underground mining at Telele and opencast mining at Hotazel). Given that this has been approved, the focus in the sections which follow will only be on the amendments to support infrastructure/activities and well as the expansion activities; and
- Proposed mine expansion: it is proposed that the Hotazel opencast pit will be expanded as well as the new opencast mine at Kipling will be mined using opencast mining methods. In this regard, the mining methodology together with all support infrastructure/activities is described in detail below. While the same mining methodology will be used for the expansion activities and new opencast mine, that is currently being used at the existing Hotazel opencast pit, this detail has been provided to provide context as well as to satisfy the DMRE requirement of an EIA/EMP addressing all activities which are triggered.

Approved mining rights area: Opencast and underground mining.

Within the existing mining rights area (York and Telele), the reef is currently targeted via open pit on the farm York. Although underground mining on the farm Telele has not yet commenced, it has already been approved in the existing EIA/EMP (Metago, 2010). The depth of the manganese resource at the mining start point on York is approximately 65 m below surface extending to approximately 170 m or more below surface. Underground mining on Telele will commence at approximately 170 m below surface.

Subsequent to the EIA/EMPr conducted in 2010, KMR applied for the re-mining of the Hotazel and Devon opencast pits. Within the mining rights area (Devon, Kipling and Hotazel), the reef that was targeted via existing (historical) open pits on the farms Devon and Hotazel. As part of the EIA/EMPr conducted in 2014, the opencast pit on Kipling was included for context purposes as only preliminary investigations had commenced. Due to this, the Kipling Opencast mine is being applied for as part of this Environmental Authorisation process. The two open pit operations at Hotazel and Devon were anticipated to be based on conventional opencast mining methods making use of drilling and blasting followed by loading and hauling utilising trucks and shovels (similar to that employed at York).

2021 Proposed Opencast pits

Establishment of new Kipling opencast pits

KMR currently owns the surface right for the Kipling property as well as the mining right to mine the mineral resources manganese on this property. As part of the proposed KMR Expansion project one of the key activities which KMR is exploring is the mining of manganese on the Kipling 271 property. Two opencast pits will be developed on the Kipling property namely, the Kipling Pit Shell and the Kipling Anomaly opencast pit. The mineral resource at these opencast pits will be exposed via blasting activities. The opencast pits will be on the western boundary of the Kipling property within the Ga-Mogara River as indicated in Figure 6-1.

Site preparation

Site preparation for opencast mining includes the clearing of vegetation and topsoil stripping from new disturbance areas associated with the pits, WRDs, roads, and other support infrastructure. Topsoil will be stockpiled, for later use in rehabilitation.

Earthworks

Following site preparation, all topsoil and some waste rock will be dozed and stockpiled separately for reuse for other construction and rehabilitation activities.

Drilling and blasting

Blasting and drilling methods will be used to loosen the remaining waste rock and ore in the open pits. The blast programme will be changed as required during the life of the mine.

Blasting is expected to occur twice per week for each pit. Blasting will not be undertaken on weekends.

Removal of waste rock

Truck and shovel methods will be used to load and haul the waste rock materials to the WRDs.

Removal of RoM

RoM will be delivered to the plant by trucks.

Rehabilitation

Once the open pits reach a steady state, on-going rehabilitation of the mined out areas will occur as mining advances. In this regard, waste rock will be used to backfill the pit voids and then topsoil will be placed over the waste rock and vegetation will be re-established. No final void is anticipated in the current scenario because there will be sufficient waste rock and topsoil to backfill and rehabilitate the open pits.

<u>Expansion of the Hotazel Pit</u>

KMR has a common boundary with the Kalagadi Manganese Mine located directly west of the Hotazel Pit operations. It is the intention of KMR to mine this boundary in order to optimise the mining resources and further increase the productivity and life of the operations.

The current opencast pit operations consist of benches located along the slope of the pit, providing stability to the pit and access for the mining equipment and trucks to mine the ore and to transport the ore and waste material out of the pit area. Figure 6-4 provides a basic schematic of the KMR opencasts pits.

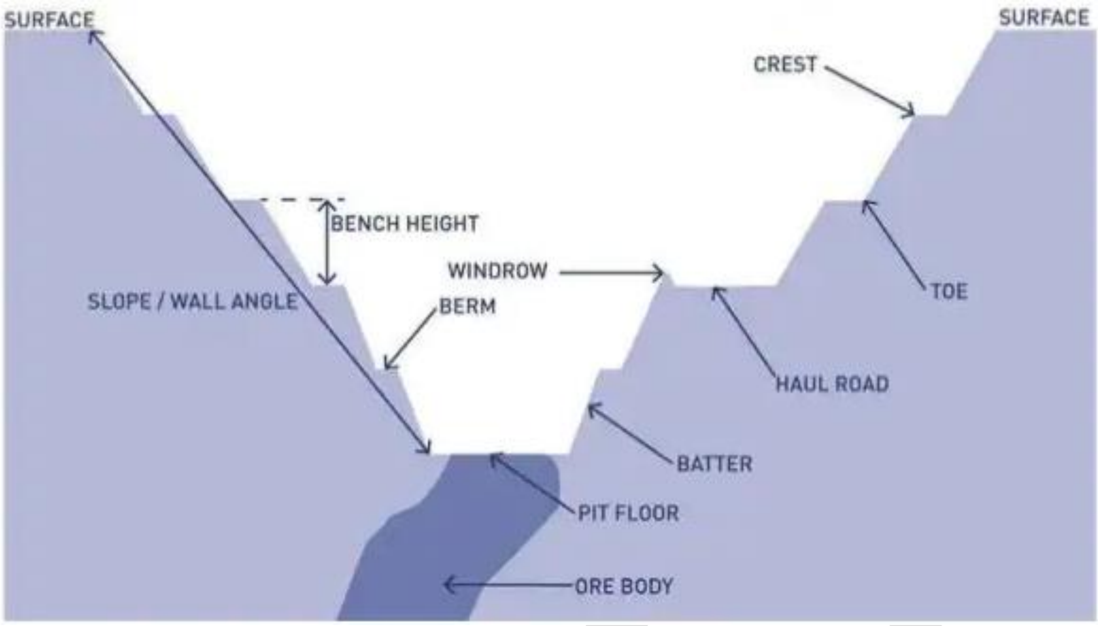


Figure 6-4: Generic schematic of an opencast pit layout

In order for KMR to access the ore located on the boundary of their Mining Right area, KMR anticipates extending the pit's shell over into the Kalagadi MR area. Various options were considered to extend the pit to access the ore and it was decided that the best option would be to extend the pit into the Kalagadi Mine area to optime the KMR mining right and resources. Negotiations and agreements are currently under way between the two mining companies to allow for this expansion of the pits.

The mining of the KMR boundary pillar will therefore result in the extension of the pit into the Kalagadi Mining Right area but will only involve the removal of waste material (overburden located between the topsoil and the ore body) and development of benches along the new pit shell's slope in order to gain access to the ore located on the boundary of KMR's MR area.

Once mining has been completed and no future opencast mining is anticipated by Kalagadi Mine, the waste material that was removed during the expansion of the pit will be placed back into the pit as part of the backfill and rehabilitation of the pit by KMR.

Figure 6-5 depicts how far the pit shell would need to be extended (Scenario 3 pit shell) in order for KMR to access the ore located within the boundary of MR Ref: NC/ 30/5/1/2/2/10053 MR.

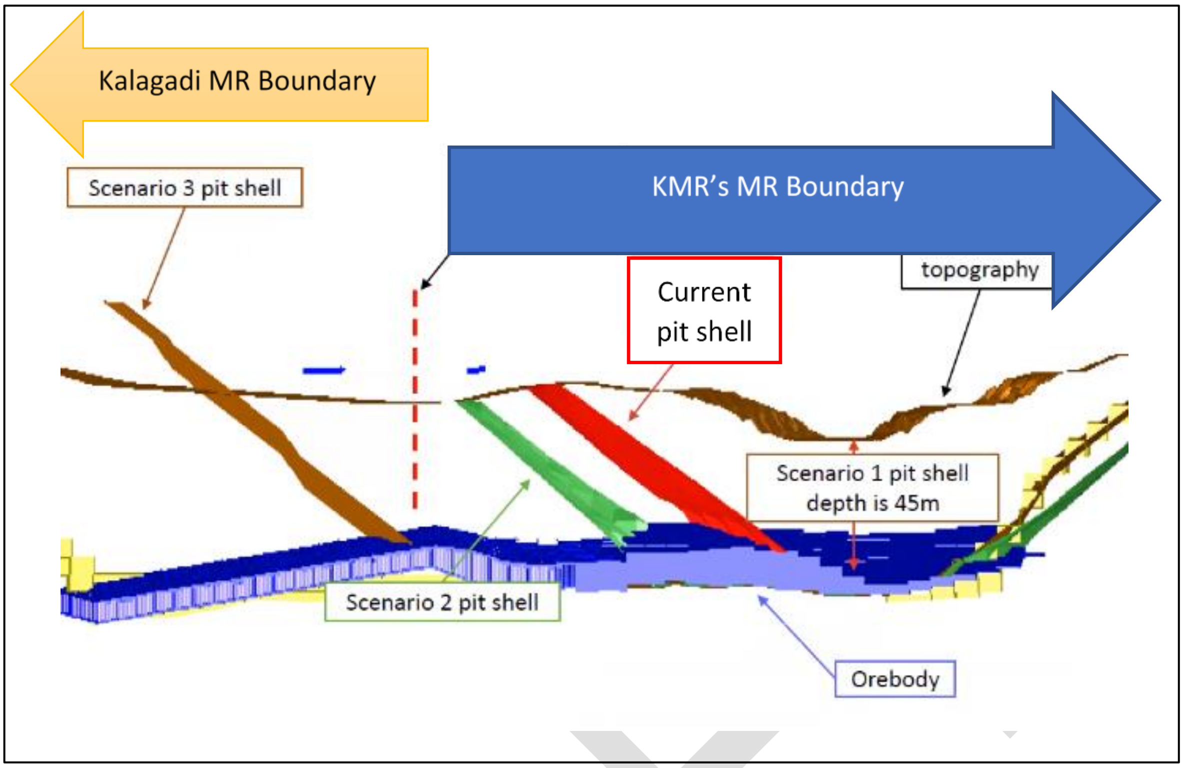


Figure 6-5: Expansion of the open pits beyond the KMR MR boundary

Site preparation

Site preparation for opencast mining includes the clearing of vegetation and topsoil stripping for new disturbance areas associated with the pits, WRDs, roads, and other support infrastructure. Topsoil will be stockpiled, for later use during rehabilitation.

Earthworks

Following site preparation, all topsoil and some waste rock will be dozed and stockpiled separately for reuse for other construction and rehabilitation activities.

Drilling and blasting

Blasting and drilling methods will be used to loosen the remaining waste rock and ore in the open pits. The blast programme will be changed as required during the life of the mine.

Blasting is expected to occur twice per week for each pit. Blasting will not be undertaken on weekends.

Removal of waste rock

Truck and shovel methods will be used to load and haul the waste rock materials to the WRDs.

Removal of run-of-mine

RoM will be delivered to the plant by trucks.

Rehabilitation

Once the open pits reach a steady state, on-going rehabilitation of the mined out areas will occur as mining advances. In this regard, waste rock will be used to backfill the pit voids and then topsoil will be placed over the waste rock and vegetation will be re-established. No final void is anticipated in the current scenario because there will be sufficient waste rock and topsoil to backfill and rehabilitate the open pits.

Rehabilitation activities at the Devon 277 opencast pit (historical pit)

As part of the EA process conducted in 2015, KMR applied to re-mine the historic manganese resource on the property Devon. The re-mining of the pit was to identify whether there was enough resource to continue mining in the future. Based on this work, KMR identified that it was not viable to mine this area for manganese. Due to this, as part of the KMR Expansion project, KMR is planning to rehabilitate their portion of Devon pit. It is important to note, the pit is located on the property Devon 277as well as Please include number and be consistent with referring farm/property. KMR only owns the Devon property, thus KMR will only rehabilitate the area on the land which they own.

6.2.2 Run of mine stockpiles

Current RoM Stockpiles

As part of the 2010 EIA/EMPr, the Mine Works Programme, at steady state, intended to mine 3.6 million tons of ROM per annum (from the existing and approved pit on York and the approved underground operations on Telele). In the approved 2014 EIA/EMPr, Kudumane intended to mine roughly 350 000 tons of ROM per annum (from both Hotazel and Devon). This ROM was then anticipated to be transported by trucks to the processing plant already approved at York.

As part of the 2014 EIA/EMPr, a ROM stockpile was authorised and subsequently has been constructed and utilised.

2021 Proposed RoM Stockpiles

Establishment of a new Kipling 271 RoM Stockpiles

In addition to the two opencast pits and the waste rock dumps a new RoM stockpile will be developed to store the ore mined at the Kipling pits. The Kipling RoM area will have an extent of 11ha.

Establishment of new Hotazel 280 RoM Stockpile

The Hotazel operations currently has an RoM Stockpile, however, due to the expansion project an addition area is required to store the ore mined. The proposed area which is required for the new RoM Stockpile will have an extent of 36ha.

6.2.3 Waste rock dumps

Current WRD

A number of WRDs have been approved as part of pervious EIAs/ EMPrs. The EIA/EMPr approved in 2010 (Metago, 2010) made provision for two WRDs and a low-grade ore/waste (Figure 6-2). In addition to these WRDs, as part of the 2014 EIA/EMPr (SLR, 2014), three WRDs (two WRDs for Hotazel and one WRD for Devon) were proposed and approved. Refer to Figure 6-3 for the proposed location of the Hotazel and Devon WRD proposed in the 2014 EIA/EMPrs.

2021 Proposed WRD

Establishment of a new Kipling 271 waste rock dump

As part of the mining operations, waste rock will be generated which has no mineral value. The waste rock which is created as part of the mining operations will be removed to the new Kipling Waste Rock Dump. The area where the waste rock dump will be located will have an extent of 25ha.

Hotazel 280 Waste Rock Dump North, South and East

Currently, the Hotazel operations has an existing waste rock dump. However, due to the expansion of the Hotazel pit, addition waste rock will be generated. Due to this, three new waste rock dump will be required namely, the North Waste Rock Dump (28ha), the South Waste Rock Dump (6ha) and East Waste Rock Dump (14.5ha). The additional waste rock dumps required will have an extent of 48.5ha in total.

6.2.4 Crusher plants

Current WRD

Currently, all the RoM produced at Hotazel is stockpiled on site and then transported via truck to the York crusher. The crushing and screening processes is as followed (approved in the 2014 EIA/EMPr):

- Sized material screened through a vibrating grizzley;
- Oversize material directed through a crusher;
- Sized material will then pass through a sizing screen whereby material <6mm will be directed to the relevant product stockpile. Material between 75mm and 6mm will pass through a flopper gate and sizing screen which will sort the material into lots of -75 +6mm, -75 +25mm and - 25 +6mm; and
- Dust suppression spraying via macro-nozzles will take place throughout the processing circuit.

No new crusher is proposed as part of the KMR Expansions Project

6.2.5 Ore stockpiles

Current Ore Stockpile

Currently, there is no ore stockpiles situated on Hotazel, Devon or Kipling as all ROM is processed at the York operations. The only Ore stockpile is situated at York where it is moved via conveyor to the stackers and stockpile area within the railway loop for dispatch.

No additional ore stockpiles will be established as part of the KMR Expansion Project.

6.2.6 Electricity supply

The primary source of this power is from Eskom as well as diesel generators. The diesel generators were retained as a back-up to Eskom power. A substation has been constructed in order to receive power from a regional Eskom powerline (Eskom's planned Kalagadi powerline). The substation is equipped with transformers and switchgear to enable the voltage from the regional line to be stepped down and internally distributed. The substation is also equipped with impermeable floors, bunds and collection traps where required to contain any spills of lubricants.

Internal power reticulation (from the diesel generators and the substation) will be by means of a distribution network comprised of powerlines and mini substations.

No additional electricity supply will be utilised as part of the KMR Expansion Project.

6.2.7 Water supply

Potable water supply

The groundwater quality is not suitable for potable water therefore potable water is sourced from the Sedibeng Vaal-Ga Mogara pipeline. Kudumane has a signed contractual agreement with Sedibeng Water for an annual off-take of 40 000 m^3 per annum (with a minimum of 32 000 m^3 per annum).

KMR will continue to source potable water from the Sedibeng Vaal-Ga Mogara pipeline.

Process water supply

Currently, all water used for processing as well as dust suppression is portable water from the Sedibeng Vaal-Ga Mogara pipeline.

KMR will continue to source potable water from the Sedibeng Vaal-Ga Mogara pipeline.

6.2.8 Stormwater management and pollution control dams

Current stormwater management and PCDs

As per the approved EIA/EMP (Metago, 2010) water management systems have been designed, implemented, and managed in accordance with the provisions of Regulation 704, 4 June 1999 (Regulation 704) for water management on mines. In general, the footprint of all dirty areas will be minimised by isolating these areas from clean water runoff and dirty water will be contained in designated systems. In this regard the management of stormwater generated at the mine includes the diversion of clean water.

The approved EIA/EMP (Metago, 2010) made provision for some water management infrastructure which included clean water diversions, dirty water interception channels, a dirty water containment facility as well as water containment channels around the pit. As part of the 2014 EIA/EMPr, these plans were expanded on in order to cater for the mining rights areas and infrastructure as well as the infrastructural changes that will take place within the existing mining rights areas.

As part of the stormwater management plan which was developed as part of the 2014 EIA/EMPr, the following was designed in order to cater for the new activities:

- off-site runoff from clean catchment to the east of the mine will be diverted around dirty areas and allowed to flow towards the river;
- dirty storm water from the TSF will drain along with any process water to a suitably sized return water dam and re-used at the processing plant;
- dirty stormwater from the WRDs, stockpile areas, railways siding, wash bay, weigh bridge, refuelling or vehicular servicing areas, any contractors areas, and the processing plant will be conveyed to one of five suitably sized pollution control dams (PCDs) and re-used at the processing plant or used for dust suppression subject to water quality; and
- dirty stormwater generated within the pits and from areas which drain into the pits will be collected within a drainage sump along with any groundwater seepage, and pumped out for re-use or used for dust suppression subject to water quality.

In order to meet the design principles above, the following stormwater management measures were proposed:

- five PCDs;
- two in-pit drainage sumps;
- five clean water diversion channels; and
- twelve dirty water interception channels.

2021 Proposed PCDs

Kipling PCD

All dirty water runoff from the Kipling operations will be re-directed to the proposed Kipling PCD. This will also include groundwater ingress abstracted from the proposed Kipling opencast pits. The Kipling PCD will be located at a lower altitude in order for the dirty water to collect at a central area and will be approximately 0.2 Ha with a capacity of 5 558 m^3. The PCD will be lined with 2mm thick HDPE lining (UV resistant) on top of 2 x 150mm Clay Layers to manage groundwater contamination.

Hotazel PCD

All dirty water runoff from the hard park areas and Hotazel WRD will be directed to the Hotazel PCD. The Hotazel PCD has a footprint of approximately 0.2 Ha and a capacity of 555 8 m^3. The PCD will be lined with 2mm thick HDPE lining (UV resistant) on top of 2 x 150mm Clay Layers.

Establishment of monitoring boreholes on Devon 277

In order to monitor the groundwater of the historic pit on the Devon 277 property, KMR is planning to establish monitoring boreholes. This will allow KMR to identify whether the existing pit is causing any groundwater contamination as well as to identify whether the area has been rehabilitated properly.

6.2.9 Water balance

A site wide water balance was undertaken as part of the specialist hydrology study. The water balance shows that during the initial years of mining when negligible groundwater inflow to the pits is expected, makeup water will be required during the dry season but excess water is anticipated during the wet season. During the later years when groundwater inflows are higher, excess water is anticipated in both the wet and the dry season.

6.2.10 Pipelines

Current pipelines

The groundwater quality is not suitable for potable water therefore potable water will sourced from the Sedibeng Vaal-Ga Mogara pipeline. Kudumane has a signed contractual agreement with Sedibeng Water for an annual off-take of 40 000 m^3 per annum (with a minimum of 32 000 m^3 per annum).

Water for construction purposes will be sourced from the infrastructure which has already been established on site.

2021 proposed pipelines

Potable water tank and pipeline

The KMR mine has one main water source which is from the Sedibeng Municipal inlet. Domestic water use is the KMR mines main water consumption. The KMR lodge located on the York Farm utilises the water from the Sedibeng pipeline. The KMR mine reservoir is also filled from the Sedibeng pipeline, and then used to provide water for domestic use in the Change Houses, Stores and Offices.

In order to store more water, a potable water tank will be constructed within the Hotazel operation area. In addition to this, a pipeline will be constructed from the existing York potable water tank to the new Hotazel potable water tank. This pipeline will also connect the Hotazel Potable water tank to the new Kipling Potable water tank.

6.2.11 Roads

Current roads

There is an existing network of roads in the project area that is currently utilised for the current operations. The delivery of consumables and staff will use the R31 from Kuruman and the R380 between Kathu and Black Rock. The N14 from Gauteng will also be used for the transportation of both consumables and product.

As part of the EIA/EMPr conducted in 2010 by Metago, there is an existing internal haul roads which area used to transport material and staff. In addition to these roads, an addition haul road was approved as part of the 2014 EIA/EMPr. This haul road connects the York operations with the Hotazel opencast pit operations.

2021 proposed roads

Construction of haul road (approx. 1.2km)

The RoM stored within the Kipling area will be transported via truck to the York operations for crushing. Due to this, the haul road which connects the York operations and the Hotazel operations will be extended to connect the Hotazel operations with the Kipling operations.

Construction and upgrading of access gravel road to Kipling 271 administration offices

The Kipling Offices will mainly be located on the northern side of the R380 in order to comply with the blasting regulations. Due to this, an additional access road is required which will be accessed via the town of Hotazel. The proposed road will be gravel and will only be accessed by KMR employees.

Rehabilitation of Road

Currently there is a road which was previously developed as a haul road to transport ore from the Hotazel Pit to the York processing facilities. Based on the proposed location of the waste rock dump, certain part of this road will need to be rehabilitated prior to the placement of the waste rock.

6.2.12 Disturbance of water courses

Current situation

The Ga-Mogara river, a major river within quaternary catchments D41K and D41J, is the closest watercourse to KMR. Previously, the approved project did not affect or disturb the watercourse. It is important to note, as part of this EIA/EMPr the Ga-Mogara river will be disturbed as an attenuation dam will be developed to prevent potential water flowing into the Hotazel opencast pit expansion area.

2021 proposed attenuation Dam

Attenuation dam within the Ga-Mogara River

KMR is exploring the viability of extending the open pit mining operations in a westerly direction at the Hotazel Pit, within the 1:100-year floodline. The extension of the pits is restricted by a drainage channel of the Ga-Mogara River on the western side. An options analysis was conducted by SRK in 2020 to identify the most feasible option to mine through the river. The possible diversion options include attenuation ponds, diversion channels with different alignments and the combination of the channels and ponds.

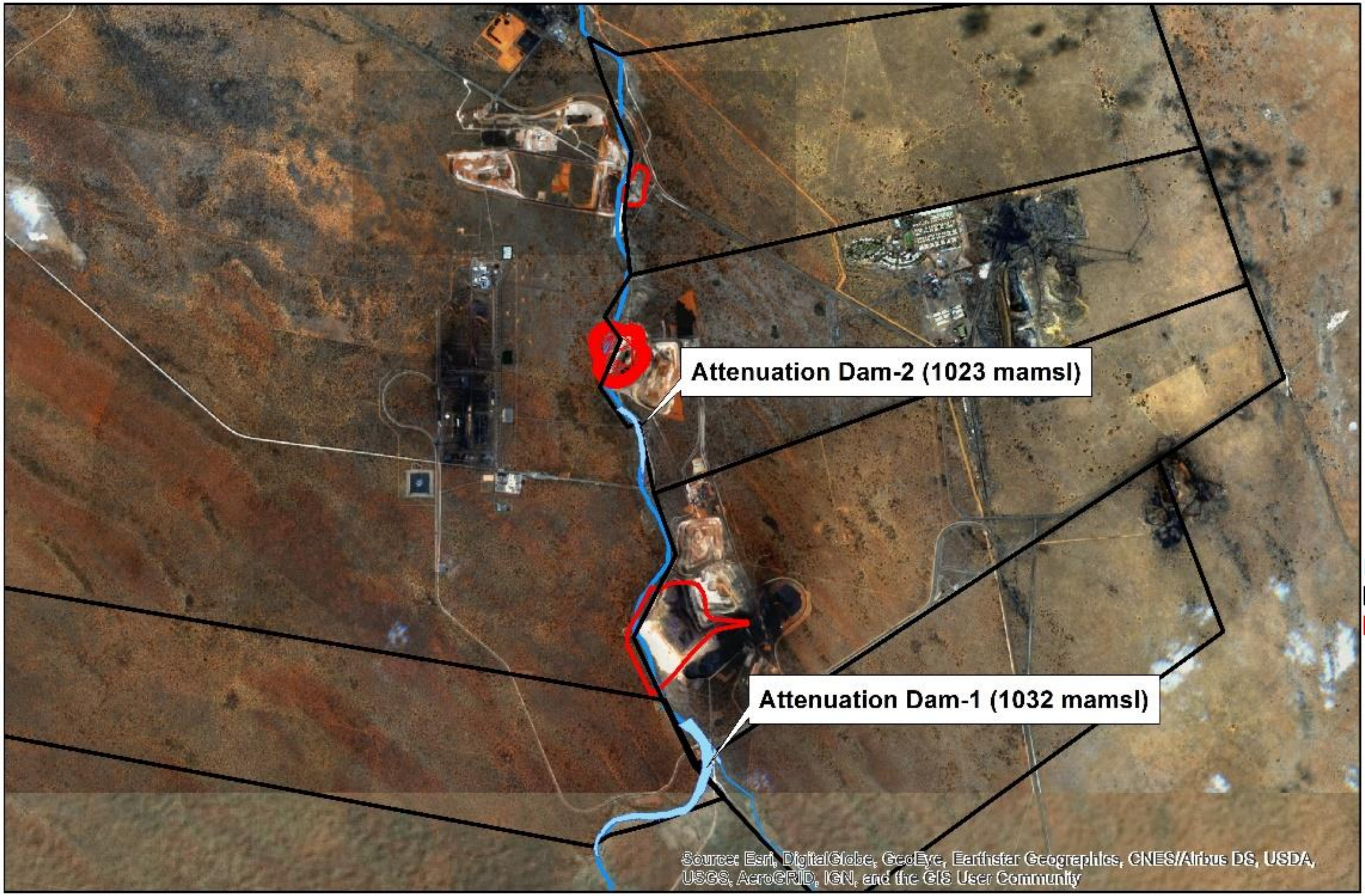
Within the options analysis study, both diversion and attenuation dam options were studied for Hotazel and York open pit areas at Ga-Mogara riverbed. Some of the options include only diversion channels, and also the combining the channels and attenuation dams were also evaluated. The recommended option was selected to construct attenuation dams along the Ga - Mogara River upstream of the site and store a certain portion of the flood water. It was identified that it was not practical to store some portion of the flood water volume within the ponds.

Since the project area is located in the low-rainfall zone and the soil is very sandy, the rainfall-runoff is minimal in the vicinity of the project area. The most recent flow in the stream bed was observed in the late 1970s and 1980s at project area.

Planned attenuation dam information is summarized in Table 6-4, and locations are shown in Figure 6-6.

Table 6-4: Attenuation Dam Summary Information

Pond ID	Site	Crest Elv. (mamsl)	Min. Elv. (mamsl)	Max. Wall Height (mamsl)	Dam Length (m)	Pond Surface Area (m²)	Storage Volume (m³)
Dam_2_1023	Hotazel	1023	1019.7	3.3	90.2	68534.4	59542.1



Legend
- Attenuation Dams
- Mining Rights
- Pit Extension Areas

Data Source: ESRI Basemap	
Scale 1:87,185	
Projection: UTM	Datum: WGS84
Central Meridian/Zone: 34 South	
Date: 06/09/2021	Compiled by: OZKM
Project No. 549507	Fig No. XX

srk consulting

KUDUMANE EIA

Attenuation Dams

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Revision: B Date: 06 09 2021

6.2.13 Non-mineral waste

Current non-mineral waste

General and hazardous waste

The types of wastes that area currently anticipated at the KMR operations:

- general waste such as office waste, building rubble, scrap metal and rubber, glass, plastic, wood, garden waste, food waste and uncontaminated PPE; and
- hazardous waste such as electrical/plastic/material off-cuts, used oil and grease, used chemicals, polluted soil (from accidental spills), paints and solvents, medical and laboratory waste, explosive packaging, contaminated metals, plastic, rubber.
- General and hazardous waste generated on site will be temporarily handled and stored on site before being removed by contractors for reuse, or disposal at an appropriately licensed waste disposal facility (Kuruman for general waste and Holfontein for hazardous waste).

Currently, all non-mineral waste is stored at the York operations prior to collection by a licenced disposal company.

2021 Proposed sewerage treatment plant

Sewage treatment plant lilliput system

In addition to the water tank, a sewage treatment plant is proposed for the Hotazel operation area to service the supporting infrastructure at the Hotazel pit. The sewage treatment plant will be a Lilliput system treatment plant.

6.2.14 Workshops, administration and other buildings

Current supporting infrastructure

Currently, all administrative activities are conducted at the York operations. The only buildings associated with the Hotazel operations are workshops and supporting buildings such as security and facilities such as toilets. It is anticipated that these workshops and offices will be relocated to the Kipling Offices once constructed.

2021 proposed supporting infrastructure

Supporting infrastructure at the Kipling Offices

In order to support the mining operations at the Kipling mine, various supporting infrastructure will be required. In addition to this, the Hotazel offices which are currently located next to the Hotazel opencast pit will be relocated to the new Kipling offices. The following infrastructure will form part of the Kipling Offices:

- Sewerage Treatment Facility (Lilliput System)
- Potable water pipeline from the York A 279 potable water tank to the proposed Hotazel 280 potable water tank to the new Kipling 271 potable water tanks.
- Administration Offices
- Diesel bay and fuel storage
- Waste storage area
- Ancillary infrastructure (e.g. Weighbridge)
- Powerlines and associated infrastructure

Relocation of administration offices from Hotazel 280 to Kipling 271

Based on an inspection from the DMRE, it has been identified that the Hotazel Admin offices are within the blasting zone which is not in line with the safety regulations. Due to this, once the offices at Kipling have been constructed the admin office and employees will be relocated to the Kipling Offices. Once the supporting infrastructure has been relocated the Kipling property, the Hotazel Office will be removed.

Establishment of explosive magazine on Devon 277

The main area of development on Devon will be the construction of an explosive magazine to store the explosive material used for blasting in the mining operations. Refer to Figure 6-7 for the proposed explosive magazine layout. The final location of the proposed explosive magazine is still under investigation.

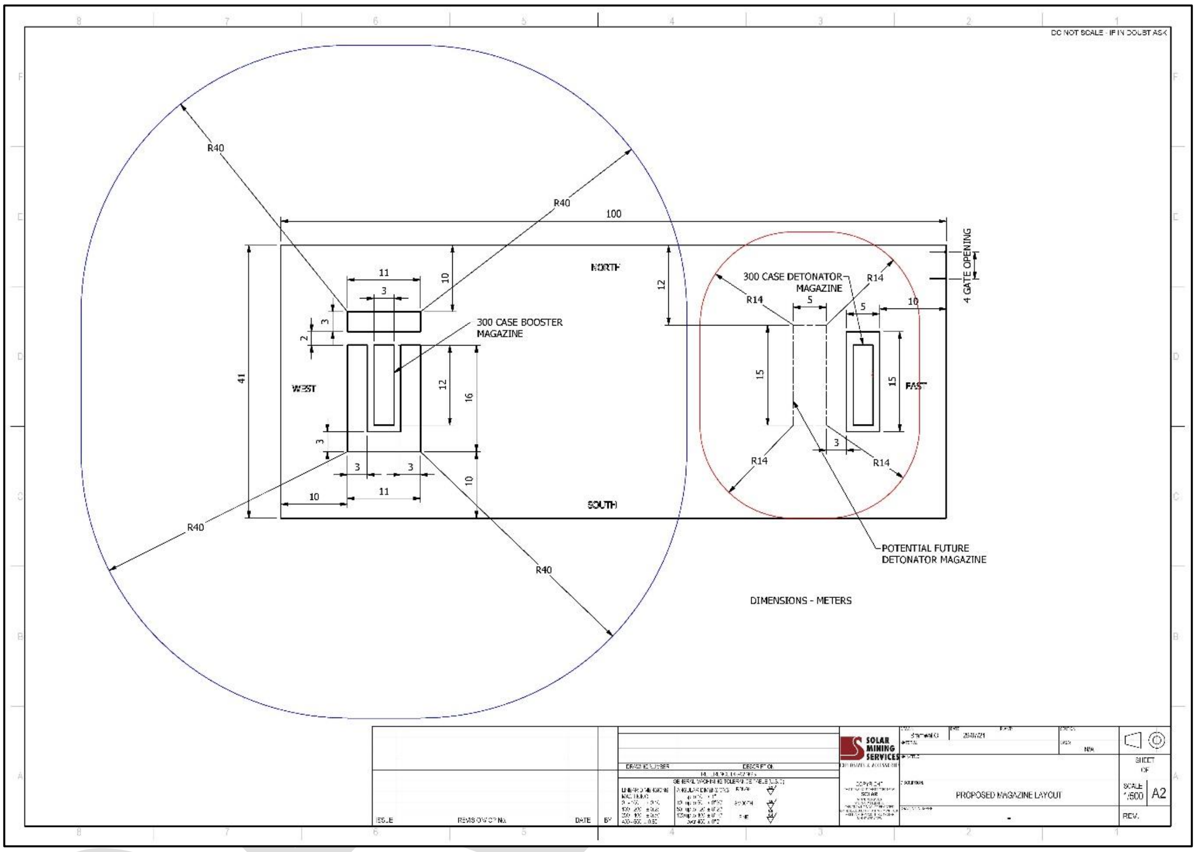

Figure 6-7: Proposed explosive magazine layout

7 Need and Desirability of the Proposed Activities

The expansion of the opencast pit, the associated secondary infrastructure (such as waste rock dumps, attenuation ponds and ore stockpiles) and supporting services, will assist KMR to optimise the mineral extraction and processing of the manganese resources located within its Mining Rights areas.

7.1 Mining benefits

The mineral extraction at KMR is considered by the company to be in the best interest of the public at large as it will generate earning power both locally and internationally. These benefits should be viewed against the absence of significant alternative employment opportunities in the area.

Manganese is sold both locally and overseas and therefore, the mine is an earner of foreign exchange for South Africa. In addition, the mine also has a positive impact on the economic growth of the Northern Cape Province, particularly in the communities around the mine (Hotazel and Black Rock) and through its rates and taxes to the National fiscus.

The current LoM is estimated to be 22 years (end 2043). During the EIA phase the number of months/years the LoM will be extended by will be calculated and provided to all stakeholders.

7.2 Environmental responsibility

KMR currently operates under two existing EMPrs under NEMA and the MPRDA. During this integrated EA process, the approved EMPr will be amended to include the activities and infrastructure associated with the expansion of the KMR mining operations.

The document will therefore contain management measures for the purpose to avoid, minimise and reduce the potential negative impacts on the environment, as a result of the current and proposed mining and processing operations at KMR.

KMR is also operating under a WUL (No. 07/D41K/ABCFGIJ/4533) and WUL amendment. As part of these authorisations processes KMR is required to conduct monthly water quality monitoring against drinking water standards.

The EMPr, WUL and WUL amendment is subject to internal and external audits.

7.3 Socio-economic benefits

KMR is considered to have a positive socio-economic benefit through employment of locals. Unskilled and semi-skilled labour is sourced mainly from the local communities and surrounding areas and recruitment is in conjunction with the local unemployment forum. Specialist and skilled labour are recruited outside the local boundaries when required due to skills scarcity.

Mining is one of the major employers within the area with many other mining companies between the towns of Hotazel and Kathu. If the proposed KMR Expansion Project is authorised and implemented, it will extend the life of the operation, which will lead to direct and indirect benefits to society and the surrounding communities. Direct economic benefits may be derived from retaining and creating new employment opportunities, wages, taxes and profit. Indirect economic benefits may be associated with the procurement of goods and services.

7.4 Employment and local procurement opportunities

All labour requirements associated with the proposed KMR Expansion Project will be prioritised for local temporary employment. External labour will only be sourced if semi-skilled and skilled positions are not available locally. The employment opportunities will be determined during the impact assessment phase, in respect of the construction, operational and closure/rehabilitation phases of the project

7.5 No-Go option

The socio-economic impacts of cessation or curtailing of operations at KMR include the following local, regional and national impacts:

- Local and regional: planned socio-economic initiatives within the surrounding communities (refer Section 7.3 above) would not be able to go ahead and employees and contractors' workers would be impacted; more than half of whom are semi-skilled/unskilled and thus would not easily find alternative employment; and
- National: Reduction in foreign exchange for South Africa will be incurred due to the decrease in mine product sales internationally.

The cessation or curtailing of the KMR will also mean that ore reserves would remain underutilised, adding to the employment and local economic opportunities and revenue that would be lost.

8 Period for which the Environmental Authorisation is Required

It is envisaged that the construction of the infrastructure associated with the proposed KMR Expansion Project will take approximately 2 to 3 years, with the expected operational, closure and post-closure timeframes associated with these project phases being in line with KMR's current Mining Right up to 2043.

9 Project Timeline

It is anticipated that early works and construction will commence in March 2021 and will continue until 2022. Construction will take place during daylight hours (i.e. 06h00 to 18h00) from Monday to Saturday, with the possibility of certain activities taking place on 24 hours per day, 7 days per week basis.

The operational phase will commence after construction of the project infrastructure has been completed and will continue in line with current LoM as detailed in Section 8.

10 Motivation for the Preferred Development Footprint

Project alternatives were considered during the compilation of the Hotazel operations' approved EMPr (SLR, 2014). Alternatives considered in the approved EMPr included:

- Mineral processing method;
- Surface infrastructure layout alternatives including the location of product stockpiling and dispatch facilities and site access alternatives;
- Water supply alternatives;
- Power supply alternatives;
- Waste management alternatives such as domestic and industrial waste, mining residue management and sewerage sludge alternatives;
- Air quality management alternatives including dust suppressions, dust extraction and a combination of the two alternatives; and
- The 'no-go' alternative

As the key infrastructure related to the proposed KMR Expansion Project is an expansion of existing infrastructure and need to be positioned in close proximity, location alternatives were not considered.

The location of the various activities and infrastructure associated with the proposed KMR Expansion Project are constrained to the location of the mineral resource, existing infrastructure and practical operational requirements located on Hotazel, Devon and Kipling. As such, no property or site alternatives were deemed viable for the proposed KMR Expansion Project.

The location and mining method of the existing Hotazel pit operation and proposed Kipling pit operation are directly linked to the location and extent of the mineral reserve in the area. Therefore the only alternatives that will be considered as part of the Proposed KMR Expansion Project are the location of the project related infrastructure and the water management strategy that will be implemented to allow for the expansion of the Hotazel Pit into the Ga-Mogara River.

Engineering details associated with these alternatives are being refined and will be reported on in full detail during the impact assessment phase..

10.1 Property alternatives

The location of the proposed KMR Expansion Project components is constrained to the location of the existing infrastructure as well as the mineral resource. As such, no property alternatives were deemed viable.

The position of the proposed project required infrastructure was also influenced by the existing and future blasting zone associated with the Hotazel and Kipling pit operations.

10.2 Technology alternatives

Technological alternatives were considered for the proposed KMR Expansion Project. The existing technology utilised by KMR and their existing operations will be utilised for the expansion activities.

10.3 Operational alternatives

The only operational alternative that have been investigated is the way water will be managed in and around the proposed extended opencast pits. As indicated in Table 6-3, the Hotazel pit is proposed to be expanded beyond the 1:100-year floodline of the Ga-Mogara River. The mine therefore had to determine whether the Ga-Mogara River would need to be diverted or altered to allow for the continuous and safe mining of the ore within the pit.

The alternatives that have been considered in respect of opencast mining alongside the Ga-Mogara River, consisted of the following options:

- Develop of two large ponds with higher dam bodies within the river system upstream and adjacent to the pits;
- Develop four smaller ponds with lower dam bodies within the river system upstream; and
- Various combinations of single or multiple diversion channels, without and with large ponds included.

Based on investigations, it was decided that two attenuation dams along the river course will be the best option, one along the York pit and one along the Hotazel Pit (this application). This will entail the construction of dams along the river course to attenuate the flow before it reaches the opencast pit areas. This option does not include any diversion channels.

Since the project area is located in the low-rainfall zone and the soil is very sandy, the rainfall-runoff is minimal in the vicinity of project area. However, in January 2021 a tropical storm (Eloise cyclone) reached the Northern Cape and as a result of this extreme weather feature, the Ga-Mogara River filled beyond its brim. However prior to the cyclone, the river was observed flowing in the late 1970s and 1980s. The capture and attenuation of flowing upstream ponds is technically a good option and if the ponds overflow, the open pit operation can be suspended until the storm has abated. Refer to Appendix F for the Option analysis which was conducted for the attenuation dams.

In summary, Table 10-1 provides a list of pros and cons that might be associated with the proposed attenuation dam option.

Table 10-1: Pros and cons associated with the attenuation dams option to allow for the expansion of the opencast pits into the Ga-Mogara River

Pros	Cons
• Less disturbance of biodiversity and environmental impact • Reduced erosion • Can be combined with the diversion channels	• Impact to downstream water users, as water will not flow in the river below the pits • Increased sedimentation due to ponding of water • Change in biodiversity due to increase ponding of water • During high rainfall events and flow rate above the thresholds mentioned above, the flow might end up at

• Since there is no diversion channel and excavation this is the cheapest option • Attenuating the flow will delay the flow into the open pit area and will give time to evacuate the pit if necessary • By reducing the amount of discharge, allows for smaller structures downstream	pit area and can cause a temporary closure of operations • Upstream of the pond area has private properties that are located within the river basin • Permissions required to authorise this option should be discussed and investigated for motivation with the relevant authority

10.4 No-Go alternative

Refer to Section 7.5 for details regarding the "No-Go option". The project relates to the expansion activities to the existing KMR Mining Right and as such no alternatives were applicable.

11 Details of the Public Participation Process

11.1 Objectives of public participation

The objectives of public participation for the various phases of the environmental authorisation process are presented in the sections below.

11.1.1 During pre-application

The objectives of the stakeholder engagement during pre-application phase are to introduce the project to stakeholders and to inform them that an environmental authorisation process will be followed.

11.1.2 During scoping phase

The objectives of public participation during scoping phase are to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner to enable them to raise comments, issues of concern and suggestions for enhanced benefits. I&APs will also have an opportunity to provide input into the terms of reference (ToR) for the specialist studies, and to contribute relevant local and traditional knowledge to the environmental assessment.

11.1.3 During impact assessment phase

The objectives of public participation, during the EIA phase, are to verify that registered I&APs issues have been considered in the environmental assessment and to comment on the findings of the environmental assessment, including the potential negative and positive impacts and the proposed management measures.

11.1.4 During the decision-making phase

Following the outcome of the decision-making process by authorities, registered I&APs will be notified of the outcome and how and by when the decision may be appealed, should they wish to.

Public participation throughout the integrated environmental authorisation process is shown in Figure 11-1.

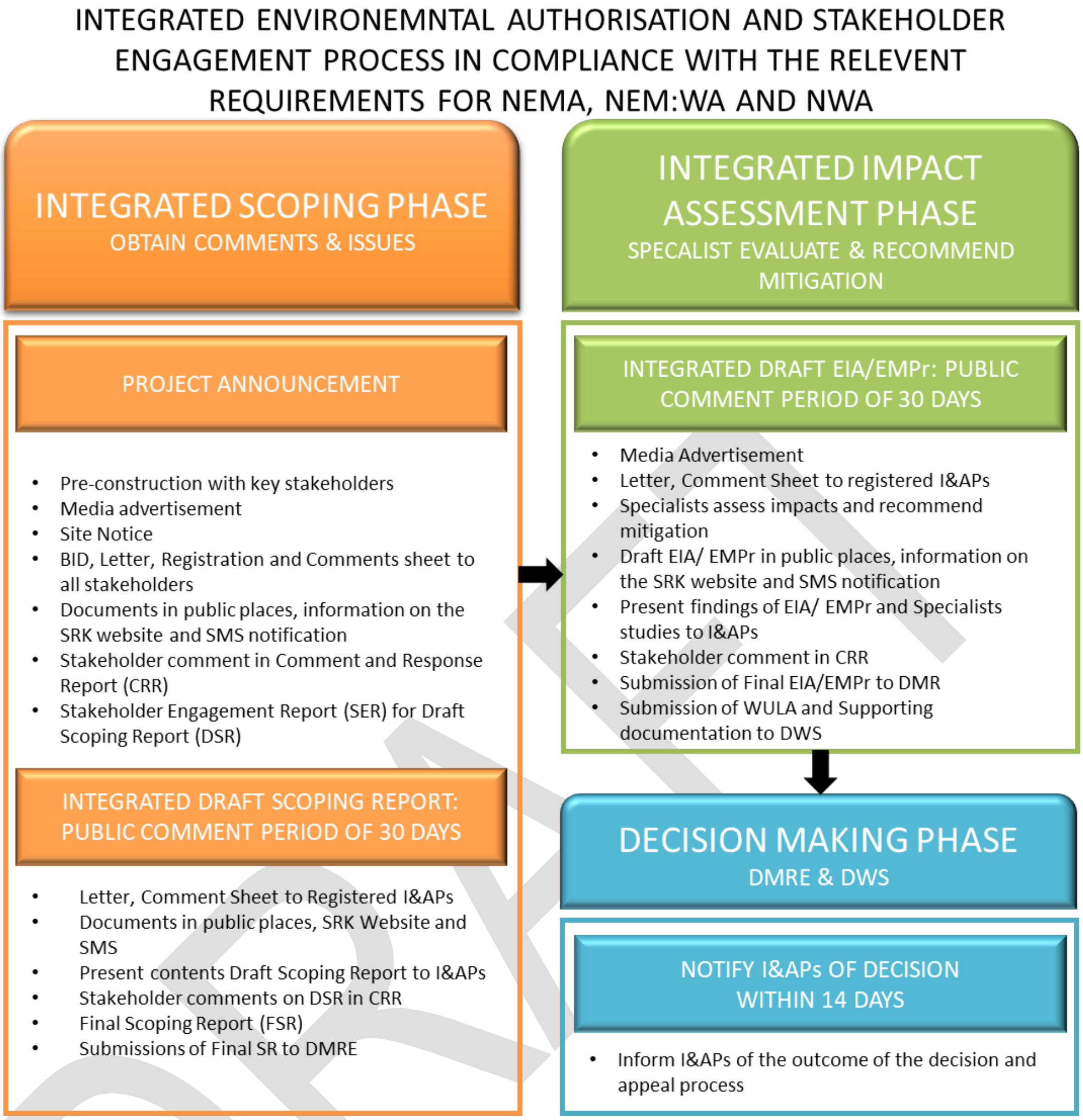

Figure 11-1: Public participation throughout the integrated environmental authorisation process

11.2 Stakeholder identification

The NEMA EIA Regulations (GN R 982 amended) require identification of and consultation with communities and interested and affected parties (I&APs). In terms of Section 24 0 (2) of NEMA, specific state departments were identified and recognised as commenting authorities on aspects of the proposed Expansion Project. Representatives from these departments are included in the stakeholder database.

I&APs identified in previous environmental authorisations processes, together with lists of stakeholders that KMR has regular contact with, and networking and referral formed the basis for the development of the stakeholder database.

The stakeholder database will be reviewed and updated after each round of engagement during the environmental authorisation process. Box 1 provides more information regarding the distinction between I&APs and registered I&APs.

Box 1. Distinction between I&APs and Registered I&APs

The NEMA Regulations (GN 982 amended) distinguishes between I&APs and registered I&APs.

I&APs, as stated in Section 24(4)(d) of the NEMA include: (a) any person, group of persons or organisation interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity.

In terms of the Regulations "***registered interested and affected parties"*** means:

An interested and affected party whose name is recorded in the register opened for that application.

For that purpose, an EAP managing an application must open and maintain a register which contains the names, contact details and addresses of:

(a) All persons who have submitted written comments or attended meetings with the applicant or EAP;

(b) All persons who have requested the applicant or EAP managing the application, in writing, for their names to be placed on the register; and

(c) All organs of state which have jurisdiction in respect of the activity to which the application relates.

11.2.1 Identification of landowners

Details of the landowners relating to the project affected properties were identified through a title deed search. Table 11-1 contains the details of the landowners of the farm portions that relates to KMR's mining right (MR10053).

Table 11-1: Properties associated with KMR's Mining Rights and proposed Expansion Project areas

Farm Name	Farm Portions	SG Code	Owner
Devon 277	Portion RE/277	C04100000000027700000	Kudumane Manganese Resources Pty Ltd
Hotazel 280	Portion RE/280	C04100000000028000002	Kudumane Manganese Resources Pty Ltd
	Portion 4/280	C04100000000028000004	Kudumane Manganese Resources Pty Ltd
Kipling 271	Portion RE/271	C04100000000027100000	ASSMANG LTD

11.2.2 Identification of District and Local Municipalities

The project area falls within the jurisdiction of the John Taolo Gaetsewe District Municipality and the Joe Morolong Local Municipality in the Northern Cape Province. Details of the relevant municipalities and respective ward councillors are provided in Table 11-2.

Table 11-2: District and Local Municipalities

Municipality	Contact Person	Designation	Contact details
John Taolo Gaetsene District Municipality	Mr Klaas Teise	Director Development Planning	053 712 8700 teisek@taologaetsewe.gov.za
Joe Morolong Local Municipality	Mr Kemothibile Phiri	Director Planning and Development	053 773 9300 bakangs@joemorolong.gov.za

11.2.3 Identification of relevant government departments

The competent authority applicable to the EA process associated with the proposed KMR Expansion Project is the DMRE and contact details are provided in Table 11-3. Information of DWS is also provided in Table 11-3 as the competent authority in respect of the WULA process associated with the KMR Expansion Project.

Table 11-3: Contact details for the competent authority

Department	Contact Person	Office Telephone Number
DMRE - Northern Cape Office	Mr V Muila &Mr. J Nematatani	053 807 1716
DWS – Northern Cape	Mr A Abrahams	053 830 8803

11.3 Introductory meetings with key stakeholders

Figure 11-2 summarises the integrated EA processes and public participation which is currently being undertaken The phases of public participation are described in more detail in the following sections.

11.3.1 Announcement

The project was announced to the public from **18 June 2021**. I&APs were notified of the opportunity to comment on the proposed KMR Expansion Project and to register as an I&AP via various engagement methods (see Appendix G for copies of all notification materials).

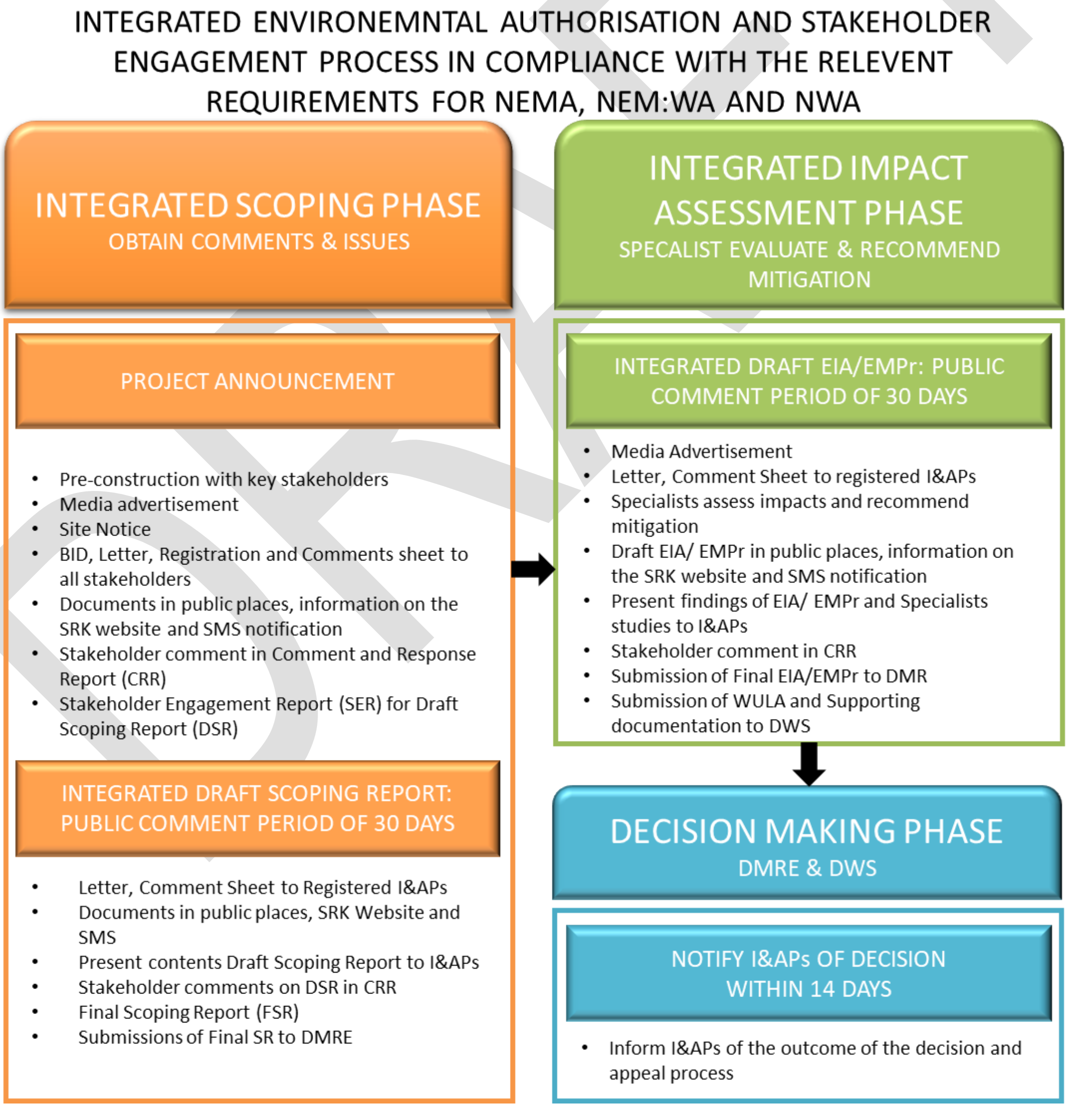

Figure 11-2: Public participation throughout the integrated environmental authorisation process

11.3.2 Meetings with local authorities

Details of meetings held with the authorities during project announcement are shown in Table 11-4.

Appendix H contains the notes arising from the meeting with DMRE.

Table 11-4: Meeting details with local authorities

Meeting details	Venue	Number of attendees
DMRE Pre-Application Meeting 17 February 2021	DMRE Offices, Northern Cape	4
DMRE Clarification Meeting 8 July 2021	DMRE Offices, Northern Cape	5

A meeting will be scheduled with DWS as part of the WULA process.

11.3.3 Opportunities to comment

I&APs are encouraged to submit their written comments to SRK's stakeholder engagement office through the contact details provided in the stakeholder letters, BIDs and comment sheets. I&APs can also fill in comment forms at one of the public places, contact the SRK stakeholder engagement team via telephone, email or fax to submit comments and to discuss any issues of concern.

All comments raised by I&APs throughout the process will be recorded and included in the Final EIA/ EMPr.

11.4 Availability of the draft scoping report for public comment

The DSR was made available for public comment from 30 August to 29 September 2021. The availability of the DSR and details relating to the public engagement meetings were announced as follows:

- Distribution of a letters to I&APs, accompanied by a registration and comment form (in English and Setswana), inviting I&APs to comment on the DSR and to register as an I&AP;
- Notification of I&APs regarding report availability via site notices, SMS, email and letters;
- Advertisement in the Noordkaap Bulletin (in English and Afrikaans); and
- Posting the DSR, announcement letter and comment form on the SRK website (https://docs.srk.co.za/en/za-kmr-expansion-project) and at public places.

Public meetings have not been organised for the Scoping phase of this project in light of the current COVID health risks. However, as part of the Draft Scoping Report process if any stakeholders wished to raise queries or questions this could be discussed telephonically, or an online meeting could be scheduled.

No stakeholders requested an online meeting as part of the Draft Scoping Phase.

11.5 Availability of the draft environmental impact assessment report and environmental management programme for public comment

The draft EIA/EMPr was made available for public comment from **11 October 2021 to 11 November 2021**. The availability of the Draft EIA/EMPr and details relating to the public engagement meetings will be announced as follows:

- Distribution of a letters to I&APs, accompanied by a registration and comment form (in English and Setswana), inviting I&APs to comment on the Draft EIA Report and to register as an I&AP;
- Notification of I&APs regarding report availability via site notices, SMS, email and letters;
- Advertisement in the Noordkaap Bulletin (in English and Afrikaans); and

- Posting the Draft EIA Report, announcement letter and comment form on the SRK website (https://docs.srk.co.za/en/za-kmr-expansion-project) and at public places.

Should an online meeting be request, the date and time of the online meeting will be communicated to all I&APs via sms and email

11.6 Comment and response report

A summary of the project related comments received to date have been included in the Comment and Response Report (CRR) in Appendix G. The CRR will be updated with comments received during the 30-day public review period of the Draft EIA/ EMPr and included in the Final EMPr/ EIA to be submitted to the DMRE.

11.6.1 The Protection of Personal Information Act 4 of 2013 (POPIA)

The Protection of Personal Information Act 4 of 2013 (POPIA), which aims to promote protection of personal information, came into effect on 1 July 2021. The EIA Regulations, 2014 require, inter alia, transparent disclosure of registered stakeholders and their comments. In terms of the EIA Regulations, 2014, stakeholders who submit comment, attend a meeting or request registration in writing are deemed registered stakeholders who must be added to the project stakeholder database. By registering, stakeholders are deemed to give their consent for relevant information (including contact details) to be processed and disclosed, in fulfilment of the requirements of the EIA Regulations, 2014 and the National Appeal Regulations, 2014.

11.7 Summary of previous stakeholder engagement processes

During the EIA/ EMPr process, which was undertaken in 2014 by SLR, various issues were raised and addressed as part of the process. These issues and responses are detailed below:

- Establishment of mining forum
- Impact the mine will have on the surrounding communities specifically the town of Hotazel
- Potential groundwater impacts
- Potential surface water impacts
- Blasting damage
- Potential waste management issues
- Land claim concerns
- Establishment of a fire protection unit
- Influx of job seekers

12 Environmental and Social Attributes

12.1 Climate and meteorology

The information presented in this section is extracted from the Surface Water specialist study undertaken by SRK Consulting (Pty) Ltd in 2021 as well as the Air Quality specialist by AirShed in 2021 (Appendix I).

12.1.1 Regional climate

The KMR mine falls within the Northern Steppe climatic zone as defined by the South African Weather Service (SAWS). The general characteristics of the area is defined as a semi-arid region, which is associated with low rainfall, but high temperatures and evaporation. The Ga-Mogara catchment is classified as endoreic, with large areas which do not contribute to the overall catchment runoff within the water course. Based off temperature data from The Prediction of Worldwide Energy Resource (POWER) Project, which is funded through the NASA Applied Sciences Program, the average annual temperature in the region is around 19 ºC. As evident from the KMR mine Automatic Weather Station (AWS), temperatures can reach as high as 41 ºC during summer and can be as low as -5 ºC during the middle of winter. The mean, maximum and minimum monthly temperatures are presented in Table 12-1 for the period from July 2019 to July 2021 from the KMR mine's AWS. The prevailing wind direction at the KMR is from the south (17 %) and south west (12 %). The southern wind vector prevails 54 % of the time, with the northern wind vector prevailing 38 % of the time.

Table 12-1: The monthly average, maximum, and minimum temperatures and windspeed observed at the Kudumane Manganese Resources mine automatic weather station from the 5th of July 2019 till the 21st of July 2021.

Month	Average Temperature (ºC)	Maximum Temperature (ºC)	Minimum Temperature (ºC)	Average Windspeed (m/s)
January	27.9	40.9	14.1	3.40
February	26.8	39.4	13.9	3.03
March	24.9	37.4	11.2	2.79
April	22.1	36.3	8.6	1.90
May	16.4	30.8	-1.8	1.45
June	13.5	30.6	-4.3	2.01
July	13.0	28.7	-5.2	2.24
August	15.8	33.3	-1.7	2.42
September	21.0	37.7	-0.4	3.39
October	25.8	41.1	5.8	3.66
November	27.9	42.5	12.6	4.27
December	27.5	41.7	11.8	3.45

12.1.2 Rainfall and evaporation

Rainfall data was only available from the AWS located at the KMR mine from July 2019 till July 2021, with a total of 121.6 mm recorded for the 2019 hydrological year (October to September). Due to the short data record, rainfall data was sourced from rainfall stations located within the upstream catchment. Five SAWS stations were located within the quaternary catchments D41K and D41J, with records available from 1920 to 2009. These records were abstracted from the daily rainfall utility software and the Water Resources of South Africa 2012 Study (WR2012) database, which both utilises the same SAWS data record. According to the WR2012, quaternary catchments D41K and D41J have a Mean Annual Precipitation (MAP) of 344 mm and 358 mm respectively. A decrease in the MAP is prevalent from east to west. Western rainfall stations beyond the boundary of the Ga-Mogara catchment have a higher MAP greater than 450 mm, while rainfalls stations to the east of the Ga-Mogara catchment have a MAP of less than 300 mm. Topographical patterns and elevation changes affect the spatial distribution of the rainfall characteristics. The majority of rainfall (85 %) falls between November and April during the wet season, while only 15 % falls during the dry season. On average, it can be expected to have 4 rain days a month during the wet season and 1 rain day a month during the dry season.

The 3 wettest months of the year are January, February, and March.

Table 12-2: The average monthly precipitation for the five SAWS stations located within the Ga-Mogara River catchment, as well as the WR2012 quaternary catchment rainfall dataset for D41K and D41J.

Month	0393083 W (Milner) 1931-2009	0392148 W (Winton) 1926-2009	0356636 W (Deben) 1925-2009	0356285 W (Hopkins) 1920-2009	0357592 W (Branksea) 1920-2009	WR2012 (D41K) 1920-2009	WR2012 (D41J) 1920-2009
October	20.4	17.1	21.0	19.5	15.2	19.0	19.7
November	33.8	26.1	27.2	27.3	33.0	30.0	31.3
December	47.4	44.2	40.7	44.3	46.0	44.7	46.5
January	68.4	62.3	57.9	60.6	58.8	61.5	64.0
February	61.6	61.2	52.6	61.8	66.4	60.1	62.6
March	67.1	57.4	58.8	67.8	71.7	63.6	66.1
April	35.6	31.4	28.1	34.9	35.6	32.3	33.7
May	15.9	13.6	12.3	14.7	17.9	14.2	14.8
June	6.3	4.1	5.3	4.7	5.6	5.0	5.2
July	1.9	2.5	2.3	3.0	1.9	2.3	2.4
August	4.0	4.8	6.6	6.1	4.8	5.2	5.4
September	6.0	6.8	7.4	6.8	6.6	6.7	7.0
Annual	368.4	331.5	320.3	351.5	363.6	344.6	358.7

No evaporation data was available from the KMR mine or from any of the SAWS stations within the catchment area. Thus, the WR2012 database was used for the assessment of evaporation within the region. Both quaternary catchments D41J and D41K fall within evaporation zone 8A with a Mean Annual Evaporation (MAE) of 2351 mm.

Table 12-3: The average monthly Evaporation and Lake Evaporation (S-pan) for zone 8A from the WR2012 database.

Month	Evaporation WR2012 (mm)	Lake Evaporation (mm)
October	269.7	218.4
November	284.0	232.9
December	294.6	244.5
January	276.9	232.6
February	209.9	184.8
March	193.3	170.1

April	144.1	126.8
May	114.7	99.8
June	91.0	77.3
July	106.0	88.0
August	153.8	124.5
September	213.0	172.5
Annual	2351.0	1972.3

12.1.3 Site temperature

Air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the emissions plume and the ambient air, the higher the plume can rise), and determining the development of the mixing and inversion layers.

Monthly mean, maximum and minimum temperatures are given in Table 12-4. Diurnal temperature variability is presented in Figure 12-1. Temperatures ranged between -5°C and 39°C. The highest temperatures occurred in December and January and the lowest in July. During the day, temperatures increase to reach maximum at around 14:00 in the afternoon. Ambient air temperature decreases to reach a minimum at around 06:00 i.e. just before sunrise.

Table 12-4: Monthly temperature summary (AERMET processed WRF data, January 2017 to December 2019)

Minimum, Average and Maximum Temperatures (°C)												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Hourly Minimum	12	12	9	5	0	-3	-5	-4	-4	-1	6	11
Monthly Average	28	27	25	22	17	13	12	14	19	22	25	27
Hourly Maximum	39	37	37	34	30	26	27	30	35	36	38	39

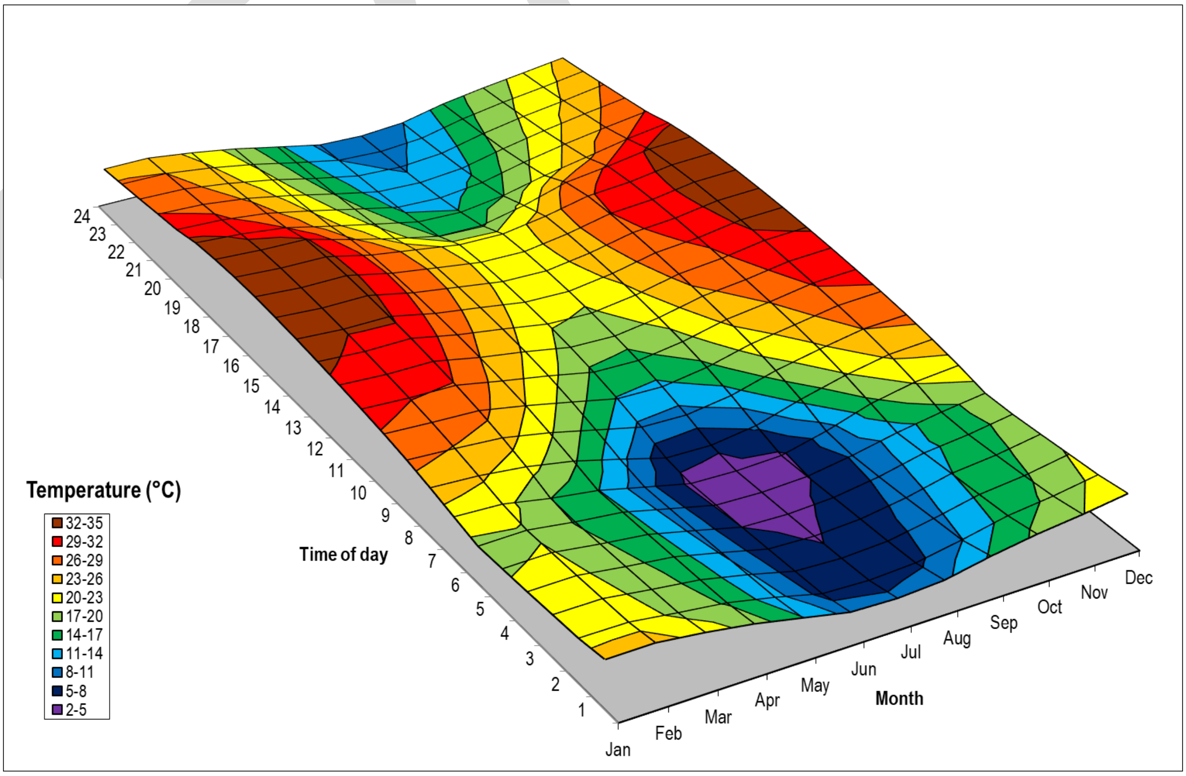

Figure 12-1: Diurnal temperature profile (AERMET processed WRF data, January 2017 to December 2019)

12.1.4 Atmospheric Dispersion Potential

Meteorological mechanisms direct the dispersion, transformation, and eventual removal of pollutants from the atmosphere. The extent to which pollution will accumulate or disperse in the atmosphere is dependent on the degree of thermal and mechanical turbulence within the earth's boundary layer. This dispersion comprises vertical and horizontal components of motion. The stability of the atmosphere and the depth of the surface-mixing layer define the vertical component. The horizontal dispersion of pollution in the boundary layer is primarily a function of the wind field. The wind speed determines both the distance of downwind transport and the rate of dilution because of plume 'stretching'. The generation of mechanical turbulence is similarly a function of wind speed, in combination with surface roughness. The wind direction, and variability in wind direction, determines the general path pollutants will follow, and the extent of crosswind spreading. The pollution concentration levels therefore fluctuate in response to changes in atmospheric stability, to concurrent variations in the mixing depth, and to shifts in the wind field (Tiwary & Colls, 2010).

The spatial variations, and diurnal and seasonal changes, in the wind field and stability regime are functions of atmospheric processes operating at various temporal and spatial scales (Goldreich & Tyson, 1988). The atmospheric processes at macro- and meso-scales need therefore be considered to accurately parameterise the atmospheric dispersion potential of a particular area. A qualitative description of the synoptic systems determining the macro-ventilation potential of the region may be provided based on the review of pertinent literature. These meso-scale systems may be investigated through the analysis of meteorological data observed for the region.

Local Wind Field

The vertical dispersion of pollution is largely a function of the wind field. The wind speed determines both the distance of downward transport and the rate of dilution of pollutants. The generation of mechanical turbulence is similarly a function of wind speed, in combination with surface roughness (Tiwary & Colls, 2010).

The wind roses comprise 16 spokes, which represent the directions from which winds blew during a specific period. The colours used in the wind roses below, reflect the different categories of wind speeds; the yellow area, for example, representing winds between 6 and 8 m/s. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. The frequency with which calms occurred, i.e. periods during which the wind speed was below 1 m/s are also indicated.

The period wind field and diurnal variability in the wind field are shown in Figure 12-2, while the seasonal variations are shown in Figure 12-3. The wind field is dominated by winds from the north-easterly sector. The strongest winds (>6 m/s) occurred mostly from the northerly sectors. Calm conditions occurred 3.66% of the time, with the average wind speed over the period of 4.36 m/s. Wind speeds are stronger during the day but with a higher frequency of calm conditions (4.01% during the day) than during the night (3.31% during the night). Night-time shows dominant north-easterly, east-north-easterly, south-south-easterly and southerly components to the wind field and during the day these winds decrease, and the northerly winds dominate. Strong winds exceeding 6 m/s occurred most frequently during summer and spring, followed by winter. Calm conditions occurred most frequently during the autumn and winter months.

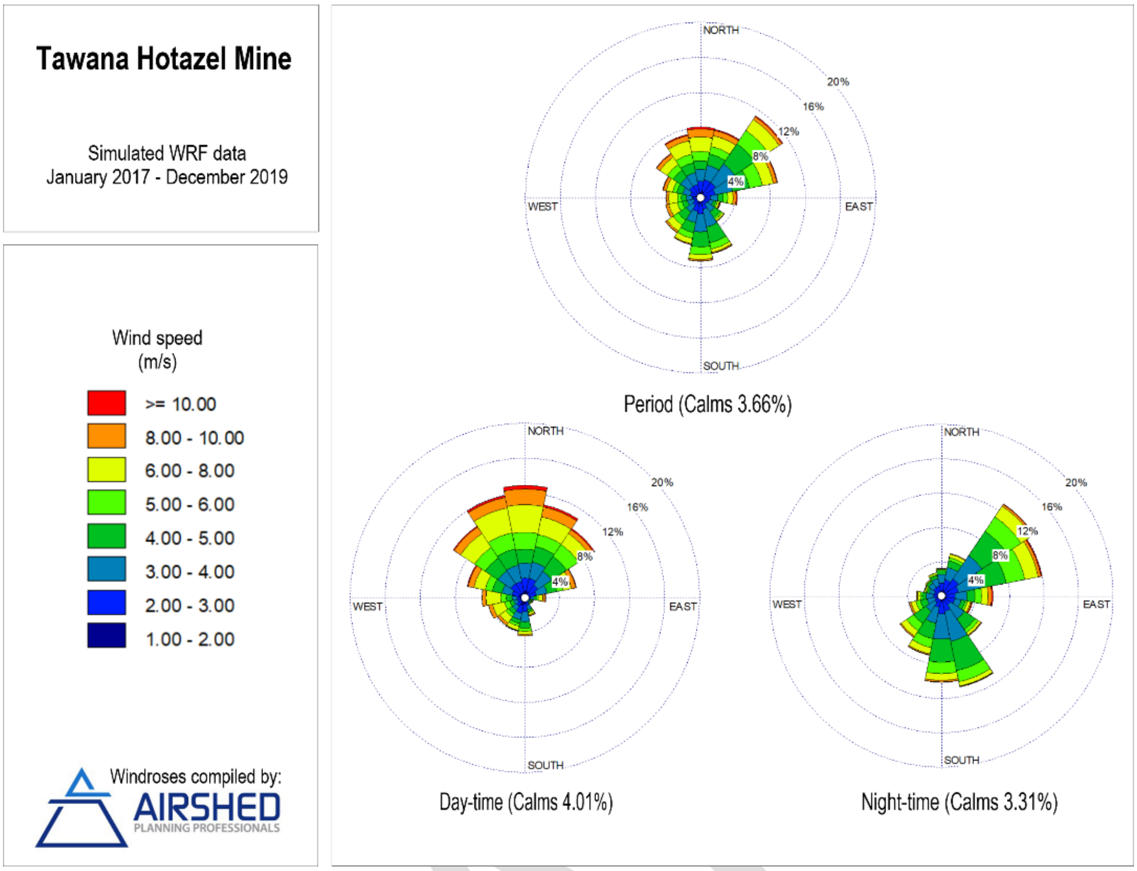

Figure 12-2: Period, day- and night-time wind roses (AERMET processed WRF data, January 2017 to December 2019)

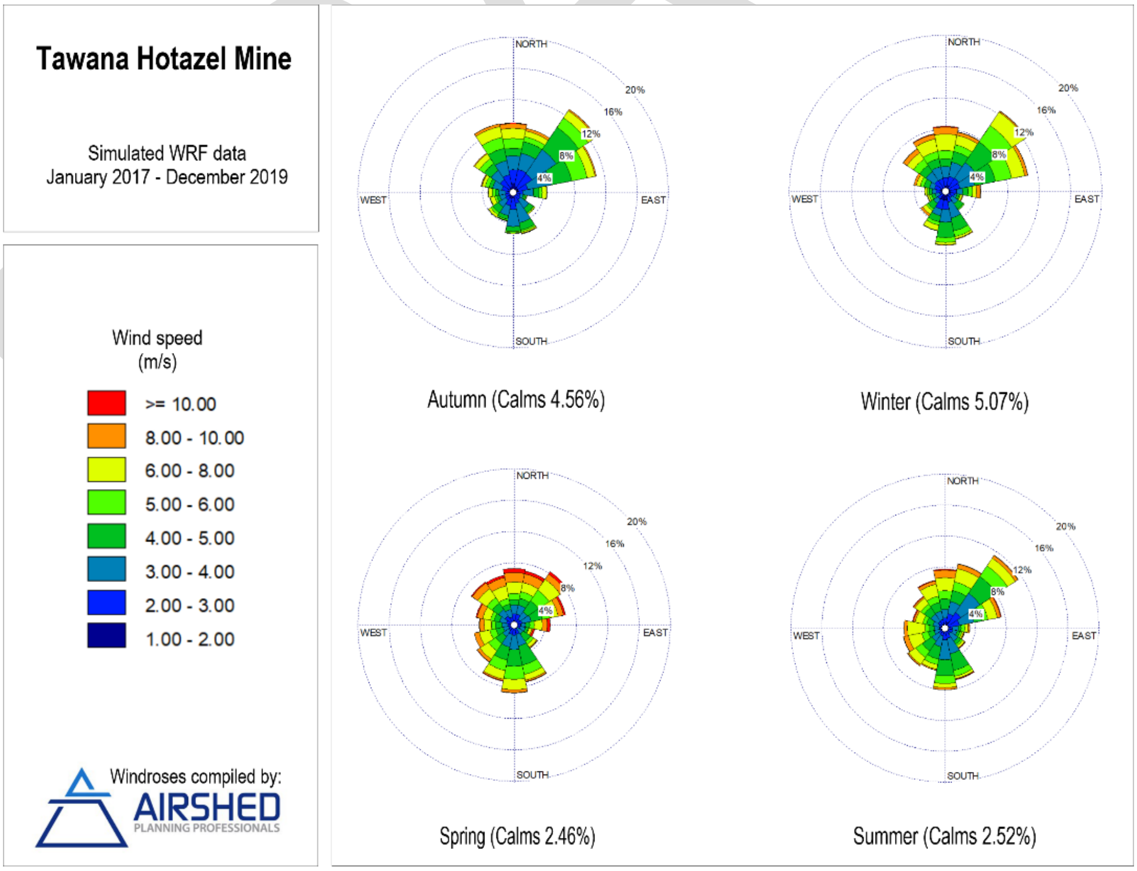

Figure 12-3: Seasonal wind roses (AERMET processed WRF data, January 2017 to December 2019)

12.2 Geology

The information presented in this section is extracted from the Groundwater specialist study undertaken by Delta H as well as the Surface Water specialist study undertaken by SRK Consulting (Pty) Ltd in 2021 (Appendix I).

The Kalahari manganese field, situated some 60 km northwest of Kuruman in the Northern Cape Province, contains the world's largest known land-based manganese deposits (Burger, 1994) (Figure 12-4). Manganese beds are confined to the Hotazel Formation. Together with the overlying carbonate rocks of the Mooidraai Formation, they make up the Voelwater Subgroup, which is a member of the Postmasburg Group of the Lower Proterozoic Transvaal Supergroup. In the central and northern parts of the basin, the Hotazel Formation is separated from the Kalahari Formation by lithologies of the Olifantshoek Supergroup and /or the Dwyka Formation of the Karoo Supergroup.

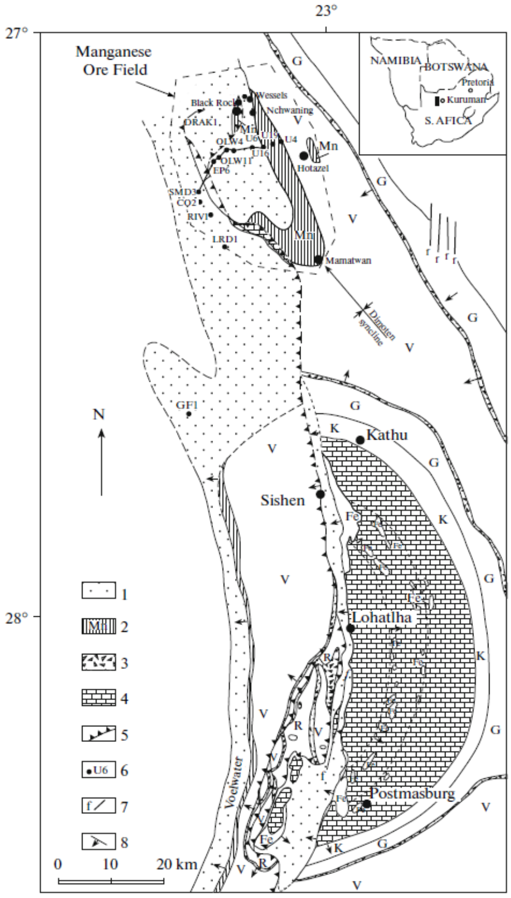

Figure 12-4: Fragment of the paleogeological sketch map of the area of deposits in the Kalahari manganese field and Postmasburg area (pre-Karoo geological time) (Adapted from Kuleshov, 2010).

The Dwyka Formation is in turn unconformably overlain by unconsolidated sediments of the Kalahari Formation composed of calcrete, gravels, clay and aeolian sand up to 125 metres thick. The Hotazel Formation is conformably overlying pillow lava and jaspilites of the Ongeluk Formation. The strata of the Hotazel Formation underlie the Kalahari Formation at a depth ranging from 8–10 to 60–70 m and plunge to west-south west at 5–8 to 10–15° (Figure 12-5). The manganese beds occur interbedded in host rock iron-formation and the ore member includes three (lower, middle, and upper) ore bodies (refer to Figure 12-5).

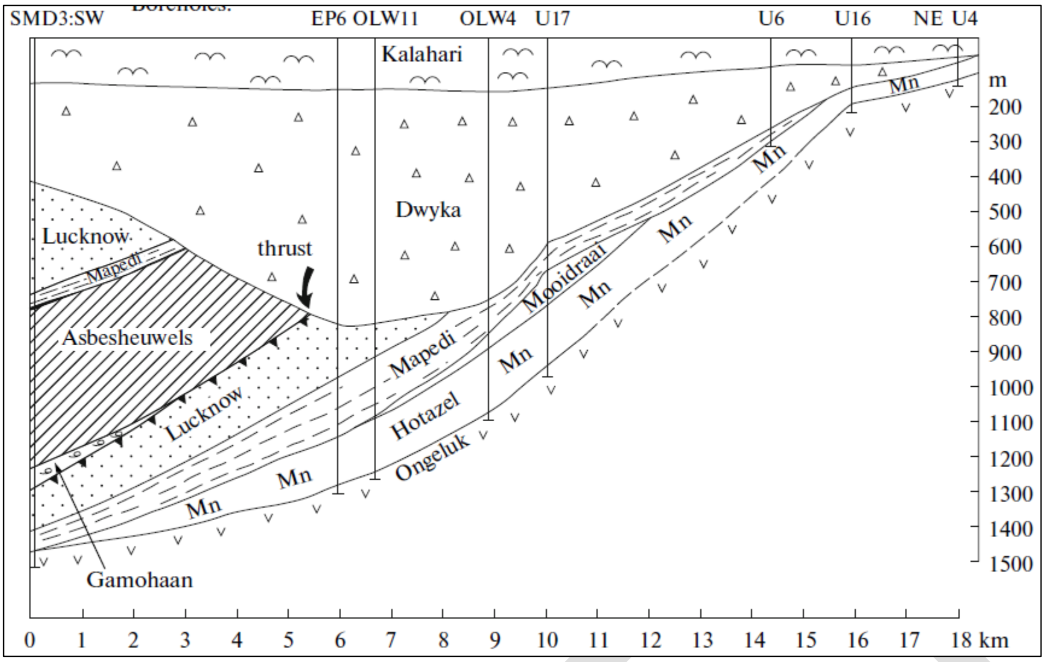

Figure 12-5: Schematic geological section of the northern parts of the Kalahari manganese field (Adapted from Kuleshov, 2010).

The Kalahari deposit is preserved in an old synclinal structure below the unconformity at the base of the Mapedi shale of the Olifantshoek Group. The cross-sections illustrate how the manganese ore beds and Hotazel Iron Formation are successively cut out by erosion to the east below the Dwyka and Kalahari unconformities, while the Olifantshoek Supergroup (Mapedi and Lucknow Formations) only appears below the Dwyka diamictite further to the west.

The main local, structural features in the Kudumane mining area are represented by north-east to south-west trending dykes. At York the dyke splits up into two entities, which continue roughly parallel to each other towards the south-west. The main resource is located on York to the north of the dykes. South of the dyke the resource is downfaulted by between 30 m and 60 m and largely eroded by younger Dwyka glacial activity (Saad et al., 2010).

12.2.1 Structural geological overview

The Kalahari deposit is preserved in an old synclinal structure below the unconformity at the base of the Mapedi shale of the Olifantshoek Group. The cross-sections (Figure 12-6) illustrate how the manganese ore beds and Hotazel Iron Formation are successively cut out by erosion to the east below the Dwyka and Kalahari unconformities, while the Olifantshoek Supergroup (Mapedi and Lucknow Formations) only appears below the Dwyka diamictite further to the west.

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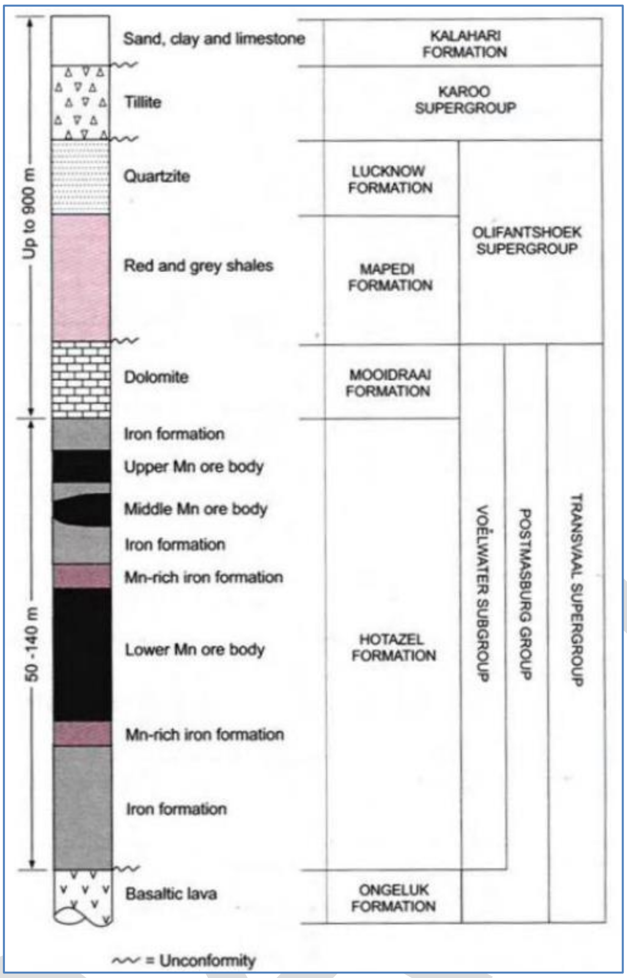


Figure 12-6: Generalized stratigraphic column for the Kalahari manganese field (Adapted from SLR, 2015).

12.2.2 Topography and drainage

The topography and the available topographical data of the study area in vicinity of the mine site is presented in Table 12-1. The attenuation dam and stormwater management plan studies and related analysis were performed by mostly using the Laser Imaging Detection and Ranging (LIDAR) data obtained in 2019, where available. The Digital Terrain Model (DTM) for LIDAR dataset was evaluated with a 0.5 m resolution by using the LAS point cloud provided by KMR .

Where the study extended to the area outside of the LIDAR boundaries, another DTM data source which was obtained in 2007 was evaluated. The DTM 2007 elevation model with the 30 m resolution was compared with the high resolute LIDAR data and elevated by 2.7 m, due to the average difference in the study area, to even out the elevation differences between the different sources.

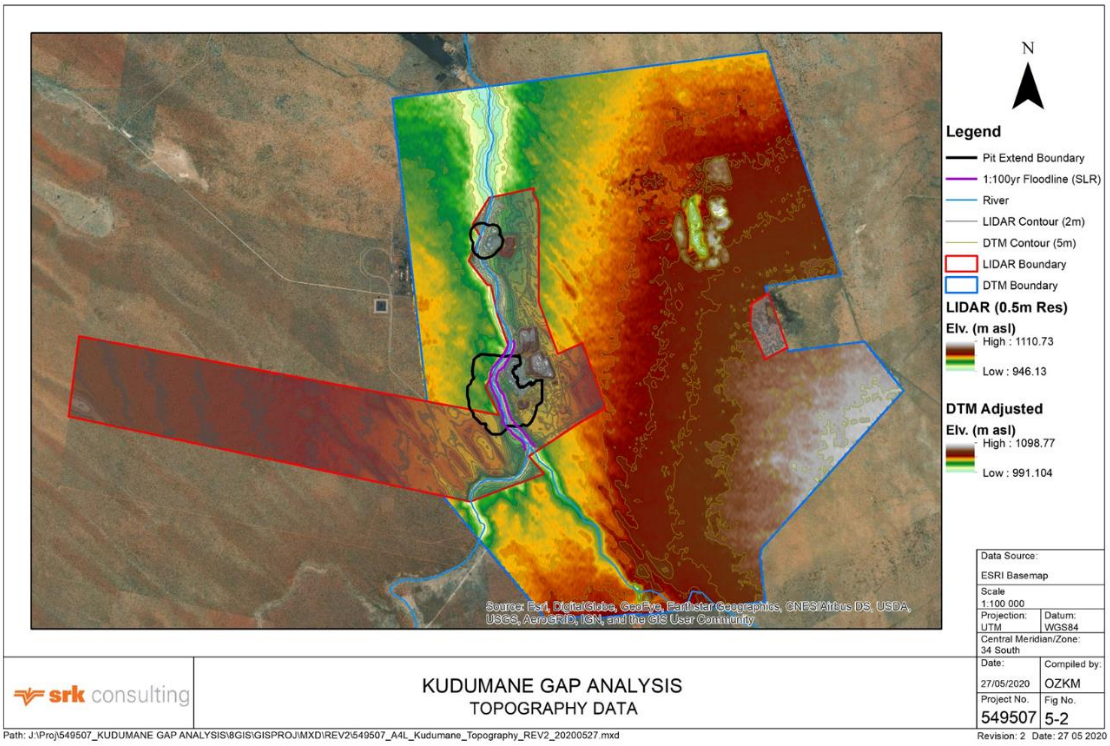


Figure 12-7: Available Topography Data at Project Site

Besides the topographical data provided by KMR in the near vicinity of the mine site, the Shuttle Radar Topography Mission (SRTM) Digital Elevation Model provided by NASA (National Aeronautics and Space Administration) was used in large scale hydrological analysis and mine focused analysis where local data is not available. The SRTM dataset has 30 m resolution.

12.3 Soils, land use and land capability

The information presented in this section is extracted from the Soil, Land use and Land capability specialist study undertaken by Zimpande Research Collaborative in 2021 (Appendix I).

12.3.1 Current Land Use

Based on the information sourced from SLR (2014) the dominant land use within the MRA is mining related activities (infrastructure/servitudes, pipelines, powerlines open cast pits and etc), ad-hoc game and cattle farming and isolated residences/residential areas. Figure 15 presents images of the current land uses in the MRA.

Figure 12-8: Photographs illustrating some of the land uses within the MRA.

12.3.2 Dominant Soil Forms

The dominant soils occurring within the footprint areas are Hutton, Hutton/Clovelly, Mispah and Witbank forms (Paterson, 2014). These soils can be broadly classified as ideal for agricultural cultivation where the climate permits and under irrigation if the weather does not permit. The physical characteristics of the surrounding soil forms can largely be described as structureless, fine-grained, sandy soils. The deep soils were classified as Hutton/Clovelly, whereas the shallow soils with the occurrence of rock outcropping and calcrete layers were classified as Mispah soil forms. Disturbed soils due to current mining operations are also present and classified as Witbank soil forms. Figure 16 below depicts the dominant soil forms identified by the Eloff et al., (1986).

Table 12-5: Dominant soil forms within the footprint areas.

Soil Form	Code	Diagnostic Horizon Sequence
Hutton	Hu	Orthic/Red apedal
Clovelly	Co	Orthic/Yellow Brown/Lithic
Mispah	Ms	Orthic/Hardrock
Witbank	Wb	Transported Technosols

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

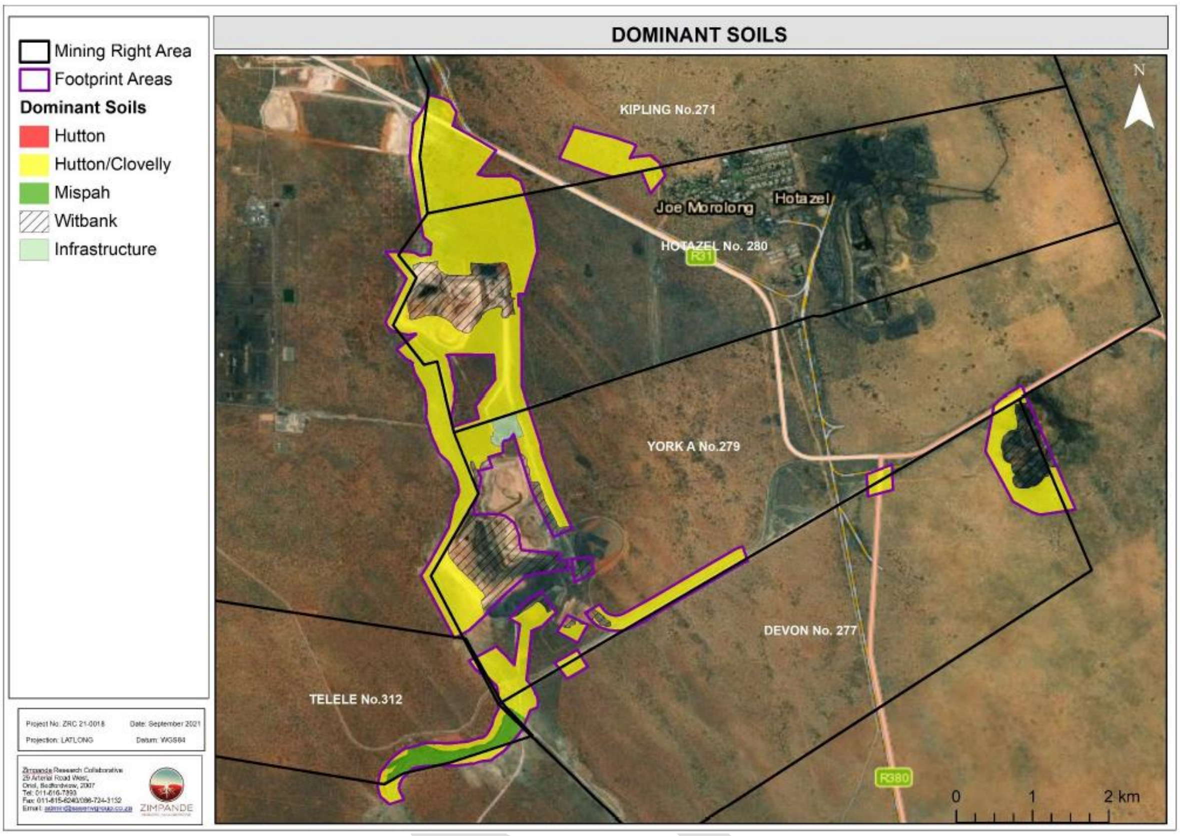


Figure 12-9: Dominant soils forms within the footprint areas (ZRC, 2019)

12.3.3 Land Capability Classification

Agricultural land capability in South Africa is generally restricted by climatic conditions, with specific mention to water availability (Rainfall). Even within similar climatic zones, different soil types typically have different land use capabilities attributed to their inherent characteristics. High potential agricultural land is defined as having the soil and terrain quality, growing season and adequate available moisture supply needed to produce sustained economically high crops yields when treated and managed according to best possible farming practices (Scotney et al., 1987).

For the purpose of this assessment, land capability was inferred in consideration of observed limitations to land use due to physical soil properties and prevailing climatic conditions. Climate Capability (measured on a scale of 1 to 8) was therefore considered in the agricultural potential classification. The MRA falls into Climate Capability Class 8 due to very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss.

The identified soils were classified into land capability and land potential classes using the Camp et. al, and Guy and Smith Classification system (Camp et al., 1987; Guy and Smith, 1998), as presented from Figure 12-10 below. The identified land capability limitations for the identified soils are discussed in comprehensive “dashboard style” summary tables presented from Table 12-7, Table 12-8 and Table 12-9 below. The dashboard reports aim to present all the pertinent information in a concise and visually appealing fashion. Table 12-6 below presents the dominant soil forms and their respective land capability as well as areal extent expressed as hectares as well as percentages.

Table 12-6: Identified soil forms within the footprint area and their respective land capability.

Soil Form	Land capability	Land Potential	Area (ha)	Percentage
Hutton	Arable (Class II)	L5	25.60	2.01
Hutton/Clovelly	Arable (Class II)	L5	800.84	63.04

Mispah	Grazing (Class VI)	L7	33.98	2.67
Witbank	Wilderness (Class VIII)	L8	409.97	32.27
Total Enclosed Area			**1270.39**	**100**

*Infrastructural and industrial areas 10.5 (0.83%) were not included in the table above since they not considered in the land capability ratings.

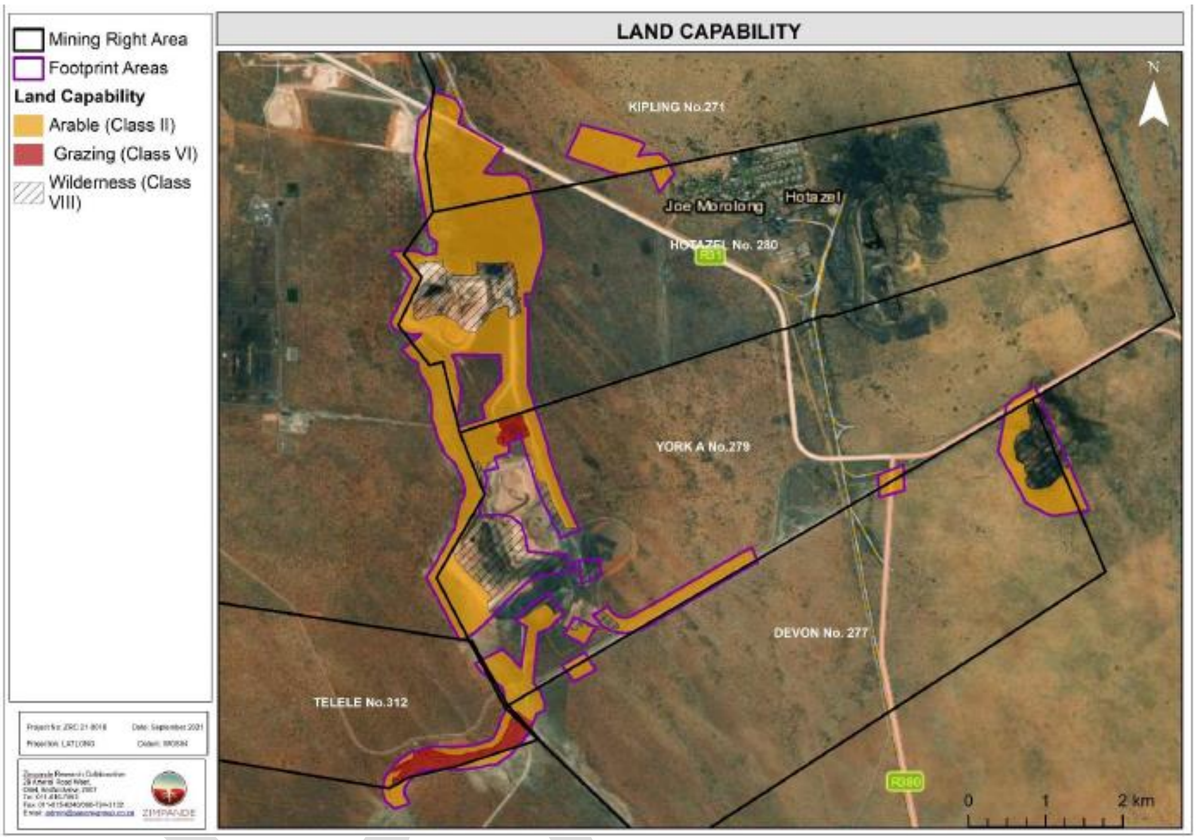


Figure 12-10: Map depicting Land capability of soils occurring within the footprint areas (ZRC, 2019)

Table 12-7: Summary discussion of the Grazing (Class V) land capability class

Land Capability: Arable (Class II) and High potential with minor limitations

Terrain Morphological Unit (TMU)	<0.5% Relatively flat	**Photograph notes**	View of the red and yellow brown apedal soil horizon associated with the Hutton and Clovelly soil forms associated with the MRA.
Soil Form(s)	Hutton and Clovelly	**Area Extent**	825.44 ha (65.05% of the footprint area)
Physical Limitations	None. These soils have enough depth for most cultivated crops and good drainage characteristics.	**Land Capability** These soil forms are considered high potential agricultural soils with high (Class II) land capability, suitable for arable agricultural land use with minimal management interventions where climate permits. Therefore, these soils are considered suitable for use for crop cultivation, and are also well-suited for other less intensive land uses such as grazing, forestry, etc. However, emphasis is directed to their agricultural crop productivity due to the scarcity of such soil resources on a national scale and food security concerns.	
Land Potential	**L5**: **Restricted Potential:** Moderately regular and/or severe to moderate limitations due to steeper slopes, high temperatures and low rainfall. Appropriate permission is required before ploughing virgin land.		
Overall impact significance prior to mitigation	**M**	The overall impact of the proposed expansion of the existing infrastructure and open cast pit on land capability and land potential is anticipated to be Medium (M) without mitigation and Low (L) with mitigation measures, due to the low agricultural potential of the soils. However, the proposed expansion project will result in a permanent changeof land use. Thus, the loss of agricultural soils and agriculturally productive land will be somewhat significant considering that arable soils are a non-renewable resource.	**Business case, Conclusion and Mitigation Requirements:** Although these are important soils for potential agricultural use, the suitability for crop production is limited by the climate because this area experiences erratic and very low rainfall which is necessary for successful dryland agriculture. The soils are sandy in natureand thus more likely to be devoid of nutrients and good water holding characteristics. In addition, no large dams or irrigation schemes are available in the area thus limiting the soilsin the area to grazing and wildlife uses. The high evaporation rate of the hot, dry climate willresult in regular irrigation needed should crops be produced this way. However, the integrated mitigation measures must be implemented accordingly, with the aim of minimizingthe potential loss of these valuable soils.
Overall impact significance post mitigation	**L**		

Table 12-8: Summary discussion of the Grazing (Class VI) land capability class

<table>
<tr><th colspan="5">Land Capability: Grazing (Class VI)</th></tr>
<tr><td colspan="5"> </td></tr>
<tr><td>Terrain Morphological Unit (TMU)</td><td colspan="2">Gently sloping land of <1% slope</td><td>Photograph notes</td><td>View of the identified rock outcroppings associated with the Mispah soil forms.</td></tr>
<tr><td>Soil Form(s)</td><td colspan="2">Mispah</td><td>Areal Extent</td><td>33.98 ha (2.67% of the Footprint Area)</td></tr>
<tr><td>Physical Limitations</td><td colspan="2">These soils have limitations in terms of water storage, depth and nutrient holding capacity due to limited rock weathering.</td><td colspan="2" rowspan="2">Land Capability
The identified soils are of poor (Class VI) land capability because of the soil depth of this class is very shallow and moderately sloping. These limitations generally makes these soils unsuited to cultivation and limit their use largely to pastures or wood land.</td></tr>
<tr><td>Land Potential</td><td colspan="2">L5: Restricted potential: Regular and/or moderate to severe limitations due to due to steeper slopes, high temperatures and low rainfall.</td></tr>
<tr><td>Overall impact significance prior to mitigation</td><td>L</td><td rowspan="2">The overall impact of the proposed expansion of the existing infrastructure and open cast pit land capability and land potential is anticipated to be Low (L) both with and without mitigation measures in place, due to the inherently poor land capability of the identified dominant soil forms. The proposed expansion project and activity/infrastructure changes in this instance will not impact on high potential soils and will be somewhat significant considering the scarcity of arable soils in South Africa.</td><td colspan="2" rowspan="2">Business case, Conclusion and Mitigation Requirements:
While these soils are not considered prime agricultural production soils. Some soils in class VI can be productively used for the common crops and grazing, provided unusually intensive management is used.</td></tr>
<tr><td>Overall impact significance post to mitigation</td><td>L</td></tr>
</table>

Table 12-9: Summary discussion of the Wildlife/ Wilderness (Class VIII) land capability class

<table>
<tr><th colspan="5">Land Capability: Wildlife/Wilderness - Class VIII</th></tr>
<tr><td colspan="5"> </td></tr>
<tr><td>Terrain Morphological Unit (TMU)</td><td colspan="2">Not applicable; highly disturbed areas</td><td>Photograph notes</td><td>View of the identified Witbank soil forms</td></tr>
<tr><td>Soil Form(s)</td><td colspan="2">Witbank (Anthrosols)</td><td>Area Extent</td><td>409.97 ha (7.99% of the Footprint Area)</td></tr>
<tr><td>Diagnostic Horizon Sequence</td><td colspan="2">Not applicable; highly disturbed soils</td><td colspan="2" rowspan="2">Land Capability
These identified Witbank soils have very poor (class VIII) land capability due to the significant disturbance that has occurred because of mining activities. This has led to the long-term alteration of the soil physical chemical properties such that these soils are no longer viable for agriculture. These soils are therefore not considered to make a significant contribution to agricultural productivity even on a local scale.</td></tr>
<tr><td>Land Potential</td><td colspan="2">L8: Very Low Potential: Due to significantly disturbed areas due from anthropogenic activities to an extent that no recognisable diagnostic soil horizon properties could be identified. These soils are characterised by various limitations, primarily the absence of appropriate soil to provide a growth medium</td></tr>
<tr><td>Overall impact significance prior to mitigation</td><td>L</td><td rowspan="2">The overall impact of the proposed expansion of the existing infrastructure and open cast pit on the land capability of these soils is anticipated to be low due to their very poor land capability</td><td colspan="2" rowspan="2">Business case, Conclusion and Mitigation Requirements:
The current state of these soils requires significant rehabilitation already. These areas should be targeted for development so as to avoid disturbance of natural soils and landscapes. These areas can be rehabilitated holistically at closure of the surrounding mines.</td></tr>
<tr><td>Overall impact significance post mitigation</td><td>L</td></tr>
</table>

12.4 Biodiversity

The information presented in this section is extracted from the Biodiversity specialist study undertaken by Scientific Terrestrial Services CC in 2021 (Appendix I).

12.4.1 Floral Assessment

Broad-scale vegetation characteristics

The proposed KMR Expansion Activities are located within the Kathu Bushveld and Gordonia Duneveld vegetation types (Mucina and Rutherford, 2006).

Most of the proposed KMR Expansion Activities are in the remaining extent of the Gordonia Duneveld, a vegetation type that is of Least Concern (LC) in terms of its conservation status but has a protection level of Moderately Protected (Skowno et al., 2019). Mucina and Rutherford (2006) describe the Gordonia Duneveld as “Parallel dunes about 3–8 m above the plains. Open shrubland with ridges of grassland dominated by Stipagrostis amabilis on the dune crests and Vachellia haematoxylon on the dune slopes, also with Senegalia mellifera on lower slopes and Rhigozum trichotomum in the interdune straaten.”.

Test pit (Devon) to be rehabilitated, the R380 intersection upgrade and the eastern section of the Kipling Offices are within the Kathu Bushveld vegetation type which is currently considered of LC and Poorly Protected (Skowno et al., 2019). Mucina and Rutherford (2006) describe the Kathu Bushveld as “Medium-tall tree layer with Vachellia erioloba in places, but mostly open and including Boscia albitrunca as the prominent trees. Shrub layer generally most important with, for example, Senegalia mellifera, Diospyros lycioides and Lycium hirsutum. Grass layer is variable in cover.”.

Ground-truthed vegetation characteristics

Three broad habitat units were distinguished for the proposed KMR Expansion Activities during the field investigation in July 2021 by STS:

- **Ga-Mogara Habitat Unit.** The Ga-Mogara habitat refers to the vegetation communities associated with the Ga-Mogara River5 – conforming to the definition of a watercourse as per the National Water Act, 1998 (Act No. 36 of 1998) (NWA) – as delineated by the Freshwater Ecologist (SAS 202196, 2021). The Ga-Mogara Habitat is considered degraded from a floral perspective in most sections associated with the proposed KMR Expansion Activities, with alien vegetation prolific in some sections and impacts from overgrazing and mining pressures more evident in others. The Ga-Mogara Habitat encompasses the channel and banks of the Ga-Mogara River;
- **Savannah Habitat Unit**. This habitat unit includes vegetation communities that are typical of the Savannah biome (i.e., characterised by a grassy ground layer and a distinct upper layer of woody plants) and elements of the two reference vegetation types are present within this habitat unit. The Savannah Habitat was divided into three subunits based on variances in species composition, habitat condition, vegetation structure, and/or soil types, namely the Degraded Thornveld, Karoid Shrubland and Mixed Thornveld; and
- **Transformed Habitat Unit**. This habitat is currently transformed in nature due largely to mining activities or mining-related infrastructure.

Table 12-10: Ga-Mogara Habitat Unit

<table>
<tr><th colspan="2">HABITAT OVERVIEW</th></tr>
<tr><td>Vegetation structure</td><td>The vegetation structure varies between either short-to-medium, dense grassland in the river channel to a short-to-tall, sparse woodland with a well- developed grass layer along the riverbanks (photo (a) below). The riverine vegetation in its natural condition comprises an almost continuous graminoid- dominated layer where woody species are sparsely scattered (mainly Vachellia erioloba, Ziziphus mucronata, Lycium hirsutum); however, the vegetation structure of the Ga-Mogara Habitat Unit takes on a short-to-tall thicket in most of its extent associated with the proposed KMR Expansion Activities due to the invasive Prosopis glandulosa which has formed dense stands (Photos b and c below).


The Ga-Mogara River is an ephemeral (or episodic) system which means that the river is most often dry but should flow for brief periods after heavy rainfall. The Ga-Mogara River, however, has been without significant surface flows for a prolonged period due to, inter alia, the episodic nature of the river, the upstream dewatering and swallet formation by mine workings of the Sishen Iron Ore Mine (more detail provided in the below section on Habitat Integrity), as well as prolonged dry conditions for the region. Even with the heavy and abnormal rainfall earlier this year, this part of the Ga-Mogara river didn't have any flow (communication with mine officials). Due to the lack of conditions more suitable for riparian vegetation, the floral communities of the Ga-Mogara Habitat Unit largely comprise of terrestrial species (limited discernible difference between terrestrial and riparian vegetation).
Despite the dry conditions of the Ga-Mogara River, the topography of the river still allows for water to collect in the channel during rainfall events and although this water drains away rapidly as a result of the course, sandy, alluvial soils, the vegetation structure is different to that observed for the surrounding terrestrial habitat, i.e., more dense assemblages of grass species (characteristic of dry and/or ephemeral river systems).</td></tr>
<tr><td>Habitat Integrity</td><td>The greater extent of the Ga-Mogara River, including the section of the Ga-Mogara Habitat Unit associated with the proposed KMR Expansion Activities, have been altered throughout the years due to impacts not only along the sections associated with KMR (i.e., local impacts), but also from historic and ongoing mining and agricultural activities along the greater extent of the river (i.e., regional impacts), resulting in degradation of floral communities along this ephemeral river.
Within the immediate vicinity of the proposed KMR Expansion Activities (local scale impacts), direct impacts to the Ga-Moraga Habitat include agricultural practices, edge effects from adjacent mining activities (increased sediment loads from dust deposition), the realignment of the Ga-Mogara River channel (on the remaining extent of the farms Gloria 266 northwest of Kipling 271 as well as the farms Kipling 271 and Umtu 281 6), as well as alien and invasive plant (AIP) proliferation (especially that of Prosopis glandulosa). A portion of the mining footprint which includes both soil stockpiles and overburden has encroached into the eastern margin of the Ga-Mogara river resulting in habitat lost to infilling (Eco-Pulse & EMS, 2019a). Other modifiers of the system include small areas of localised erosion and bank incision, as well as (haul)road and bridge crossings. See example photos below.

Left: The Opencast Pit on York in close proximity to the Ga-Mogara Habitat Unit, contributing to sediment loads to the system from dust deposition. Right: Several rail and bridge crossings are associated with the Ga-Mogara Habitat unit.
Within the greater river system (resulting in regional scale impacts), one of the more significant impacts stem from dewatering activities of the Sishen Iron Ore Mine as well as the formation of swallets south of the Sishen Iron Ore Mine (GCS 2011; PHD 2007), which have contributed to an almost complete loss of surface flow: "As a result of the surface flow in the Gamagara River being captured in recent years mainly by the large N-S structural feature [i.e., the swallets] that crosses the river near the old golf club, surface flow in the downstream sections of the Gamagara River has virtually ceased.". The dewatering and swallet formation have further resulted in higher transmission losses in the river, though this impact has been recorded to decrease in intensity with downstream distance from impact. More important to the vegetation communities of the Ga-Mogara Habitat Unit, the invasion by Prosopis glandulosa also has far-reaching impacts.
The above-mentioned impacts on the Ga-Mogara River have placed cumulative pressures on the systems and resulted in the current desiccated condition of the river and loss of integrity of the Ga-Mogara Habitat from a floral perspective.</td></tr>
<tr><th colspan="2">SPECIES OVERVIEW</th></tr>
<tr><td colspan="2">Apart from the Transformed Habitat Unit, the Ga-Mogara Habitat Unit generally comprised lower species diversities than the other natural habitat units assessed. The floral diversity is especially low in sections where the river has been more severely impacted by either agricultural practices or where AIPs were recorded as dominant. Where less habitat disturbances are present, the floral species diversity is higher and the vegetation denser (especially within the graminoid layer). As beforementioned, the prolonged dry periods and very little surface water flow in the Ga-Mogara River, the vegetation communities associated with this habitat unit are largely terrestrial in nature, with only a select few species considered restricted/unique to the Ga-Mogara Habitat, such as the forb Cullen tomentosum, and the graminoid Cyperus margaritaceus.
The graminoids component included Aristida stipitata, Cenchrus ciliaris, Chloris virgata, Cynodon dactylon (dominant in several sections), Cyperus margaritaceus, Enneapogon cenchroides, Eragrostis echinochloidea, Eragrostis trichophora and Schmidtia kalihariensis. All these graminoid species are also present in the adjacent terrestrial habitat. The forbs were scattered, not abundantly distributed, and overall, poorly represented within the Ga-Mogara Habitat Unit. Species recorded on site included species not necessarily associated with watercourses, namely Amellus tridactylus, Arctotis leiocarpa, Citrullus naudinianus, Geigeria ornativa, Nerine laticoma and Sesamum triphyllum. Only Cullen tomentosum is considered a species more typical of watercourses than terrestrial habitat. The alien forbs Bidens pilosa, Schkuhria pinnata and Tagetes minuta were irregularly distributed – being abundant in some sections, but absent in others. The woody component included scattered trees, shrubs and dwarf shrubs, none of which are restricted to the Ga-Mogara Habitat Unit. Typically seen are Vachellia erioloba, Lycium hirsutum, Melolobium cf. microphyllum and Ziziphus mucronata. The alien tree Prosopis glandulosa has significantly proliferated within several sections of the Ga-Mogara Habitat Unit.</td></tr>
</table>

SOME REFERENCE PHOTOS OF FLORA WITHIN THIS HABITAT UNIT	

From left to right: Nerine laticoma, Cullen tomentosum (close-up), Cullen tomentosum (growth form), Arctotis leiocarpa, Chrysocoma ciliata, Bidens pilosa

SPECIES OF CONSERVATION CONCERN AND PRESENCE OF UNIQUE LANDSCAPES (CBAS, ESAS, PROTECTED AREAS, INDIGENOUS FOREST, ETC.)	
Presence of Unique Landscapes	The Screening Tool outcome indicates that the Ga-Mogara Habitat Unit occurs in a Very High Sensitivity area which was triggered by the presence of an Ecological Support Area (ESA) (Holness and Oosthuysen, 2016). According to the Northern Cape CBA Map Reasons database the triggering biodiversity and ecological features associated with the ESA includes the presence of all Rivers (i.e., the Ga-Mogara River) and Landscape Structural Elements such as dolerite dykes (Holness and Oosthuizen, 2016). The Ga-Mogara Habitat is therefore considered an important ecological corridor and is of conservation significance. Much of the Ga-Mogara Habitat is degraded from a floral perspective and lacks a species composition distinctly unique from the surrounding terrestrial habitat. However, the river system cannot be considered on a localised scale alone (being a connected system) and thus as a whole it is regarded a unique feature in the landscape as an ESA and further enjoys protection under the NWA and NEMA as a watercourse. The Very High Sensitivity of the Screening Tool outcome is confirmed for the Ga-Mogara Habitat Unit.
Species of ConservationConcern	As part of the SCC assessment, the following classes were considered: Threatened species. In terms of Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) (NEMBA), threatened species are Red Data Listed (RDL) species falling into the following categories of ecological status: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected in terms of the NEMBA Threatened or Protected Species (TOPS) Regulations (General Notice (GN) R152 of 2007, as amended). Removal, translocation and/or destruction of these species require authorisation from the DFFE. Protected Species. Species that do not necessarily fall in the above categories of ecological status, but that are deemed important from a provincial biodiversity perspective, e.g., Protected Species [Schedule 2, Section 50(1)] and Specially Protected Species [Schedule 1, Section 49(1)] under the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) for which restricted activities may not occur without permits. The List of Protected Tree Species (GN No. 536) as published in the Government Gazette 41887 dated 7 September 2018 as it relates to the National Forest Act, 1998 (Act No. 84 of 1998) (NFA) was also considered for the SCC assessment. No threatened species were recorded within the Ga-Mogara Habitat and from a floral perspective the habitat is not suitable to sustain threatened species. Screening Tool outcome further indicated the Plant Species Theme to be of low sensitivity, thus from a database perspective no threatened species are known from the area. The area is, however, known to be poorly sampled and a Probability of Occurrence (POC) assessment was undertaken for threatened species known from the QDS 2722BB, 2722BD, 2723AA, and 2723AC. No threatened species were found to be associated with the assessed QDS's, and thus the low sensitivity for the Plant Species Theme is supported within the Ga-Mogara Habitat Unit. Nationally protected tree species associated with the Ga-Mogara Habitat included several large individuals of *Vachellia erioloba* (Camel Thorn). These individuals were pod-bearing, which means that they are old specimens. Boscia albitrunca (Shephard's tree) was noted in the EMS reports, but not recorded on site. The *Boscia albitrunca* becomes more prominent southwards towards Kathu. Provincially protected species were associated with the Ga-Mogara Habitat, namely *Nerine laticoma* (confirmed on site) and *Gymnosporia buxifolia* (potentially occurring) – both species are listed under Schedule 2 of the NCNCA. These species are not currently threatened, and their conservation status is LC. Their distributions are also not restricted to this habitat unit, nor to the local or regional areas. Permits from the Department of Environment and Nature Conservation (DENC) and authorisations from the DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place.

Table 12-11: Savannah Habitat Unit

HABITAT DESCRIPTION

The Savanna Habitat includes three subunits that vary in vegetation structure, soil type and/or habitat integrity – namely the Degraded Thornveld, Karoid Shrubland and Mixed Thornveld. Species composition invariably differ between these habitat subunits, but most species are, however, shared among them. Due to the similarities in species composition as well as general vegetation structure conforming to the definition of a savanna, the grouping of the subunits under one broad unit is justified.

The habitat subunits are discussed in more detail in the below sections of this table.

Mixed Thornveld

The vegetation structure of the Mixed Thornveld subunit was variable throughout the assessed areas but can largely be described as an open tree savanna, which is characteristic of the Kathu Bushveld reference state (photos a and b below). Elements of the Gordonia Duneveld was also present with, e.g., low parallel dunes on the plains (photo c below), though these were more often not a prominent feature in the assessed areas. More formally the vegetation structure varied between tall-to-high, open woodland with a well-defined tree layer occurring on the characteristic red, wind-blown aeolian kalahari sands, with other sections better described as tall, open shrubland with some variances in tree/shrub height occurring based on the abundance and/or presence of taller tree species such as *Vachellia erioloba* and *Terminalia sericea*. Refer to the photos below for examples of vegetation structure variances throughout the site.

Vegetation structure generally an open tree savanna, with a medium to tall tree canopy. Dominant trees varied between sites, with *Vachellia erioloba* dominant in some sections (photo a), and the smaller *Vachellia haematoxylon* (photo b) more prominent in other. Photos a and b depict a characteristic vegetation structure of the Kathu Bushveld reference vegetation type, with photo c depicting the dunes more characteristic of the *Gordonia Duneveld* reference vegetation type. The grass layer also varied from continuous in some sections to more sparsely occurring in others (photo d).

On Kipling and Telele (along the Ga-Mogara River), as well as the assessed sections that encroached onto the neighbouring Kalagadi Mine, the woody component is characteristic of an open tree savanna and included scattered, tall *Vachellia erioloba* trees with the low tree layer occupied mainly by *Senegalia mellifera subsp. detinens* (almost encroaching in some areas). Other characteristic woody species included *Grewia flava*, *Lycium hirsutum, Vachellia haematoxylon* and *Ziziphus mucrunata*. The sections of this habitat subunit within Devon and York and the more northerly sections of Kipling, comprised less tall tree species and the lower trees and/or taller shrubs formed the prominent woody component. The tall tree layer was typically very sparse, with smaller trees such as *Senegalia mellifera subsp. detinens* and *Ziziphus mucronata* more abundant. Shrubs such as *Grewia flava, Lasiosiphon polycephalus, Lycium cinereum, Rhigozum trichotomum, Roepera lichtensteiniana* and *Vachellia hebeclada subsp. hebeclada* were well represented throughout.

The graminoid component was well represented (good diversity of species) in this habitat subunit (throughout), albeit not a continuous cover of graminoids. This fragmented graminoid cover is characteristic and expected of this semi-arid environment. Denser and more continuous grass stands will be present during wetter seasons. The grass species best represented in this habitat subunit included *Aristida congesta subsp. barbicollisis, Aristida congesta subsp. congesta, Enneapogon cenchroides, Eragrostis echinochloidea, Eragrostis lehmanniana, Eragrostis pallens, Pogonarthria squarrosa, Stipagrostis cf. ciliata, Stipagrostis uniplumis, Schmidtia pappophoroides and Schmidtia kalihariensis*. The forb component was poorly represented and can be attributed to the season of assessment.

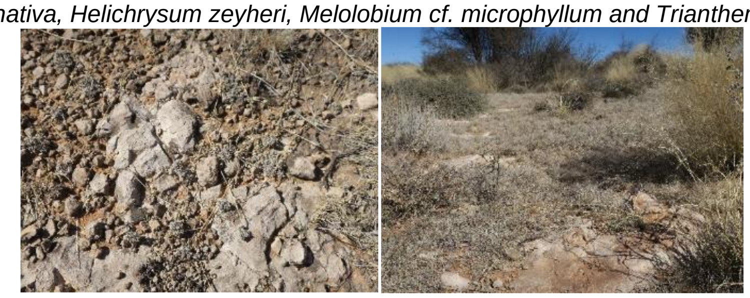
Floristically this habitat subunit matched the anticipated species diversities with habitat integrity largely intact. Much of the Mixed Thornveld subunit is connected to a larger expanse of habitat where very few anthropogenic activities have occurred, thus resulting in minimally modified ecological processes and drivers. Fire and herbivory have been altered due to management practices, including fencing off farm portions, but not to the extent that floral communities are notably being adversely affected. Habitat integrity levels were higher for sites further away from mining activities. External factors placing pressure on floral communities included grazing pressures, woody species encroachment in some sections, and the loss of natural ecological processes (fire and herbivory) required to maintain a healthy savanna ecosystem.

Floristically this habitat subunit matched the anticipated species diversities with habitat integrity largely intact. Much of the Mixed Thornveld subunit is connected to a larger expanse of habitat where very few anthropogenic activities have occurred, thus resulting in minimally modified ecological processes and drivers. Fire and herbivory have been altered due to management practices, including fencing off farm portions, but not to the extent that floral communities are notably being adversely affected. Habitat integrity levels were higher for sites further away from mining activities. External factors placing pressure on floral communities included grazing pressures, woody species encroachment in some sections, and the loss of natural ecological processes (fire and herbivory) required to maintain a healthy savanna ecosystem.

Karoid Shrubland

The Karoid Shrubland comprises short, open shrubland and differed significantly in structure from the other subunits of the Savanna Habitat. The tree layer was largely absent and the presence of calcrete soils have resulted in a prominent and well-represented dwarf (karoid) shrub layer. Species such as *Aptosimum lineare, Barleria rigida, Cadaba aphylla, Caroxylon (Salsola) cf. patentipilosa, Eriocephalus sp*., *Justicia australis* and *Pentzia calcarea* were better represented in this habitat subunit than in the others. The grass species *Enneapogon desvauxii* was far more prominent in this subunit than in the other Savanna Habitat subunits.

One of the aspects that mostly separates this habitat subunit from the others is the shallow soils with the flat, low-lying calcrete outcrops (refer to below photos). It is these shallow soils that result in the dominance of dwarf (or karoid) shrubs. Tree species with deeper root systems will struggle to adequately establish in these soils. Similarly, with the graminoid layer, species such as *Enneapogon desvauxii, Stipagrostis obtusa* and *Aristida congesta subsp. congesta* favour these shallower soils more so than the deeper sandy soils found in the majority of the KMR areas. Forbs were largely absent at the time of assessment due to seasonal constraints, but species noted during the site assessment included *Dicoma capensis, Dimorphotheca zeyheri, Geigeria ornativa, Helichrysum zeyheri, Melolobium cf. microphyllum and Trianthema parvifolia*.



This habitat subunit stretches over both the farm Kipling and Hotazel. The section within Hotazel has been subjected to various mining-related impacts and edge effects which have

Degraded Thornveld

The Degraded Thornveld subunit includes open-to-closed, tall shrubland and is largely characterised by vegetation that has been degraded either through overgrazing or being subjected to mining edge effects. The resultant vegetation structure includes areas with a particularly low presence of graminoids (many bare soil patches), with some sections severely encroached by *Senegalia mellifera subsp. detinens* and *Rhigozum trichotomum*.

Although the woody component was well represented in this habitat subunit, the encroaching nature of these species are resulting in the loss of indigenous floral diversity by pushing out these species and occupying habitat where additional species could have established following dispersal events. The lack of a well-represented graminoid layer excludes many grazing herbivores that play a key role in tree-grass coexistence and hence the increase in woody encroacher species in many of the sections where grass cover is low.

Where this habitat subunit occurs along mining activities it is subjected to edge effects and with it being fenced off from the surrounding natural habitats, the natural ecological processes have been severely altered. The resulting vegetation

<table>
<tr>
<td colspan="2">resulted in the habitat becoming encroached and the vegetation communities degraded. The section within the Kipling farm, which is less disturbed, was in a better condition with the habitat retaining moderately high levels of integrity (as seen in the above photos).
Species diversity for the habitat subunit was moderate.</td>
<td>communities are thus degraded, encroached and often associated with an increased presence of AIPs or weedy herbaceous species.
Habitat integrity is largely diminished in this subunit.
  </td>
</tr>
<tr>
<th colspan="3">SPECIES OF CONSERVATION CONCERN AND PRESENCE OF UNIQUE LANDSCAPES (CBAS, ESAS, PROTECTED AREAS, INDIGENOUS FOREST, ETC)</th>
</tr>
<tr>
<td>Presence of UniqueLandscapes</td>
<td colspan="2">According to the Screening Tool, the Terrestrial Biodiversity Theme associated with the proposed KMR Expansion Activities largely fall in a Low Sensitivity area, with a significant stretch mapped as Very High Sensitivity areas. The triggered sensitivity features include an ESA that surrounds the Ga-Mogara Habitat Unit. According to the Northern Cape CBA Map Reasons database the triggering biodiversity and ecological features associated with the ESA includes the presence of the Kathu Bushveld, Gordonia Duneveld vegetation types, as well as the conservation areas (i.e., the Griqualand West Centre (GWC)) (Holness and Oosthuizen, 2016). Neither of these vegetation types are considered endemic, nor are they listed as being threatened. Habitat indicative of the GWC is not present within this habitat unit and as such no unique habitat related to the centre of endemism is likely to be available. The Savanna Habitat Unit is a fair representation of these two reference vegetation types, albeit an ecotonal representative; however, these vegetation types are currently still wide-spread and not under threat, thus the Very High Sensitivity is not supported.</td>
</tr>
<tr>
<td>Species of Conservation Concern</td>
<td colspan="2">As mentioned before, as part of the SCC assessment, the following classes were considered Threatened species as well as both nationally and provincially protected species. As for the Ga-Mogara Habitat, no threatened species were recorded within the Savanna Habitat Unit, supporting the Screening Tool’s low sensitivity outcome for the Plant Species Theme. Within the sections where the characteristic red aeolian sands were present, the NEMBA TOPS protected species Harpagophytum procumbens (LC) was confirmed on site (also a Schedule 1 protected species under the NCNCA – see sections below). Though not currently threatened, the destruction/removal/relocation of this species is regulated by the DFFE and permits would need to be obtained before any vegetation clearance can take place.

Several nationally protected tree species were associated with the Savanna habitat, particularly with the Mixed Thornveld subunit. Vachellia erioloba (Camel Thorn) was recorded throughout the assessed areas but was markedly more abundant in sections of Kipling (north of the R380). The protected Vachellia haematoxylon (Grey Camel Thorn) was also recorded throughout but in greater abundances than Vachellia erioloba. Within the northern sections of Devon, Kipling north of the R380, and the habitat on the neighbouring Kalagadi mine west of the farm Hotazel were associated with increased abundances of Vachellia haematoxylon. Vachellia erioloba is a more widespread species (below photo – left three), although its slow growth makes the tree sensitive to habitat loss. The Vachellia haematoxylon species are more restricted in its distribution range and is a Kalahari endemic (below photos – right three). Loss of habitat has a higher possibility to negative impact on Vachellia haematoxylon if these species are not either rescued and relocated, or offset.

From left to right: Distribution map of Vachellia erioloba, adult Vachellia erioloba, characteristic thorns of Vachellia erioloba, distribution map for V. haematoxylon, adult V.haematoxylon, characteristic thorn and leaves of V. haematoxylon.

Provincially protected species were associated with the Savanna Habitat Unit, although only Harpagophytum procumbens (Schedule 1), Nerine laticoma (Schedule 2), Ruschia griquensis (Schedule 2) and Trianthema parvifolia (Schedule 2) was confirmed on site; mostly recorded within the Mixed Thornveld subunits. Species that were not recorded on site but that obtained a high POC score for this habitat unit included Schedule 2 species: Plinthus sericeus, Raphionacme velutina (recorded by Todd (2018) within the area), Gymnosporia buxifolia (recorded by Todd (2018) within the area), Babiana hypogaea (well-known from the area), Moraea pallida, and Jamesbrittenia atropurpurea subsp. atropurpurea (recorded by Todd (2018) within the area). None of these species have a restricted distribution range or are currently considered threatened. They are all known from both the local and regional areas.
Permits from DENC and authorisations from the DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place.</td>
</tr>
</table>

Table 12-12: Transformed Habitat Unit

REFERENCE PHOTOS	
 Typical vegetation and landscape features associated with the Transformed Habitat Unit	
HABITAT OVERVIEW	
Vegetation structure andcondition	No real vegetation structure could be defined for this habitat unit due to large sections being transformed or heavily degraded.
Habitat Integrity andSpecies overview	Due to modification of habitat and vegetation clearing associated with mining activities, the habitat integrity of this habitat unit is diminished. The habitat is largely devoid of vegetation apart from some pioneer species such as the grasses Enneapogon cenchroides and Pogonarthria squarrosa establishing on bare patches. AIPs were recorded in this habitat unit, but numbers were generally low.
SPECIES OF CONSERVATION CONCERN AND PRESENCE OF UNIQUE LANDSCAPES (CBAS, ESAS, PROTECTED AREAS, INDIGENOUS FOREST, ETC)	
Presence of UniqueLandscapes	Within areas identified as an ESA and a Centre of Endemism: • Small section of this habitat unit is located within ESAs. However, given the level of transformation that this habitat has experienced, it is no longer considered to be representative of an ESA. The floral communities are indicative of disturbed habitat and do not have the complement of species that would render this habitat unit a representative of the ESA in which it occurs, especially as the Northern Cape CBA reason map references the nearby Gamagara River and associated wetland systems. • Habitat indicative of the GWC is not present within this habitat unit and as such no unique habitat related to the centre of endemism is likely to be available. Given the above, no unique habitat was identified within this habitat unit and the results of this assessment do not align with the Very High Sensitivity outcome of the Screening Tool.
Species of ConservationConcern	No SCC were recorded in this habitat unit and the level of habitat degradation is not suitable for the establishment of SCC, especially not of more sensitive endemics and RDL species. The Screening Tool further indicates the areas to be of Low Sensitivity, thus further supporting the lack of SCC for this habitat unit.
CONCLUDING REMARKS	
This habitat unit is not considered important from a floral ecological importance and resource management perspective. Key considerations: • The habitat is severely degraded and no longer represents the original state, nor is it suitable to sustain viable populations of floral SCC. The infrastructure proposed within this habitat unit is unlikely to disrupt any significant ecological processes or impede any ecological corridors (from a purely floral perspective). • In terms of the Screening Tool outcome, these areas match the Low Sensitivity assigned to the Plant Species Theme. • Due to the area already being exposed to disturbances and edge effect impacts from overgrazing and mining activities, this habitat unit is associated with, and further susceptible to, AIP proliferation and bush encroachment. If the proposed KMR Expansion Activities are authorised, it will be important to implement measures that will limit edge effect impacts on the surrounding areas.	

Alien and Invasive Plant (AIP) Species

South Africa is home to an estimated 759 naturalised or invasive terrestrial plant species (Richardson et al., 2020), with 327 plant species, most of which are invasive, listed in national legislation7. Many introduced species are beneficial, e.g., almost all agriculture and forestry production are based on alien species, with alien species also widely used in industries such as horticulture. However, some of these species manage to “escape” from their original locations, spread and become invasive. Although only a small proportion of introduced species become invasive (~0.1–10%), those that do proceed to impact negatively on biodiversity and the services that South Africa’s diverse natural ecosystems provide (from ecotourism to harvesting food, cut flowers, and medicinal products) (van Wilgen and Wilson, 2018).

Legal Context

South Africa has released several Acts legislating the control of alien species. Currently, invasive species are controlled by the National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) – Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020. AIPs defined in terms of NEMBA are assigned a category and listed within the NEMBA List of Alien and Invasive Species (2020) in accordance with Section 70(1)(a) of the NEMBA:

- Category 1a species are those targeted for urgent national eradication;
- Category 1b species must be controlled as part of a national management programme, and cannot be traded or otherwise allowed to spread;
- Category 2 species are the same as category 1b species, except that permits can be issued for their usage (e.g., invasive tree species can still be used in commercial forestry, providing a permit is issued that specifies where they may be grown and that permit holders “Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to Regulation 3”); and
- Category 3 are listed invasive species that can be kept without permits, although they may not be traded or further propagated, and must be considered a Category 1b species if they occur in riparian zones.

Duty of care related to listed invasive species are referred to in NEMBA Section 738. The motivation for this duty of care is both environmentally and economically driven. Management of alien species in South Africa is estimated to cost at least ZAR 2 billion (US$142 million) each year - this being the amount currently spent by the national government’s DFFE - i.e., the Working for Water programme (van Wilgen, 2020). Managing AIPs early on will reduce clearing costs in the long run.

Site Results

The assessed areas for the proposed KMR Expansion Activities had low diversity of AIPs. The density of most of the AIPs were low; however, within the Ga-Mogara Habitat and some sections associated with the Transformed Habitat, the AIP abundance was medium-high. Most of the species recorded on site (including those recorded during previous assessments) are listed category invaders for which control is required.

Table 1 below lists the AIPs associated with the KMR MRAs. The existing AIP control plan (Eco-Pulse & EMS, 2019b) is sufficient but would need to be revised to include the new sections of the proposed KMR Expansion Activities. Additional species recorded on-site during the 2021 assessments would also need to be considered in the revised Eco-Pulse & EMS (2019b) AIP control plan.

Table 12-13 Dominant alien floral species identified during the field assessment with their invasive status as per NEMBA: Alien and Invasive Species Lists, GN R1003 of 2020.

Scientific name (Common Name)	Origin	NEMBA Category
Alternanthera pungens	South America	Not Listed
Argemone mexicana (Yellow-flowered Mexicanpoppy)	Mexico	1b
Argemone ochroleuca (White-flowered Mexicanpoppy)	Mexico	1b
Atriplex nummularia (Old Man Salt Bush)	Australia	2
Bidens pilosa (Common Blackjack)	South and Central America	Not Listed
Cylindropuntia imbricata (Imbricate cactus, Imbricate prickly pear)	North and Central America (southern United States & Mexico)	1b
Datura ferox (Large thorn apple)	TropicalAmerica	1b
Opuntia ficus-indica (Mission prickly pear,Sweet prickly pear)	Central America(Mexico)	1b
Opuntia humifusa (Large-flowered pricklypear, Creeping pricklypear)	North and Central America (south-western United States and Mexico)	1b
Pennisetum setaceum (Fountain Grass)	North Africa	1b
Prosopis glandulosa (Honey mesquite)	North and Central America	3 in NorthernCape **1b in watercourses**
Prosopis velutina (Velvet mesquite)	Southern Arizona, USA, and northern Sonora, Mexico	3 in NorthernCape **1b in watercourses**
Schkuhria pinnata (Mexican marigold)	Central America	Not Listed
Tagetes minuta (Khaki weed)	South America	Not Listed

12.4.2 Fauna Assessment

As outlined in Section 12.4.1, there are three broad habitat units wherein the proposed KMR expansion activities will occur (including the 100 m buffer around the activities referred to as the “habitat unit mapping area”).

- Ga-Morgara Riverine Vegetation habitat unit
- Savanna habitat unit which is comprisied of Mixed Thornveld, Degraded Thornveld, Karoid Shrubveld
- Transformed Habitat

The Table 12-14 to Table 12-17 indicate the fauna which were identified within the proposed project area:

Table 12-14: Field assessment results pertaining to mammal species within the sites associated with the proposed KMR Expansion Activities.

Mammalian Species of Conservation Concern (SCC)			
Species	**Habitat and Resources in the Sites**	**Conservation Listing**	**POC**
Felis nigripes (Black Footed Cat)	Eye witness accounts (Birch 2012) and the ADU (2021) databases indicates that this species has been seen in the vicinity of the site. It inhabits dry savannas, preferring, short grassy areas with an abundance of small rodents and ground-roosting birds. It will use dens dug by other animals which were observed in the Savanna habitat unit.	NT & SP	H
Atelerix frontalis (Southern African Hedgehog)	Species' distribution range overlaps the MRAs. It can occupy a wide variety of habitats, including semi-arid ecosystems such as that on site. It feeds on invertebrates which will likely be abundant in the summer months.	NT	M
Smutsia temminckii (Pangolin)	Eye witness accounts from (Todd, 2018) and online databases confirm that this species occurs in the vicinity of the MRAs which significantly increases its POC on site. It will be sustained by termites in the Savanna habitat.	VU & P	M

Photograph Notes

Top: Left – *Sylvicapra grimmia* (Grey Duiker, LC) observed passing a camera trap in the Degraded Thornveld habitat unit associated with the site located within the farm York. Middle: *Phacochoerus africanus* (Common Warthog, LC) was observed walking along the same game trial as the duiker in the Degraded Thornveld habitat unit associated with the site located within the farm York. Right – Burrows ranging from fairly large to small were abundant throughout the Savanna habitat unit throughout the sites.

Bottom: Left – *Gerbillurus paeba* (Hairy Footed Gerbil, LC) caught in a sherman trap in the Mixed Thornveld habitat unit associated with the site located within the farm Devon. Middle – The heaps of *Cryptomys hottentotus* (Common Mole Rat, LC) were widespread and abundant in all subunits of the Savanna habitat, (excluding the Karroid Shrubveld habitat). Right – The droppings of *Tragelaphus strepsiceros* (Greater Kudu, LC) were also frequently encountered within the Savanna habitat unit.

Please see Appendix I for a more comprehensive list of mammal species observed on site in 2021 and by persons in previous studies (Birch, 2009; Todd,2018; Bell, 2019).

Mammal Discussion

This field assessment concurs with the findings of previous studies undertaken in the area by Todd (2018) and Bell (2019) that the mammalian diversity within the various identified habitat units associated with sites is deemed moderate. Mammalian diversity on site is limited by the dominance of a relatively homogenous vegetation, anthropogenic disturbances such as livestock grazing and mining activities, and artificial barriers in the form of fences, active mine pits, buildings and linear developments. The faunal assemblage is dominated by mostly common species known from, and well trusted within the region that can infiltrate through and/or jump fences, and are thus less affected by these structureswhich often impact on habitat connectivity and species movement.

Although habitat disturbances were observed on site, many portions have been excluded from any intensive developments or vegetation clearing and as a result have retained habitat that offer refuge and food for small mammals such as *Xerus inauris* (Ground Squirrels, LC), *Suricata suricatta* (Meerkats, LC), *Cynictis penicillata* (Yellow Mongoose, LC) and browsers such as *Raphicerus campestris* (Steenbok, LC), *Sylvia grimmia* (Grey Duiker, LC) and *Tragelaphus strepsiceros* (Greater Kudu, LC). These smaller prey species will in turn support scavengers or predators such as *Felis nigripes* (Black-footed Cat, NT) *Canis mesomelas* (Black-backed Jackal, LC) and *Vulpes* chama (Cape Fox) and any other mammalian predator that can bypass fences on site. Of particular abundance within the Kipling farm were the burrows of *Gerbillurus paeba* (Hairy Footed Gerbil, LC) along with the burrows of *Cynictis penicillata* (Yellow Mongoose, LC). The site's sensitivity from a mammalian perspective is increased by the potential occurrence of three SCC discussed above. Minimising impacts to these SCC should be considered during planning, construction and operation of the proposed KMR expansion activities within all sites.

Business Case and Conclusion - Mammals
The proposed KMR expansion activities will result in the direct decline of mammalian habitat and food resources within the sites as a result of vegetation clearing. The mining expansion activities will further lead to habitat fragmentation within the landscape, potentially impacting on gene flow and long-term viability of mammal populations in the area, including the three potentially occurring SCC. Mammal species will have to relocate into surrounding areas where they may be subjected to increased resource competition. The proposed KMR expansion activities, especially the construction of the two proposed attenuation dams in the Ga-Morgara Riverine Vegetation habitat unit will impact on mammal foraging habitat herein and potentially impede the movement corridor function that this riverine vegetation currently serves. Additionally, vegetation clearing for development may increase the spread of Alien Invasive Plants (AIPs) and other edge effects. These edge effects may potentially impact mammal habitat on a larger scale, outside of the sites that are directly impacted by the proposed KMR Expansion Activities as the AIPs may potentially spread. During the construction and operational phases, there is an additional risk of increased mammal mortalities from vehicle collisions or from increased human-wildlife conflict. As such, it is strongly advised that mitigatory measures stipulated in section 5.1 be adhered to, to reduce the potential impact that the proposed KMR expansion activities will have on mammalian communities on site.

H = High; M = Medium; VU = Vulnerable; NT = Near Threatened; SP = Specially Protected in the Northern Cape; P = Protected according to NEMBA: TOPS List of 2007.

Table 12-15: Field assessment results pertaining to avifaunal species within the sites associated with the proposed KMR Expansion Activities.

Photograph Notes:

Top: Left – non-breeding *Prinia flavicans* (Black-Chested Prinia, LC) eating an apple in front of a camera trap within the Mixed Thornveld habitat situated in the site located within the farm Devon. Right – *Tockus leucomelas* (Yellow-billed Hornbill, LC) was frequently observed within the Savanna habitat throughout all sites.

Bottom: Left – *Tockus nasutus* (African Grey Hornbill, LC) were also abundant and widespread within all sites. Right – *Turdoides bicolor* (Southern Pied Babbler, LC) keeping sentry in the Mixed Thornveld, situated in the footprint of the proposed abstraction borehole on the farm Telele.

Avifauna SCC			
Species	**Habitat and Resources in the Sites**	**Conservation Listing**	**POC**
Neotis ludwigii (Ludwig's Bustard)	Inhabits mostly flat, semi-arid, open country in the Succulent Karoo, Nama Karoo and Namib. Its preferred habitat on site will be the Savanna habitat unit.	EN	M
Polemeatus bellicosus (Martial Eagle)	Martial eagles occur throughout southern Africa in varied habitat, only avoiding mountainous and forested areas.	EN	M
Aquila rapax (Tawny Eagle)	Generally widespread throughout sub-Saharan Africa. This species prefers savanna habitat but does occur in grassy habitats where powerlines are utilised for nesting.	EN	M
Ardeotis kori (Kori Bustard)	Inhabits mostly flat, arid, mostly open country (grassland, bushveld, thornveld, scrubland and savanna).	NT	M
Cursorius rufus (Burchell's courser, VU)	A nomadic species with little known about its movement. Often utilises open short sward grassland, dry savannas overgrazed or burnt grasslands or pastures, bare or sparsely vegetated sandy or gravelly deserts. This habitat is available on site.	VU	H
Gyps africanus (White-backed Vulture)	No nest sites were recorded on site. However, the presence of large *Vachellia erioloba* trees (in the Mixed Thornveld) presents ideal nesting habitat for these birds that have been previously recorded in the area by SABAP 2.	CR	H
Torgos tracheliotos (Lappet Faced Vulture)	Occurs in Savanna and semi-arid regions. It is closely associated with *Acacia* spp, *Bosica albitrunca* and *Terminalia pruniodes*. Suitable habitat for this species on site, will be particularly available within the Mixed Thornveld habitat unit.	EN	M
Sagittarius serpentarius (Secretarybird)	This species has a wide distribution range. It occupies open grassland with scattered trees, shrubland, or open Savanna. Patches of open Savanna are readily available in the Savanna habitat unit. Insects that comprise 80 % of its diet, are likely to be in high abundance in the summer season. The ecosystem on site will therefore be able to support this species.	VU	M

General Avifauna Discussion

Avifaunal diversity and sensitivity on site are deemed to be high, with 156 bird species having been recorded in the area (Bell, 2019). Field observations indicated that food resources are considered in adequate supply for different trophic avifaunal groups. Small mammals are available for predatory birds; fruit and seed producing plants provide suitable food resources for granivores and frugivores whilst invertebrates are available for insectivores. Many large birds use the site as a migratory passageway, means that many large species may use the site to forage (Bell, 2019). Two large ground dwelling avifaunal SCC, namely *Ardeotis kori* (Kori Bustard, NT) and *Neotis ludwigii* (Ludwig's Bustard, EN) are likely to utilise the Savanna habitat unit, especially with the presence of Karroid Shrubveld on site. The highly ephemeral nature of the Ga-Mogara River has resulted in the river banks and channel being colonised by dense, terrestrial vegetation. This river will therefore be unable to support high water bird diversity; instead favouring terrestrial avifauna such as *Ptilopsis granti* (Southern White-faced Owl, LC), *Bubo africanus* (Spotted Eagle Owl, LC) and other predatory birds that will hunt for rodents in the thick grass layer of this riverine vegetation. Many savanna-adapted avifaunal species will also benefit from the scattered tree layer along the Ga-Mogara watercourse, where they will be able to roost, build nests and forage for tree-dwelling insects. The widespread *Vachellia erioloba* trees in the Savanna habitat unit are valuable to avifaunal species such as *Philetairus socius* (Sociable Weaver, LC) that construct their large communal nests within these trees. No sociable weaver nests were observed on site, but should they occur, they will serve as biodiversity hotspots, attracting various predators of all faunal classes whilst other avifauna may also make use of these nests. *Senegalia mellifera* is another valuable tree species for Kalahari avifauna, as they provide shelter against predators and the sun while foraging. This is especially important for avifauna that spend long periods of the day foraging on the ground for insects or herbivorous material. The presence of large, flat-topped *Vachellia erioloba,* other *Vachellia* spp and *Terminalia* in the Savanna habitat unit provide valuable nesting sites for two threatened vulture species, namely *Gyps africanus* (White-backed Vulture, CR) and *Torgos* tracheliotos (Lappet Faced Vulture, EN), increasing their POC on site. Six other avifaunal SCC occurring in the Northern Cape have increased POC on site, on the basis that that they have been recorded in the vicinity and have suitable habitat on site. One of these SCC includes *Sagittarius serpentarius* (Secretarybird, VU) which is listed by the DFFE screening tool as having a medium POC on site, a listing with which this assessment concurs.
Business Case and Conclusion - Avifauna
The majority of the proposed KMR expansion activities will lead to a reduction of avifaunal habitat, which may impact on avifaunal abundance and possibly diversity within the direct and adjacent sites. Vegetation clearance will lead to the reduction in avifaunal food resources and nesting opportunities, notably as a result of the removal of larger woody species. The reduction of resources on site will force many avifaunal species to migrate to surrounding areas. Edge effects such as the spread of AIPs, noise, dust and footprint creep may lead to additional impacts on avifaunal species in the areas adjacent to the sites where the proposed KMR expansion activities will occur. Additionally, the increased movement of vehicles as a result of the proposed KMR expansion will increase mortality risk for avifaunal species, as a result of a possible increase in vehicle strikes. To reduce impacts to avifaunal community on site, it is recommended that the mitigatory measures stipulated in section 5.1. be adhered to.

EN = Endangered; CR = Critically Endangered; VU = Vulnerable; NT = Near Threatened; M = Medium; H = High

Table 12-16: 3: Field assessment results pertaining to amphibian species within the sites associated with the proposed KMR Expansion Activities.

Photograph Notes

No herpetofauna were observed within the sites wherein the proposed KMR Expansion Activities will occur. Above are all **representative photographs** of herpetofaunal species likely to occur within the larger MRAs (not only the sites) as they have been seen in the surrounding vicinity (in accordance with the ADU (2021) database). On considering the species habits and requirements, suitable habitat is available within the Savanna and Ga-Mogara Riverine Vegetation habitat units on site.

Top: Left – *Chondrodactylus bibronii* (Bribron's Gecko, LC). Right – *Agama aculeata* (Common Ground Agama, LC).

Bottom: Left – *Breviceps adspersus* (Common Rain Frog, LC). Right – *Tomopterna cryptotis* (Tremelo Sand Frog, LC).

Herpetofauna Species of Conservation Concern (SCC)

No Amphibian or reptile SCC were observed during this 2021 assessment nor were any such species observed or noted in the previous specialist assessments undertaken for the Mine. Given that no SCC have been identified in the site's QDSs, or lack suitable habitat, no herpetofaunal SCC are anticipated to occur within the sites associated with the proposed KMR expansion activities.

Herpetofauna Discussion

No herpetofauna were observed on site during this STS (2021) field assessment. The site is deemed to host a moderate diversity of reptiles, with eight common reptiles recorded in the site's QDSs according to the updated ADU (2021) database. Species that may occur within the sites will be associated with flat terrain, sandy substrates or with trees (Bell, 2019). Reptiles adapted to the sandy and open savanna site conditions include but are not limited to *Chondrodactylus bibronii* (Bibron's Gecko, LC), *Pedioplanis lineoocellata* (Spotted sand lizard, NYBA), *Nucras tessellata* (Western Sandveld Lizard, LC) *Heliobolus lugubris* (Bushveld lizard, NYBA), *Pseudapsis cana* (Mole snake, LC) and *Ptenopus garrulus* (Common barking gecko, LC). The skink species *Trachylepis spilogaster* (Kalahari tree skink, LC) lives under tree bark and even in houses.Another Kalahari adapted reptile species is *Agama aculeata* (Common Ground Agama, LC) that tends to shelter beneath trees,basks in low bushes and uses burrows. Overall, habitat integrity for reptiles on site is considered high, as natural habitat remainsin many portions of the site and many reptile species are able to utilise even transformed environments. Old burrows of varioussizes were observed throughout the sites that will provide valuable shelter for fossorial reptiles. Food is not considered a limitingfactor for reptiles, as small mammal signs were frequently encountered, and insects are likely to be abundant in summer.

The Ga-Mogara River, the only watercourse on site, is highly ephemeral (flooding rarely and only after heavy rainfall). This is a result of the region's dry climate, coupled with high rates of rainfall infiltration due to the dominance of sandy soils on site. As such, this river remains dry for extended periods of time. Where freshwater habitat is artificially created through mining processes, it too will likely remain dry for extended periods. As such, suitable habitat for water dependant amphibians is absent from the site, which significantly limits the amphibian assemblage to very few species that can survive with little moisture (Bell, 2019). Only two amphibians, namely *Breviceps adspersus* (Common Rain Frog, LC) and *Tomopterna cryptotis* (Tremelo Sand Frog, LC) that have been recorded in the site's QDS according to the ADU (2021) database, of which both species are adapted to very dry conditions and may therefore occur within the sites. Amphibian sensitivity for the site is therefore considered low.

Business Case and Conclusion - Herpetofauna

The lack of suitable freshwater habitat for amphibians lowers amphibian sensitivity on site, as such the proposed KMR expansion activities are likely to have a limited impact on this particular faunal class. Although a moderate reptile assemblage is expected to be present and it is unlikely that reptile SCC will occur within the site, it is still necessary to ensure that the impacts from the proposed KMR expansion activities be kept as small as possible. This can be achieved by avoiding unnecessary disturbance and minimising construction footprints to minimise the fragmentation of reptile habitat. It must also be ensured that all disturbed areas are rehabilitated to prevent the proliferation of alien and invasive plant species.

Table 12-17: Field assessment results pertaining to insect species within the sites associated with the proposed KMR Expansion Activities.

Invertebrate SCC			
Species	**Habitat and Resources in the Sites**	**Conservation Listing**	**POC**
Ceratogyrus darlingi (Rear-horned Baboon Spider)	Occupies round, silk-lined burrows in lightly wooded areas, beneath rocks and logs.	P	M
Harpactira hamiltoni (Highveld Baboon Spider)	*Harpactira hamiltoni* is a fossorial species, living in deep burrows they either modify from a crevice between rocks, or construct themselves beneath rocks, tree stumps and even at the base of shrubs.	P	M
Opistophthalmus carinatus (Robust Burrowing Scorpion)	It is found under rocks and the bark of dead trees. Dead trees will be abundant in the Savanna habitat unit, which has a well-developed woody component. It is active on warm nights.	P	M
Opistophthalmus wahlbergii (Kalahari Burrowing Scorpion	It burrows in open sandy areas where the burrows may be up to a meter deep. Open sandy areas are abundant in the Savanna habitat unit. They are often active at night.	P	M

Photograph Notes

Top: Left –. A deceased *Heliocopris atropos* (Giant Dung Beetle, NYBA) found in Mixed Thornveld habitat unit along the proposed York attenuation dam option. Middle – *Schistocerca gregaria* (Desert Locust, NYBA) observed in the Mixed Thornveld habitat unit in the footprint of the proposed abstraction borehole on the farm Telele. Right – **Not observed, representative photograph only** – The TOPS Protected spider, *Ceratogyrus darlingi* (Rear-horned Baboon Spider) has been previously observed in areas surrounding the greater MRA according to the ADU (2021) database, which increases the POC of this spider species within the sites. **Bottom: Not observed, representative photographs only** of three other arachnid SCC that have been recorded in areas surrounding the greater MRA and therefore have increased potential to occur within the sites: Left – *Harpactira hamiltoni* (Highveld Baboon Spider, P); Middle – *Opistophthalmus carinatus* (Robust Burrowing Scorpion, P) and Right – *Opistophthalmus wahlbergii* (Kalahari Burrowing Scorpion, P).

Invertebrate Discussion

Observed invertebrate diversity was considerably lower than expected, significantly influenced by the winter season when most invertebrates have sought shelter and become less active or are in a dormant life cycle. Many insects are inactive during the winter, as they survive this period as pupae, or are in low abundances as a result of low temperatures, moisture and food resources. Considering the quantity and variety of grassy and woody microhabitats within the Savanna habitat unit, it is anticipated that invertebrate diversity will be substantially higher following rains in the summer season. The Savanna and Ga-Mogara Riverine Vegetation habitat units are able to support a rich abundance of invertebrates but increased competition for resources through grazing by livestock reduces the herbaceous layer, which in turn impacts on invertebrate habitat as well as food resources. All of the invertebrate species observed were common and widespread species. No invertebrate SCC were observed during the field investigation, but it is possible that *Opistophthalmus* spp (Burrowing Scorpions) and spider species of the genus *Harpactira* and *Ceratogyrus* may occur within the sites, notably within or nearby sandy and woody microhabitats. These SCC are slow-moving and often do not venture far from their burrows or excavations beneath objects, thus earthworks, and vegetation clearance will pose a threat to these species.

Business Case and Conclusion - Invertebrates

The proposed KMR expansion activities will lead to the localised loss of invertebrate habitat and food resources, reducing invertebrate diversity within the habitat units associated with the sites wherein the proposed KMR expansion activities will occur. Earthworks will have a notable impact on the Savanna habitat and Ga-Mogara Riverine Vegetation habitat units , which provides refuge to several invertebrate species as well as potential arachnid SCC. Invertebrates are considered a vital and important link in the ecosystem, fulfilling many ecological roles, including pollination, removal of carcasses and plant material, pest predation and parasitism and clearing of dung and scat from mammals. Insect species also provide a vital food resource for many of the other faunal species in the site. As such the loss of insect abundance and diversity may have a negative cascading effect on the remaining wild faunal species on site. Please see section 5.1 for a list of recommended mitigatory measures to minimise potential impacts on invertebrates, during all phases of the proposed mining activities.

12.5 Noise

The information presented in this section is extracted from the specialist Noise specialist study undertaken by Acusolv in 2021 (Appendix I).

12.5.1 Baseline noise

Legal Framework

SANS 10103

Noise regulations require that the measurement and assessment of noise comply with the guidelines of in SANS 10103. The concept of noise nuisance, however, only features in the regulations. SANS 10103 only deals with quantifiable noise (noise disturbance), without any guidelines for, or reference to noise nuisance.

SANS 10103 - Acceptable Ambient Levels

Noise regulations require that the rating level of the ambient noise be compared with the rating level of the residual noise (where this can be measured), or alternatively (where the noise source cannot be switched off or interrupted), with the appropriate rating level as outline in Table 2 of SANS 10103. Neither the noise regulations, nor SANS 10103 define or refer to the term noise impact. It is however generally understood and defined for purposes of this assessment, as the amount in dB by which the total noise level exceeds the nominal or the measured ambient level rating, whichever is applicable, for the area under consideration.

Table 12-18 summarises SANS 10103 criteria for acceptable ambient levels in various districts. Note that ratings increase in steps of 5 dB from one to the next higher category and that, in general, regardless of the type of district, ambient noise levels tend to decline by typically 10 dB from daytime to night-time. It follows that, for the same level of intrusive noise, the noise impact would typically increase by 10 dB from daytime to night-time.

Table 12-18: Typical outdoor ambient noise levels in various districts (SANS 10103)

District		Daytime	Night-time
(a)	Rural	45	35
(b)	Suburban – With little road traffic	50	40
(c)	Urban	55	45
(d)	Urban - With workshops, business premises & main roads	60	50
(e)	Central business districts	65	55
(f)	Industrial districts	70	60

A 24-hour cycle is divided into the following periods:

- Daytime: (06:00 – 22:00)
- Night-time: (22:00 – 06:00)

SANS 10103 also gives guidelines in respect of expected community response to different levels of noise impact (increase in noise level), as summarized in Table 12-19.

Table 12-19 Expected community response to an increase in ambient noise level (SANS 10103)

Increase in Ambient Level [dB]	Expected Community Reaction
0 - 10	Sporadic complaints
5 - 15	Widespread complaints
10 - 20	Threats of community action
More than 15	Vigorous community action

SANS 10103 Guidelines

A good indication of ambient noise levels to be expected in an area can be obtained by application of SANS 10103 guidelines and consideration of land-use, population density, road infrastructure and traffic volume profiles.

SANS 10103 provides guidelines (Table 12-20) for estimation of typical or expected ambient levels in various districts, ranging from rural to central business districts (CBD's). The table gives typical levels for ambient noise averaged over daytime (06:00 – 22:00) and night-time (022:00 - 06:00) periods. Ratings increase in steps of 5 dB from one to the next higher district category. In general, regardless of the type of district, ambient noise levels tend to drop by typically 10 dB from daytime to night-time.

Baseline Ratings for the KMR Assessment Area based on SANS 10103 Guidelines

The proposed KMR Expansion Project is located in a rural district interspersed with mining operations. Depending on the distance from the nearest main roads and mining operations, ambient noise in the assessment area vary. Hotazel, the nearest and only town potentially within audible range of KMR operations, is characteristically urban with little road traffic. Elsewhere, most of the area has a rural to semi-rural character determined mainly by natural sounds with low background noise levels. According to SANS 10103 guidelines, typical daytime and night-time levels in the noise assessment area are as summarised in Table 12-20.

Table 12-20: Typical ambient noise levels in the noise assessment area

Noise Assessment Area	SANS 10103 Guideline		
	District	Typical Ambient Levels	
		Daytime	Night-time
Hotazel outlying areas	Rural to semi-rural	45 - 50	35 - 40
Hotazel Town	Suburban – With little road traffic	50	40

Baseline Ratings derived by SRL in 2014

In an assessment conducted by SLR in 2014, ambient noise was measured and existing conditions investigated at three locations. One location was in Hotazel Town. A second location was at Langdon near a dormant mining area. This area, intersected by the R31 provincial road, is semi-rural in character. The third location was in the Devon/Telele area which is mostly rural. Baseline ratings derived by SRL from the field measurements and investigations, are summarised in Table 12-21. These results are in agreement with the ratings derived in the current desktop assessment (Table 12-20).

Table 12-21: Baseline Ratings derived by SRL in 2014

Noise Assessment Area	SANS 10103 Guideline		
	District	Typical Ambient Levels	
		Daytime	Night-time
Hotazel	Suburban – With little road traffic	50	40
Langdon	Rural	45	35
Devon/Tele	Rural	45	35

12.5.2 Noise Survey

Vibration

Machinery and earthwork vibrations are of no material consequence to people in the surroundings of KMR operations. Vibrations caused by machinery, excavation, dozing or by any other earth-moving equipment operations, are generally only significant on the equipment itself and in a localised area on the site or inside plant buildings (in the workplace). Vibration induced by such equipment into and propagated through the earth (ground-borne machine vibration), is rapidly attenuated to negligible levels even before it reaches the site boundaries. Compared to airborne noise, the vibration footprint of mining operations is entirely negligible. For all practical purposes, the scope of the noise and vibration assessment and the risk of vibration impacts are covered by the results and findings of the air-borne noise impact assessment concluded in this study.

The only source of potentially significant vibration in mining operations is blasting, which is the subject of assessment to be undertaken by the blast specialist (Section 12.6).

Air-borne Noise

KMR Sources of Noise

The noise sensitivity analysis in the KMR Expansions assessment was made by taking both the existing ambient levels and broad estimates of the expected noise footprints of KMR Expansion operations and activities into account. Centres of operation from which noise will emanate, are:

- Opencast in-pit and associated surface operations around the new pit on Kipling, and at the expanded Hotazel and York pits;
- Operations on the expanded waste rock dumps at the proposed Kipling operation and at the existing Hotazel operation;
- Operations on the expanded ore stockpile dumps at the proposed Kipling operation and at the existing Hotazel and York operations;
- Hauling operations on the new haul road between the proposed Kipling operation and the existing Hotazel operation and on the existing (to be upgraded) haul roads between the Hotazel and York operations.

The layout of operations and the locations of potentially significant noise-generating activities and infrastructure are shown on the map in Figure 12-11.

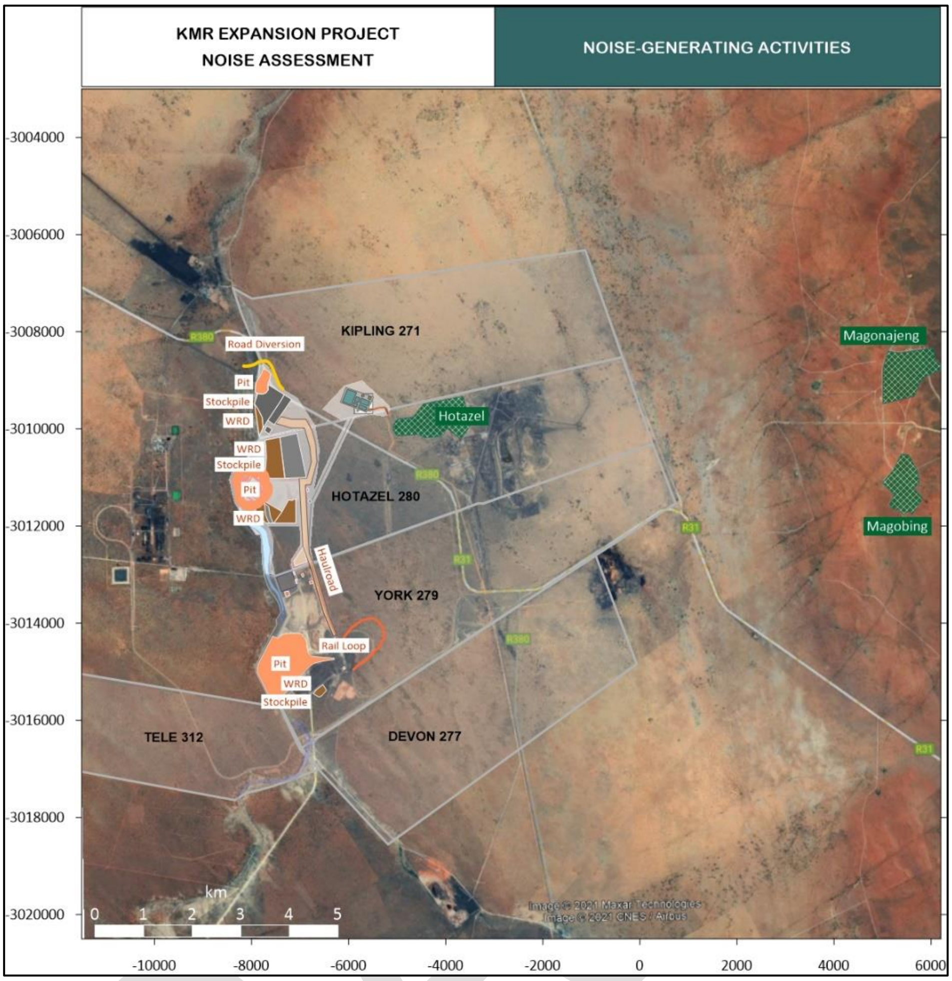


Figure 12-11: Noise-generating activities and infrastructure

KMR Noise Footprint

Ballpark estimates of Project noise footprints were derived by high-level computations, using archived noise emission data for the type of noise sources entailed by the proposed expanded KMR operations. Table 12-22 summarises typical audible reaches for these sources, estimated for neutral weather conditions at night in rural and semi-rural areas with little road traffic. These estimations are realistic and substantiated by knowledge gained from previous field surveys and modelling of similar operations.

Table 12-22: Typical ranges of influence. Distances over which noise from various noise-generating mining activities and associated infrastructure will be audible at night in rural and semi-rural areas.

Operation	Audible Range	
	Distance	Audible noises
Opencast – In-pit operations	500 m	Engine, drilling, excavation, dozing
Opencast – Surface operations	1500 m	Engine, dozing, truck movements
Waste Dump operations	1 900 m	Engine, dumping, dozing, truck movement
Stockpile operations	600 m	Piling, front-end loader, engine
Haul roads	1000 m	Engine, truck movements, bucket noises
Reverse alarms	1 500 m	Beeping (noise nuisance)

The most noise-sensitive time in any non-industrial urban or rural district is at night when the general ambient noise level characteristically drops to its lowest level. A 24-hour operation will therefore have maximum noise impact at night; not only because the noise output remains constant, but also because atmospheric sound propagation at night tends to diffract sound earthwards, rather than skywards as typically occurs during the day. This results in higher levels and higher impacts at night.

The estimated night-time audible noise footprint of all KMR mining operations collectively, is shown on the map in Figure 12-12. The contour delineates the distance beyond which noise from KMR operations is expected to drop to a level below 40 dBA, which is the typical night-time background ambient level in semi-rural districts. By implication, the audible footprint also signifies the potential significant impact range or footprint of KMR operations following implementation of the proposed expansions.

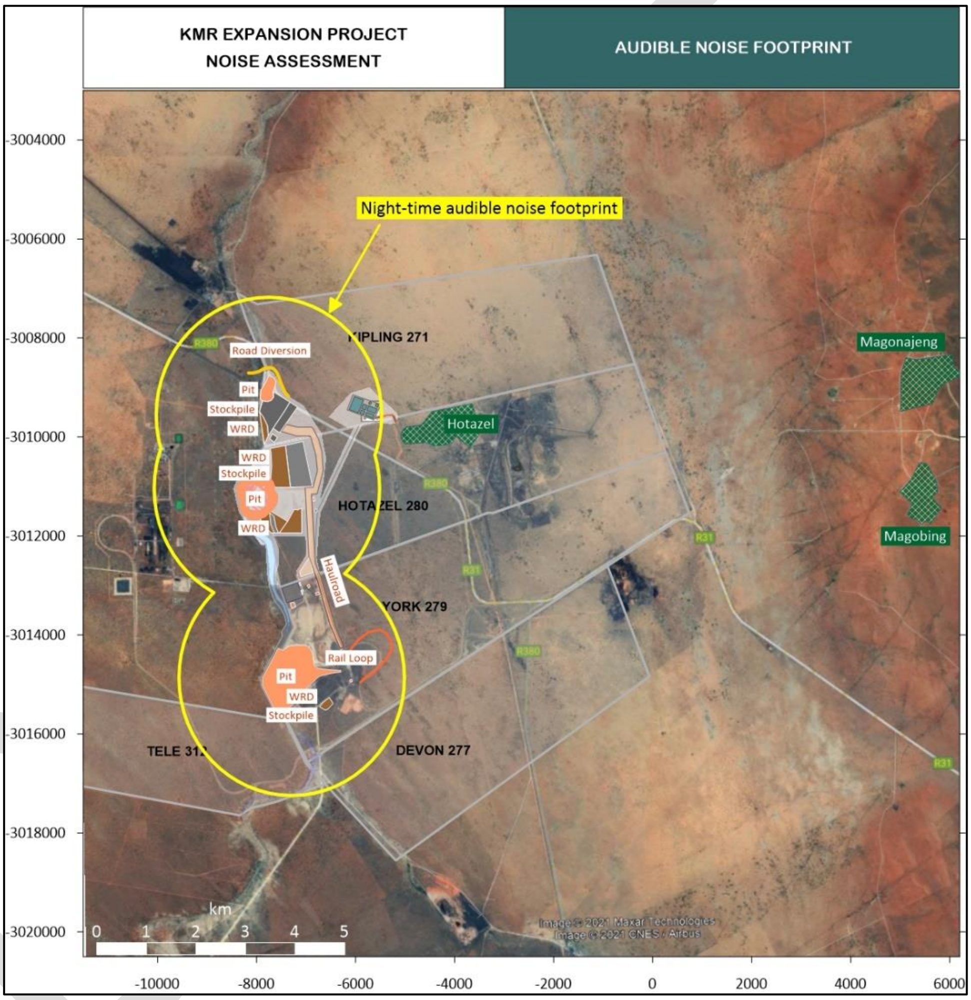


Figure 12-12: Estimated night-time audible noise footprint of KMR mining operations

12.6 Blasting

The information presented in this section is extracted from the Blasting and Vibration specialist study undertaken by Blasting Management and Consulting (Pty) Ltd (BMC) in 2021 (Appendix I).

Blasting operations are required to break rock for excavation to access the targeted ore material. Explosives in blast holes provide the required energy to conduct the work. Ground vibration, air blast and fly rock are a result of the blasting process. Based on the regulations of the different acts consulted and international accepted standards these effects are required to be within certain limits. The following sections provide guidelines on these limits. As indicated, there are no specific South African ground vibration and air blast limit standard.

During the site visit blasting was monitored for ground vibration and air blast. Objective of the baseline was to ensure ground vibration and air blast shows typical trends. And confirm the expected levels closer to the blast area. A monitoring program is also in place at the mine currently the measures and confirm ground vibration and air blast levels at strategic positions. Of specific importance is monitor located within Hotazel township. Though limited data from the monitoring program was provided it showed valuable results with the data recorded during the site visit.

Data recorded clearly indicate significant attenuation of ground vibration over a relative short distance – approximately 100 m to 1000 m from the blast ground vibration attenuates from 39 mm/s to 4.44 mm/s. At distance to Hotazel no significant ground vibration is realised at the monitor in town.

Air blast showed high levels very close to the last with significant attenuation over distance. At closest point levels were higher than the microphone's capabilities. It is also observed that levels were less than the general accepted safe blasting limit of 134 dB at approximately 1000 m.

It is safe to say the that expected possible negative influence from ground vibration due to blasting operations will be restricted to distances less than 500 m. This is specific with regards to house structures.

Air blast may have effects over greater distances but is expected to be less than limits no further than a 1000 m.

The detail evaluation done in the report will define the expected levels of ground vibration for the different points of interest identified. Levels will be confirmed if correlating to the baseline data recorded.

Results from recording done is presented below. The graphs clearly indicate attenuation over distance.

Table 12-23: Baseline Data recorded

Date	Time	Seis. Location	Description	L-PPV	T-PPV	V-PPV	L-Freq	T-Freq	V-Freq	Resultant PPV (mm/s)	Air Blast
2021/07/15	17:20:11	Point 02	Within Mining Area	26.91	27.37	39.31	45.51	40.96	73.14	39.47	150.00*
2021/07/15	17:20:11	Point 01	Within Mining Area	12.85	16.72	13.41	27.68	43.57	26.60	18.45	143.90
2021/07/15	17:20:11	Point 03	Within Mining Area	3.19	3.86	2.49	32.00	33.03	14.95	4.44	133.00
2021/07/15	17:20:11	Point 04	Dyason Cres, Hotazel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

* Microphone exceeded capabilities, estimate value was used.

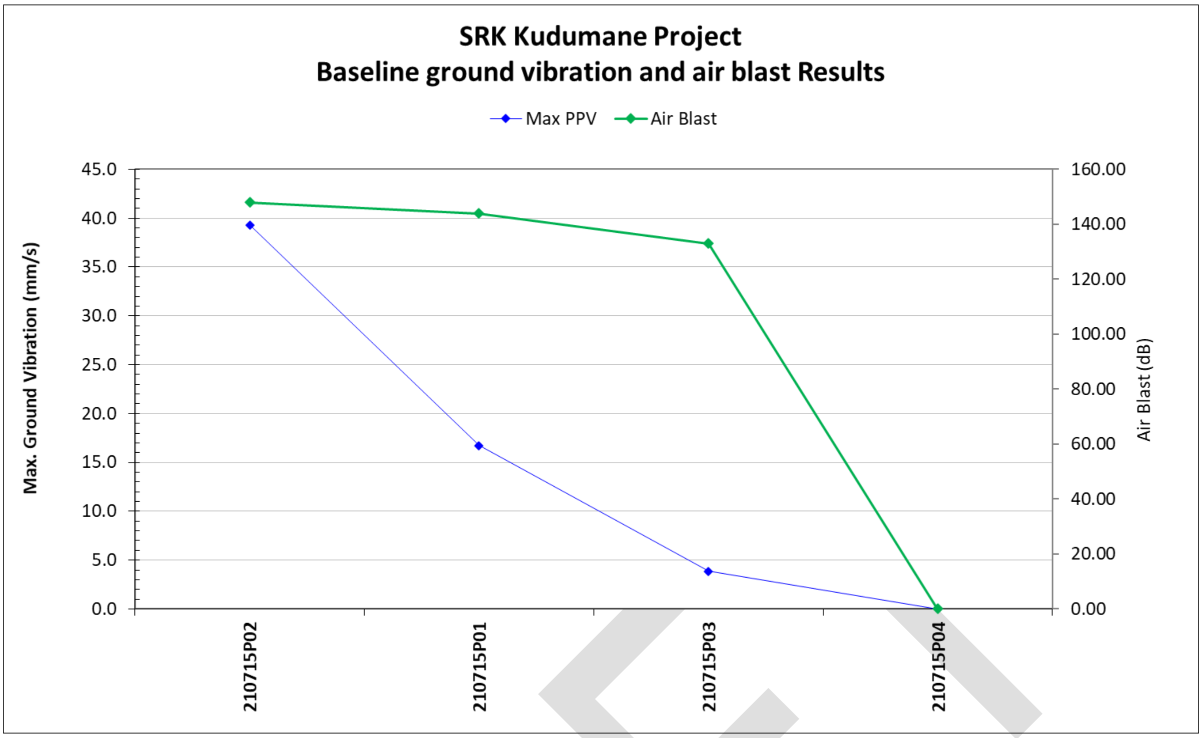


Figure 12-13: Attenuation of ground vibration and air blast

As part of the baseline, all possible structures in a possible influence area are identified. The site was reviewed using Google Earth imagery. Information sought during the review was to identify surface structures present in a 3500 m radius from the proposed open pit areas, which will require consideration during modelling of blasting operations, e.g. houses, general structures, power lines, pipelines, reservoirs, mining activity, roads, shops, schools, gathering places, possible historical sites, etc. A list was prepared of all structures in the vicinity of the open pit area. The list includes structures and Points of Interest (POI) within the 3500 m boundary – see Table 7 of Appendix I. A list of structure locations was required to determine the allowable ground vibration limits and air blast limits. Figure 12-14 and Figure 12-15 shows an aerial view of the planned open pit area and surroundings with POIs. The type of POIs identified is grouped into different classes. These classes are indicated as "Classification" in Table 12-24. The classification used is a BM&C classification and does not relate to any standard or national or international code or practice. Table 12-24 shows the descriptions for the classifications used.

Table 12-24: Point of Interest Classification used

Class	Description
1	Rural Building and structures of poor construction
2	Private Houses and people sensitive areas
3	Office, High-rise buildings and Industrial buildings / Infrastructure
4	Ruins
5	Animal related installations and animal sensitive areas
6	Industrial Installations
7	Earth like structures – no surface structure
8	Heritage sites (buildings, infrastructure, activity)
9	Graves
10	Water Borehole
11	Water Resources Surface
12	Pipelines Buried

13	Powerlines / Telephone Lines / Towers
14	Road Infrastructure

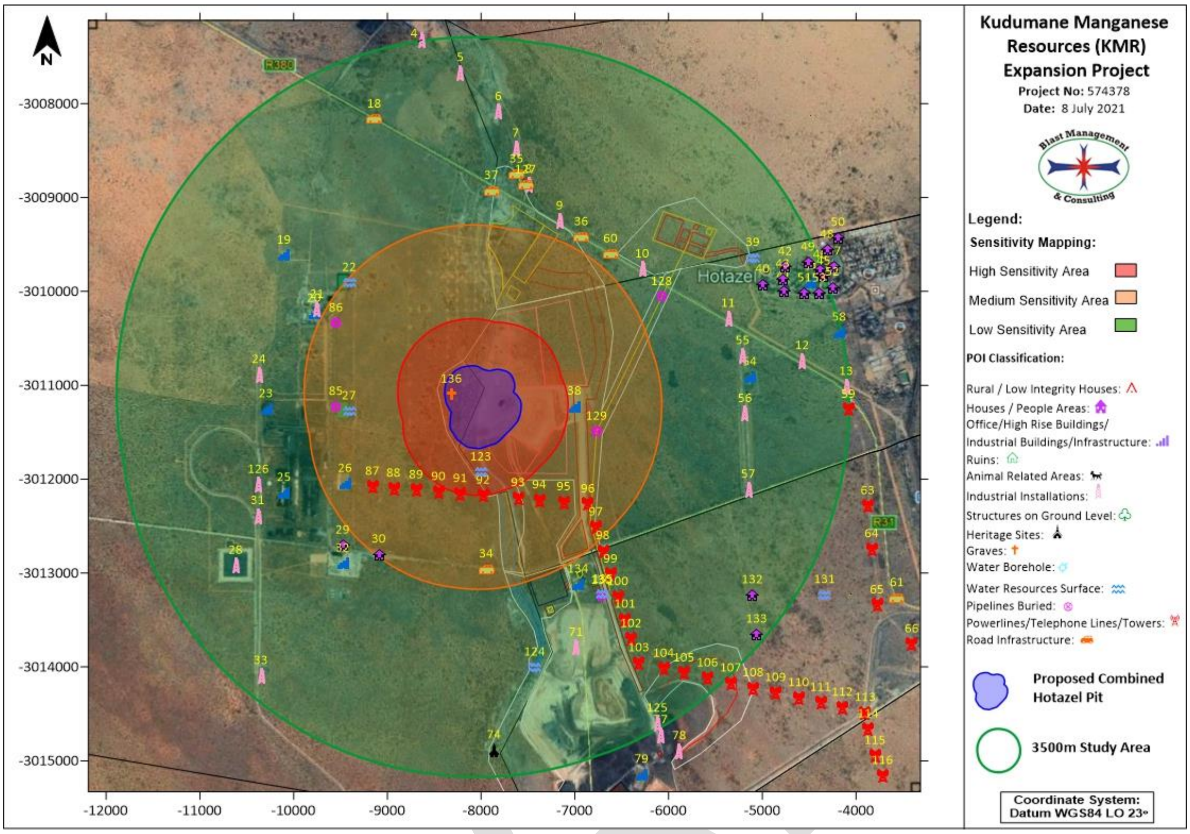


Figure 12-14: Identified sensitive areas for the combined Hotazel Pit area

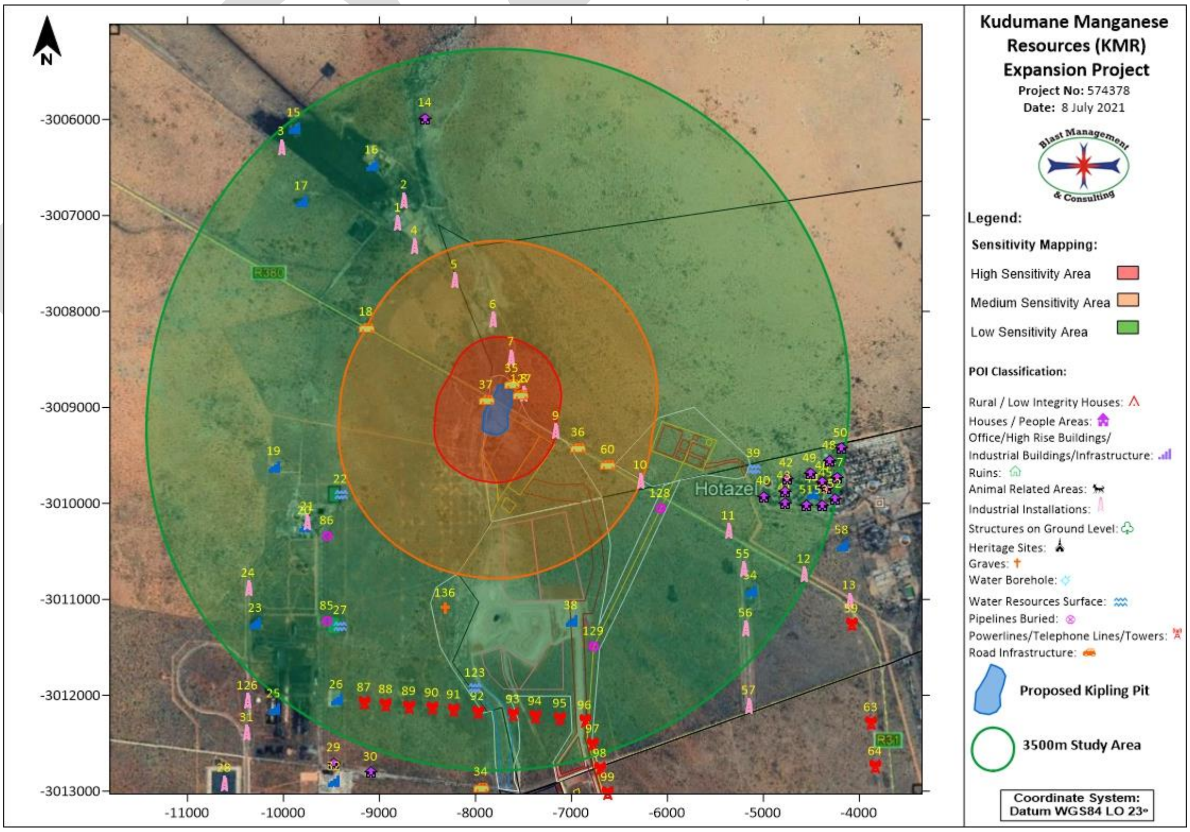


Figure 12-15: Identified sensitive areas for the Kipling Pit area

12.6.1 Blasting Operations

In order to evaluate the possible influence from blasting operations with regards to ground vibration, air blast and fly rock a blast design is required to determine possible influences.

During the site visit two typical blasts were observed. The information from these blasts were applied as baseline data and used for input into the evaluation.

Table 12-25 shows summary technical information for the blasts monitored and applied for this evaluation.

Table 12-25: Blast design technical information

Technical	
Blast Design - Kudu 559	
Block	BCM 37 241.95
Pattern 1	
Number of Holes	107
Burden	4
Spacing	4.5
Diameter	171
Number of decks per hole	1
Explosives	INNOVEX™ 100
Total Explosives	32 373.82 kg
Hole Powder Factor	1.09
Hole Energy Factor	0.94
Summary	
Total Holes	107
Total Detonators	107
Average Hole Depth	15.6 m
Average Explosives per hole	302.6
Total Explosives	32 373.81 kg
Total Meters Drilled	1 774.7
Average Hole Powder Factor	1.09
Average Hole Energy Factor	0.94
Average Block Powder Factor	0.87
Average Block Energy Factor	0.76
Maximum Instantaneous Charge =	1284.69

Technical	
Blast Design - Kudu 558 C strip Final design	
Block	BCM Not Provided
Pattern 1	
Number of Holes	895
Burden	4
Spacing	4.5
Diameter	171
Number of decks per hole	1

Explosives	INNOVEX™ 100
Total Explosives	149 244.1 kg
Hole Powder Factor	0.96
Hole Energy Factor	0.84
Summary	
Total Holes	895
Total Detonators	895
Average Hole Depth	9.8 m
Average Explosives per hole	166.8
Total Explosives	149 244 kg
Total Meters Drilled	9 667.2
Average Hole Powder Factor	0.96
Average Hole Energy Factor	0.84
Maximum Instantaneous Charge =	386.28

Both blasts were designed and simulated by BME (Bulk Mining Explosives). BME is conducting the blasting operations on site. Both blast designs provide values for Maximum instantaneous charge that is used in the modelling of ground vibration and air blast. Evaluation of the blasting operations considered a minimum charge and a maximum charge. The minimum charge was derived from the design for the Kudu 558 C strip and the maximum charge from the design for Kudu 559. The Maximum instantaneous charge relates to the maximum charge associated with the maximum number of blastholes detonating within 8ms of each other. The minimum charge applied relates to 386 kg and the maximum charge applied relates to 1285 kg. These values were applied in all predictions for ground vibration and air blast.

12.6.2 Ground Vibrations

Predicting ground vibration and possible decay, a standard accepted mathematical process of scaled distance is used.

Review of the type of structures that are found within the possible influence zone of the proposed mining area and the limitations that may be applicable, different limiting levels of ground vibration will be required. This is due to the typical structures and installations observed surrounding the site and location of the project area. Structure types and qualities vary greatly, and this calls for limits to be considered as follows: 6 mm/s, 12.5 mm/s levels and 25 mm/s at least.

Based on the designs presented on expected drilling and charging design, the following Table 12-26 shows expected ground vibration levels (PPV) for various distances calculated at the two different charge masses. The charge masses are 386 kg and 1285 kg for the Pit areas.

Table 12-26: Expected Ground Vibration at Various Distances from Charges Applied in this Study

No.	Distance (m)	Expected PPV (mm/s) for 386 kg Charge	Expected PPV (mm/s) for 1285 kg Charge
1	50.0	244.7	660.1
2	100.0	125.4	338.1
3	150.0	39.9	107.7
4	200.0	24.8	67.0
5	250.0	17.2	46.4
6	300.0	12.7	34.3
7	400.0	7.9	21.4

8	500.0	5.5	14.8
9	600.0	4.1	10.9
10	700.0	3.1	8.5
11	800.0	2.5	6.8
12	900.0	2.1	5.6
13	1000.0	1.7	4.7
14	1250.0	1.2	3.3
15	1500.0	0.9	2.4
16	1750.0	0.7	1.9
17	2000.0	0.6	1.5
18	2500.0	0.4	1.0
19	3000.0	0.3	0.8
20	3500.0	0.2	0.6

12.6.3 Air blast

The prediction of air blast as a pre-operational effect is difficult to define exactly. There are many variables that have influence on the outcome of air blast. Air blast is the direct result from the blast process, although influenced by meteorological conditions, wind strength and direction, the final blast layout, timing, stemming, accessories used, covered or not covered etc. all has an influence on the outcome of the result. Air blast is also an aspect that can be controlled to a great degree by applying basic rules.

In most cases mainly an indication of typical levels can be obtained. The indication of levels or the prediction of air blast in this report is used to predefine possible indicators of concern.

As discussed earlier the prediction of air blast is very subjective. Following in Table 12-27 below is a summary of values predicted.

Table 12-27: Air Blast Predicted Values

No.	Distance (m)	Air blast (dB) for 386 kg Charge	Air blast (dB) for 1285 kg Charge
1	50.0	145.2	147.6
2	100.0	142.7	145.1
3	150.0	138.4	140.9
4	200.0	136.6	139.1
5	250.0	135.2	137.7
6	300.0	134.1	136.6
7	400.0	132.3	134.8
8	500.0	131.0	133.4
9	600.0	129.8	132.3

12.7 Visual

The information presented in this section is extracted from the Visual specialist study undertaken by SRK Consulting (Pty) Ltd in 2021(Appendix I).

12.7.1 Visual character

The KMR mine and associated expansion areas are situated on the eastern edge of what is referred to as the Kalahari Manganese Field on government and private land. KMR is situated approximately 3 km south-west of the town of Hotazel within the John Taolo Gaetsewe District Municipality (JTGDM) in the Northern Cape.

The project site is located approximately 5 km west of the R31 that links Hotazel to the regional town of Kuruman. Kuruman lies around 60 km south-east of Hotazel via the N14 that leads to Upington.

The N14 is managed by the South African National Roads Agency (SANRAL), whilst the R31 and R380 are important provincial roads, linking Hotazel, Black Rock, Kuruman and Danielskuil. Apart from Hotazel, which is considered to be the main town in the area, there are several doorstep communities approximately 10 to20 km from the project site.

This wider area is rural and sparsely populated human settlements, and predominant commercial farms and mining activities. Closer to the project site, the land is dominated by mining activities. KMR is one of twelve (12) operating mines in the area. Some of these include United Manganese of Kalahari (UMK), South 32, Assmang Black Rock, Tshipi-e-Ntle, Kalagadi, Sebilo and Aquila Mine (KMR, 2018).

Most farms adjacent to the project site are rented by farmers for the purpose of cattle grazing. Several of the surrounding farms have been bought by mining companies in the last century and much of the existing farmland is reportedly in a general poor environmental condition.

The project site itself is relatively flat sloping gently from south east to north west. According to Scientific Terrestrial Services (STS, 2021) three broad habitat units exist in the area, including the Ga-Mogara Habitat Unit which is limited to the Ga-Mogara River channel and banks, the Savannah Habitat Unit comprising Degraded Thornveld, Karoid Shrubland and Mixed Thornveld.

The study area can be divided into distinct ‘land types’ each with a dominant landscape character. These land types are:

- Mining;
- Agriculture with mostly livestock farming on leased farms;
- Small settlements; and
- Natural to semi-natural areas.

The land use character of the area can be scored as per the criteria in Table 12-28.

Table 12-28: Land Use Character Rating System

Description	Value	Typical Character / Use
Unmodified landscape/natural	5	No / minimal impact associated with the actions of man. National parks, coastlines, pristine forest areas.
Natural transition landscape	4	A changing landscape character associated with the interface between natural areas and modified rural / pastoral or agricultural zones.
Modified rural landscape	3	Typical character is rural landscape, defined by field patterns, forestry plantations and agricultural areas and associated small-scale roads and buildings.
Transition landscape	2	Transitional landscape associated with the interface between rural, agricultural area and more developed suburban or urban zones.
Highly modified landscape, urban/industrial.	1	Substantially developed landscape. High levels of visual impact associated with buildings, factories, roads and other related infrastructure.

The visual character of the study area can be described as being an area modified by existing mining activities, interspersed with savannah type vegetation and agricultural activities. In terms of the rating system presented in Table 12-28, the visual character of the study area can be described as constituting a **Modified Rural Landscape (3),** attributed to the mine and the surrounding mines.

12.7.2 Sense of place

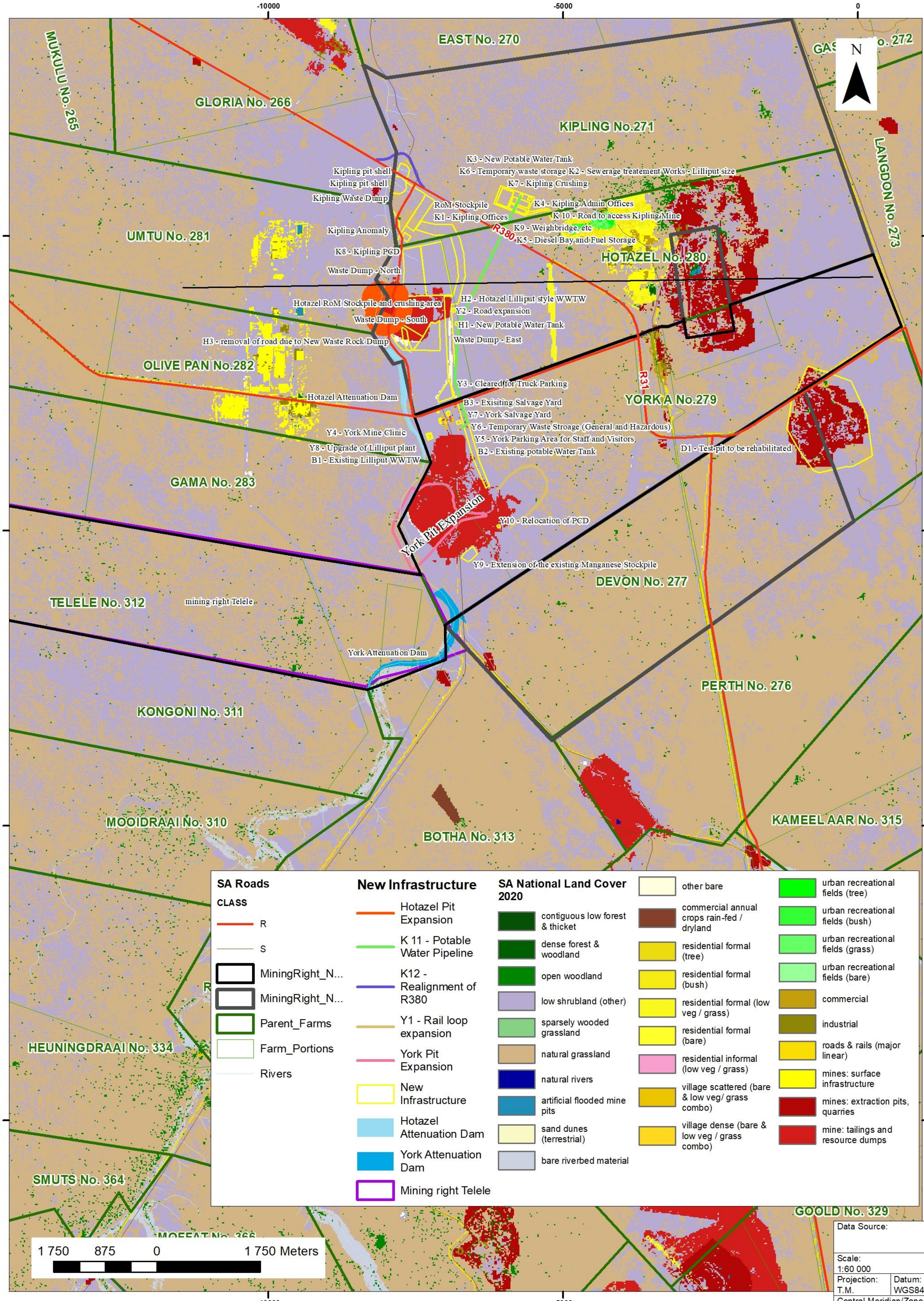
Our sense of a place depends not only on spatial form and quality but also on culture, temperament, status, experience and the current purpose of the observer (Lynch, 1992). Central to the idea of ‘sense of place’ or *Genus Loci* is identity.

An area will have a stronger sense of place if it can easily be identified, that is to say if it is unique and distinct from other places. Lynch defines ‘sense of place’ as “the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid or unique, or at least a particular, character of its own” (Lynch, 1992:131).

Based on the land use map for the area (Figure 4-1), the predominant land use around the mine includes a flat open landscape comprising low shrubland and grassland with the only noteworthy town being Hotazel situated 3km away from the mine.

Most of the residents of Hotazel are likely used to the mining landscape due to the proximity of the town to the KMR and other mines in the areas. Many residents are likely to be reliant on the mine for primary or secondary income. The sense of place for the residents and the farmers in the area will be associated with mining and interspersed vast open spaces. The proposed expansions are unlikely to significantly change the sense of place of the residents of Hotazel.

Travellers using the R31 road and surrounding road networks will have a transient sense of place associated with mining while travelling through the landscape. As many other mines are visible along the R31 road, the expansions to the KMR mine are unlikely to alter the sense of place for motorists travelling through the area.



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Projection: T.M.	Datum: WGS84
Central Meridian/Zone: LO23	
Date: 27/09/2021	Compiled by: STOM
Project No. 574378	Fig No. 3-3

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KUDUMANE MANGANESE RESOURCES EXPANSION PROJECT
LAND COVER

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Revision: A Date: 27 09 2021

12.7.3 Visual Quality

Visual quality is evaluated by identifying the vividness, intactness and unity present in the viewshed. This approach to evaluating visual quality can also help identify specific methods for mitigating specific adverse impacts that may occur as a result of the mine.

Aesthetic value is an emotional response derived from our experience and perceptions. As such, it is subjective and difficult to quantify in absolute terms. Studies in perceptual psychology have shown that humans prefer landscapes with higher complexity (Crawford, 1994). Landscape quality can be said to increase when:

- Topographic ruggedness and relative relief increases;
- Water forms are present;
- Diverse patterns of grassland and trees occur;
- Natural landscape increases and man-made landscape decreases; and
- Where land use compatibility (coherence) increases.

Thus, visual quality decreases when elements deter from the natural environment and, hence, influence the wider area of influence in a negative way. Elements that decrease the visual quality of an area includes “visual clutter” and man-made features.

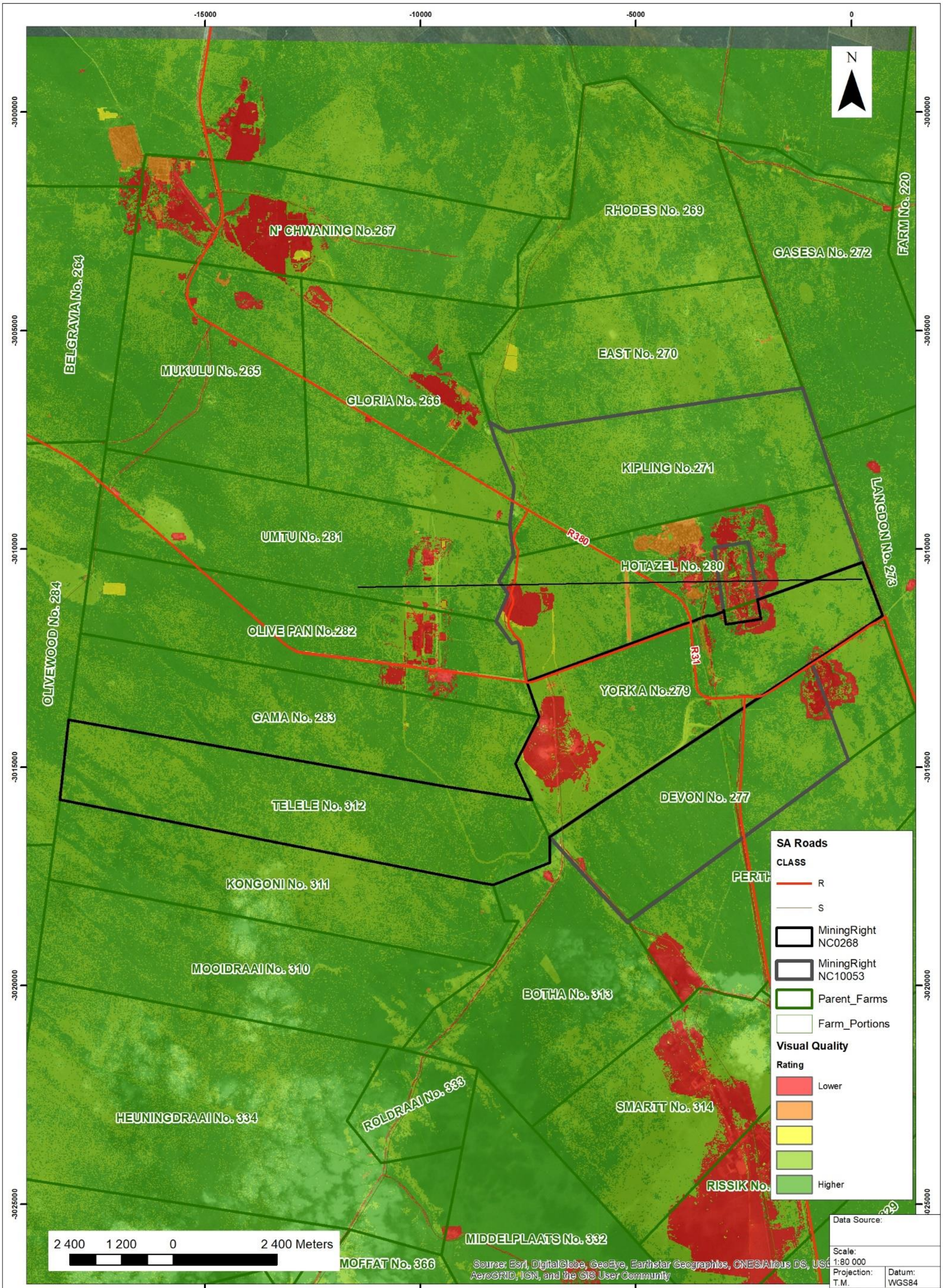
The visual quality of the study area is calculated and summarised in Table 4-3.

Table 12-30: Visual Quality rating for the KMR Mine surrounds

Criteria	Rating	Description
Vividness	3	The study area can be described as having a moderately memorable impression, based on the flat topography, sparse area and vegetation type in the area. Thus, the vividness of the area is classified as being **Medium**.
Intactness	3	The intactness of the area is classified as **Medium** due to some natural areas interspersed between the mines and agricultural plots/farms with degraded vegetation.
Unity	3	The study area can be classified as having a **Medium** unit. Although the manmade elements do not have a visual relationship to natural landforms or land cover patterns and visual order is lacking, the sparseness of the area creates unity beyond the mining footprints
Calculation	$Visual\ Quality = \frac{3\ +\ 3\ +\ 4}{3} = 3.33\ (\boldsymbol{MEDIUM\ to\ HIGH})$	

Based on the calculations made in Table 4-3, the visual quality of the area surrounding the mine is deemed to be **medium to high**.

Figure 4-2 overleaf shows a map in which land use has been reclassified in terms of visual quality attributes, for example highly built-up areas will have a lower visual quality than natural areas. The distinction between mining areas, the town and the natural environment surrounding the mines are evident and the reclassified map confirms that the visual quality outside the mining areas is medium to high.



Data Source:

Scale: 1:80 000

Projection: T.M.	Datum: WGS84
Central Meridian/Zone: LO23	
Date: 27/09/2021	Compiled by: STOM
Project No. 574378	Fig No. 3-4

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KUDUMANE MANGANESE RESOURCES EXPANSION PROJECT

VISUAL QUALITY

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Revision: A Date: 27 09 2021

12.7.4 Visual exposure

Visual exposure is determined by an objects “zone of visual influence” or how visible an object may be in the landscape. The visual exposure of an object can be broken down into two elements:

- Firstly, how exposed is the object to the surrounding area? This can be determined by the topography in which the object is located; and
- Secondly, how exposed are viewers to the object? This can be determined through topography and land use in which the viewer is situated.

The topography of an area can limit or expose the visibility of an object. Table 12-31 below outlines a set of Visibility Criteria that were used to rank how visible the expansion may be from Hotazel and the R31.

Table 12-31: Visibility criteria (Exposure)

Visibility Ranking			
Not Visible	Marginally Visible	Visible	Highly Visible
Visibility Criteria (Exposure Rating)			
1	2	4	5

Usually a viewshed is created using infrastructure footprints and heights to model areas from where infrastructure may be visible. As stockpile and infrastructure heights were not available for the assessment the modelling could not be undertaken and reliance is placed on topography and the criteria as per Table 12-31.

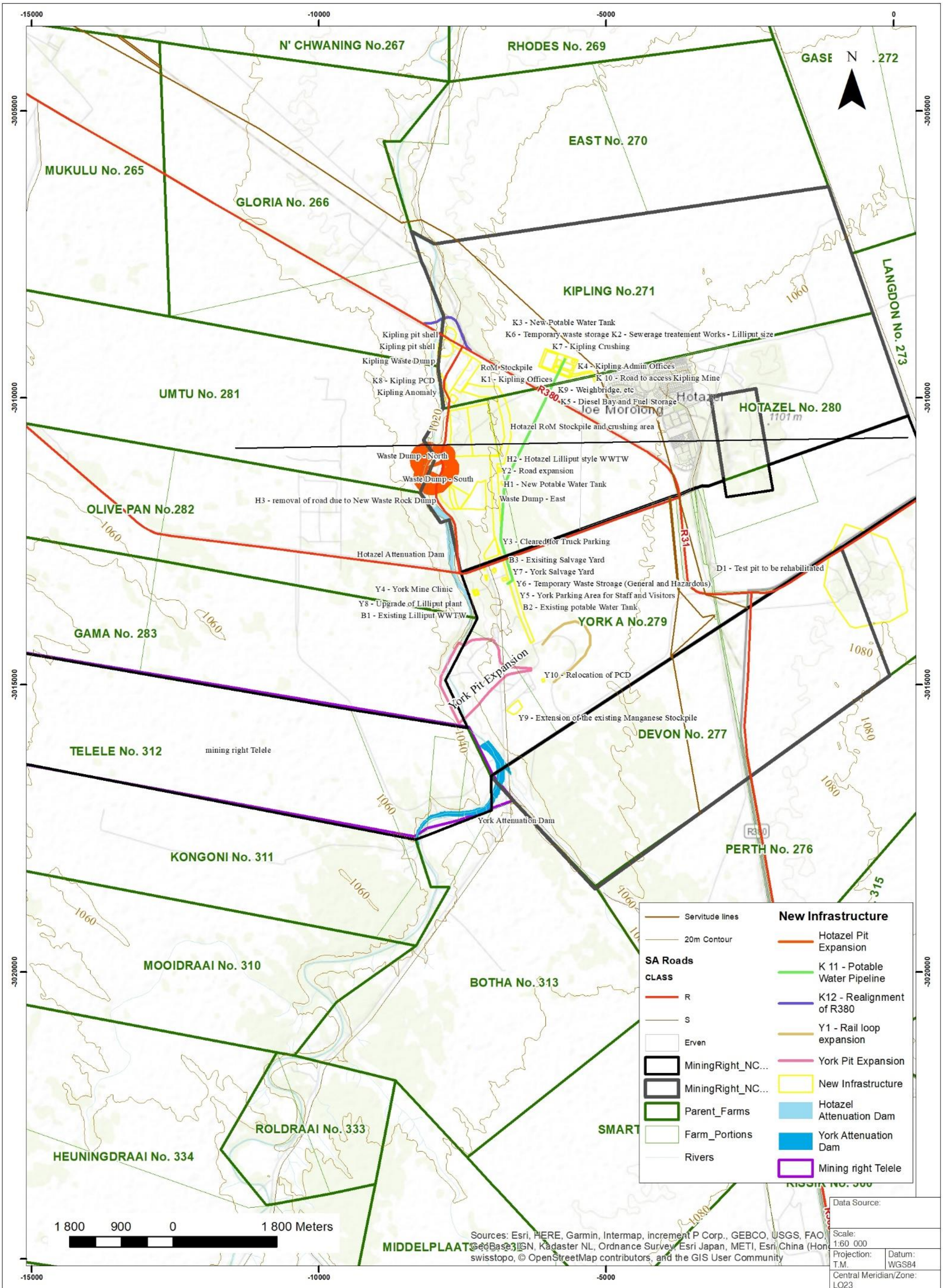
The topography of the area is relatively flat and the mine area slope gently from south east to north west (Figure 12-16). Visibility of aboveground infrastructure such as waste rock dumps, conveyors, TSF’s, ventilation shafts etc usually increases in a flat landscape due to the absence of natural landforms to screen infrastructure.

The proposed waste rock dumps and ore stockpiles associated with the new and expanded open cast mines will gradually increase over time and the visibility of these structures will become evident in the landscape due to the landscape being flat and currently devoid of hills that resembles the shape of waste rock dumps. Existing waste rock dumps associated with the York and Hotazel pits are clearly visible in the landscape (Figure 5-1) due to their large footprints, and being devoid of vegetation makes them stand out from the greenery in the environment surrounding it. It is likely that the proposed waste rock dumps will be visible to visual receptors in Hotazel town as well as motorists travelling on the R31. The visibility rating for the waste rock dumps and ore stockpiles is highly visible (5).

It can be inferred that future underground mining and Telele will have aboveground infrastructure such as winders, ventilation shafts etc which will protrude from the flat surface area of the mine. These structures are likely to be visible to motorists on the R31 but unlikely to be visible from Hotazel, as other mining structures would have been developed between Telele and Hotazel. The structures are likely to be visible (4).

Figure 12-16: Left: existing Hotazel and York pits; right: Kalagadi Manganese Mine

The two attenuation dams proposed to be constructed on the Ga-Mogara River is expected to have lower heights and is deemed to be marginally visible (2) in the landscape.



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KUDUMANE MANGANESE RESOURCES EXPANSION PROJECT

TOPOGRAPHY

Date:	Compiled by:
27/09/2021	STOM
Project No.	Fig No.
574378	3-2

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Revision: A Date: 27 09 2021

12.7.5 Viewing distance and visibility

The distance of a viewer from the proposed structures and infrastructure is an important determinant of the magnitude of the visual impact. This is due to the visual impact of an object diminishing / attenuating as the distance between the viewer and the object increases. This is a measurement of how visual impact is modified by distance. The effect of scale, topography, vegetation and weather, changes with distance, and in turn changes the degree of visual effect.

The following rating system (Table 12-32) has been incorporated spatially with the viewshed to moderate distance between a viewer and an object. This rating system does not however, take into account all existing features (such as vegetation and man-made structures).

Table 12-32: Distance Rating System

Location of development (From Viewpoint)	Category	Value	Description
0 to 0.5 km	Adjacent	5	Adjacent – The mine can clearly be seen. Usually on the property boundary or property grounds.
0.5 km to 1 km	Foreground	4	This is the zone in which details such as colour, texture and form can be appreciated. Objects in this zone are highly visible unless obscured by other landscape features, existing structures or vegetation.
1 km to 3 km	Middle ground	3	The zone which occupies the area "between" detail and indistinct colour and line discernment. Objects in this zone can be classified as visible to moderately visible unless obscured by other elements within the landscape.
3 km to 5 km	Distant middle ground	2	This zone is discerned by means of line and colour. Texture and form are generally not seen. Objects in this zone can be classified as marginally visible to not visible. Areas beyond 3 km are usually not investigated as the impact would be negligible on these areas.
5 km and greater	Background	1	Background – Not Visible (The mine can hardly / not be seen).

The proposed waste rock dumps and ore stockpiles falls within the **middle ground (3) category**, as these structures can be classified as being visible from Hotazel which is 3km away. It should be noted that due to the flat topography, existing vegetation and existing mining activities and related infrastructure, that views towards the mining infrastructure may be obscured from certain locations within the landscape. The waste rock dumps associated with Kipling and Hotazel pits will be in the **foreground (4)** for motorists travelling on the R380.

The proposed Telele underground operation will fall in the **Background (1)** category as it will be more than 5km away from Hotazel. The two attenuation dams will fall in the **Distant Middle ground (2)** category due to its distance from the R31.

12.7.6 Visual absorption capacity

The Visual Absorption Capacity (VAC) is the potential for the area to conceal / mitigate the impact of the mining infrastructure through natural or man-made features in the landscape.

The VAC is rated from high (1) to low (5) based on the capacity of the environment to absorb the visual impact of the facility. The VAC will be high when the environment can impede the infrastructure and as such, the colour of a facility can also determine its VAC. The VAC will be low in areas where the topography is flat and natural features such as trees, outcrops and mountains are absent.

The area within which the mine is situated is generally flat. Existing vegetation, although being relatively low growing, is likely to act as a visual buffer towards views of the proposed mine infrastructure from various areas and may mitigate the visual exposure from certain areas.

Due to the low growing and sparse nature of the vegetation it is unlikely that it would provide sufficient VAC to “hide” infrastructure such as the waste rock dumps, stockpiles and aboveground infrastructure associated with future underground mining. The VAC is likely to be higher for structures such as the water attenuation ponds, provided that vegetation around these ponds is left intact.

The proposed WRD’s and stockpile areas are proposed to be situated in close proximity to other existing stockpiles and mining areas and will blend in with existing structures, although this will increase the magnitude of the visual impact on the area over time

Given the above, the VAC for the WRD’s and stockpile areas are considered to be **low to medium (4)** for the WRDs, stockpiles and aboveground infrastructure associated with future underground mining. The VAC for attenuation ponds is considered to be **high (1).**

12.7.7 Sensitivity of viewers

The sensitivity of viewers is determined by the number of viewers and by how likely they are to be impacted upon. Sensitivity is also dependent on the viewer’s perception of the area and their ability to adapt to changes in the environment. This can also include how frequently they are exposed to the view i.e. static views from houses would have a higher sensitivity than transient views experienced by motorists.

The viewer sensitivity is ranked from high (5) to low (1) based on the probable perceptions of the viewers and their willingness to change. The viewer sensitivity for the mine is regarded as being **medium to low (2)**. This rating is attributed to the mine being in existence for a number of years but also considering that many other mines are operating in the area. The closest town of Hotazel is 3 km away from the mine and many residents are likely to be employed by the mine or other mines in the area. It is understood that the mine has bought most farms around it and is leasing these farms for livestock grazing.

The public participation process will inform this aspect further and will require re-evaluation prior to the submission of the Final Report to the authorities.

12.8 Air quality

The information presented in this section is extracted from the Air Quality specialist study undertaken by Airshed in 2021 (Appendix I)..

12.8.1 Affected Environment Air Quality Sensitive Receptors (AQSRs)

AQSRs primarily refer to places where people reside; however, it may also refer to other sensitive environments that may adversely be affected by air pollutants. Ambient air quality guidelines and standards have been developed to protect human health. Ambient air quality, in contrast to occupation exposure, pertains to areas outside of an industrial site/mine boundary where the public has access to and according to the NEM:AQA excludes areas regulated under the Occupational Health and Safety Act (No 85 of 1993) (Republic of South Africa, 1993). Receptors near the Project include the residential areas of Hotazel, Blackrock, Mogojaneng, and Magobing which are made up of individual residences, schools, medical facilities as well as contractors and leisure accommodation. There are also isolated farmsteads, contractors and leisure accommodation and mining villages near the Project that would also be classified as sensitive receptors. Individual receptors, excluding residences within the towns are listed in Table 12-33 and shown in Figure 12-17. These will be included in the dispersion model setup as discrete receptors.

Table 12-33: Identified individual air quality sensitive receptors

ID	Type/Name	Longitude	Latitude
1	Isolated Farmstead	22.8752233	-27.0550574
2	Isolated Farmstead	22.8949495	-27.0733785
3	Isolated Farmstead	22.8882821	-27.0735733
4	Isolated Farmstead	22.8245882	-27.2107420
5	Isolated Farmstead	22.8340190	-27.1934312
6	Isolated Farmstead	22.8213387	-27.1842499
7	Isolated Farmstead	22.8793125	-27.1361285
8	Isolated Farmstead	22.9123383	-26.9954076
9	Isolated Farmstead	22.8156389	-27.0172500
10	Isolated Farmstead	22.6916769	-26.9838082
11	Isolated Farmstead	22.7054722	-27.0126944
12	Isolated Farmstead	22.6807870	-27.0501349
13	Isolated Farmstead	22.7491685	-27.0815903
14	Isolated Farmstead	22.8014233	-27.0910794
15	Isolated Farmstead	22.7943662	-27.0532343
16	Isolated Farmstead	22.8418309	-27.0392855
17	Isolated Farmstead	22.7934825	-27.0503076
18	Isolated Farmstead	22.8378690	-27.0357610
19	Isolated Farmstead	22.7283921	-26.9947437
20	Isolated Farmstead	22.8264722	-27.0234556
21	Isolated Farmstead	22.8294705	-27.1121647
22	Isolated Farmstead	22.9137247	-27.1663037
23	Isolated Farmstead	22.9191123	-27.2660470
24	Isolated Farmstead	22.9759960	-27.2936931
25	Isolated Farmstead	23.0220230	-27.2413886
26	Isolated Farmstead	23.0339781	-27.2278217
27	Isolated Farmstead	23.0282703	-27.2234385
28	Isolated Farmstead	23.0627878	-27.2067993
29	Isolated Farmstead	23.0408978	-27.1572191
30	Isolated Farmstead	22.9316061	-27.1354432
31	Mecca Guest House	22.7588659	-27.0454282
32	Mokala Lodge	22.8375860	-27.1251043
33	Blackrock Primary School	22.8326506	-27.1218626
34	Hotazel College	22.9565852	-27.1981002
35	Hotazel Combined School	22.9635842	-27.2076038
36	Lehikeng Primary School	23.0422191	-27.1166384
37	K S Shuping High School	23.0889135	-27.0981386
38	Tshego Middle School	23.0889208	-27.0951933
39	Tsineng Primary School	23.0820940	-27.0864197
40	Maremane Primary School	23.2031856	-26.8247006
41	Resolofetse School	23.2058260	-26.8163292
42	Masankong Primary School	23.1210404	-27.1677943

43	Sedibeng Primary School	23.1760458	-27.1905644
44	Gaseagelwe Primary School	23.0492355	-27.2134125
45	Life Occupational Health - Hotazel Manganese Mines Clinic	22.9608967	-27.2034796
46	Wessels Clinic	22.9641166	-27.2112190
47	Dibiaghomo Compound	22.8890574	-27.0637503
48	Gloria Mine Village	22.9099020	-27.1691317
49	Black Rock Mine Village	22.8524183	-27.1462776

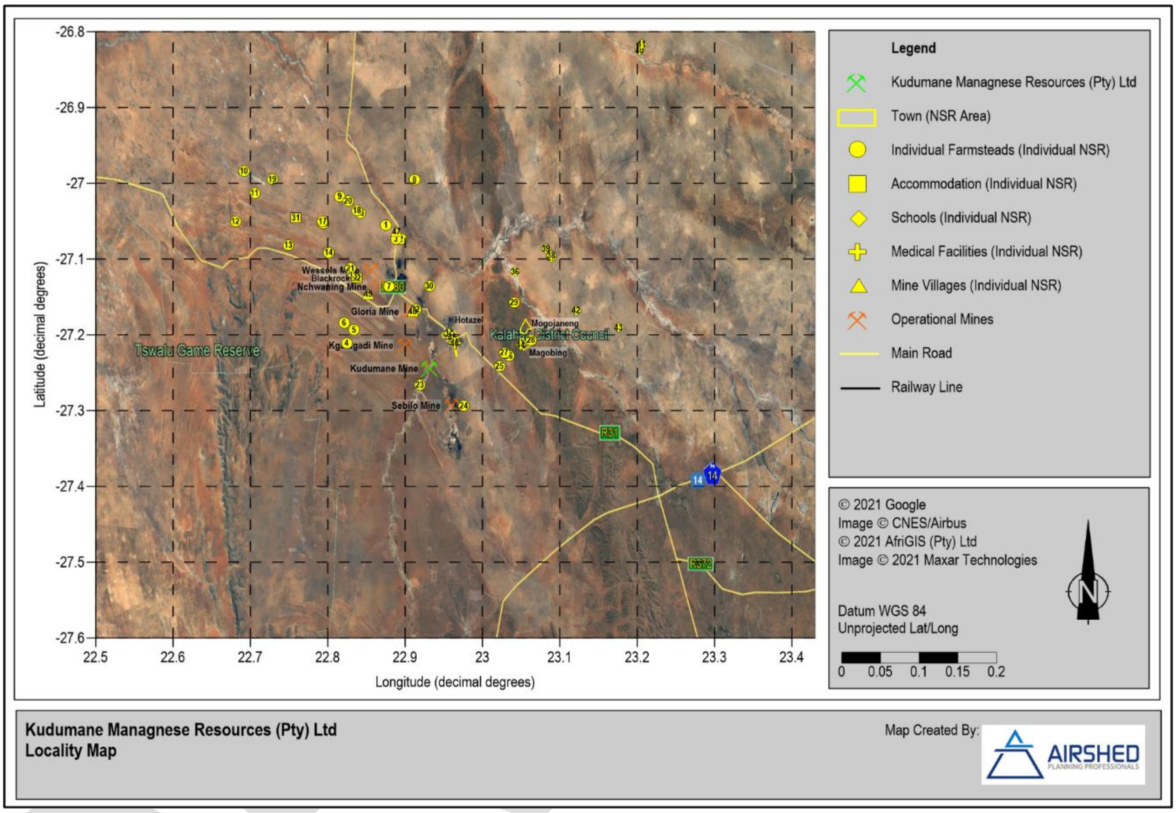


Figure 12-17: Sensitive receptors in accordance with KMR

12.8.2 Existing Air Quality

The current air quality in the study area is mostly influenced by mining and processing activities at other companies' operations, as well as farming activities, domestic fires, vehicle exhaust emissions and dust entrained by vehicles. These emission sources vary from activities that generate relatively course airborne particulates (such as dust from paved and unpaved roads, and the mine sites) to fine PM such as that emitted by vehicle exhausts, diesel power generators and processing operations. Other sources of PM include occasional fires in the residential areas and farming activities. Emissions from unpaved roads constitute a major source of emissions to the atmosphere in South Africa. When a vehicle travels on an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong turbulent air shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. Dust emissions from unpaved roads are a function of vehicle traffic and the silt loading on the roads. Emissions from paved roads are significantly less than those originating from unpaved roads, however they do contribute to the particulate load of the atmosphere. Particulate emissions occur whenever vehicles travel over a paved surface. The fugitive dust emissions are due to the resuspension of loose material on the road surface. Emissions generated by wind erosion are dependent on the frequency of disturbance of the erodible surface. Every time that a surface is disturbed e.g. by mining, agriculture and/or grazing activities, its erosion potential is restored.

12.9 Archaeological and cultural heritage

The information presented in this section is extracted from the Archaeological and Cultural Heritage specialist study undertaken by PSG in 2021(Appendix I) .

12.9.1 Archaeological overview of the Study Area and Surrounding Landscape

The Northern Cape is an arid region with limited surface water so that archaeological remains are often found near water (Mitchell 2002) and sources of lithics that have been used to produce stone tools. Palaeo- and current river systems, springs and pans and dominant geographical landscape features such as hills or shelters are important locales within any landscape.

The region abounds with the remains of prehistoric hunting and gathering groups. Numerous archaeological sites have been recorded, researched and published through archaeological impact and heritage assessments. Stone tools mostly mark areas of prehistoric occupations, and these suggest a widespread presence for tool-producing Plio-Pleistocene hominins in southern Africa (Barham and Mitchell 2008). This important part of the prehistory of southern Africa, known as the Stone Age, is chronologically divided into the Earlier, Middle and Later Stone Ages (ESA, MSA and LSA).

In addition to this, rock engravings are principally found in the interior of South Africa and are plentiful in the Northern Cape. Engravings are found on rocky outcrops, river beds and boulders. They are made by pecking away the surface of the rock with another rock, incising it with a sharp stone or scraping it off with another stone. Unfortunately, there are no scientific methods for securely dating engravings and research into this is still at an experimental stage.

12.9.2 Historical overview of the Study Area and Surroundings

The archival and desktop research of the history of the study area and surrounding landscape identified a number of historical aspects which can be associated with the study area as well as its immediate surroundings. These historical facets include:

- Settlement during the Later Stone Age
- Early Black Settlement during the Late Iron Age and Historic Period
- European Explorers and Visitors
- Historic Black Settlement
- British Protectorate
- Lower Kuruman Native Reserve
- The Langeberg Rebellion
- *Settlement of White Farmers*
- Farm Surveys

12.9.3 Previous Archaeological and Heritage Studies from within the Kudumane Mine Property

Several previous archaeological and heritage surveys were undertaken within the property of the Kudumane Mine. These previous reports identified seven heritage sites in total. A single recorded artefact (KMR 002) of low significance falls within the study area but the other sites identified at the time fall outside of the current development footprint.

As part of the fieldwork conducted in 2014, one archaeological site (KU001) comprising a low-density scatter of stone tools, was identified on the eastern banks of the Ga-Mogara River (PGS, 2014). The site was given a low heritage significance and it was graded as Generally Protected (Grade 4B).

During fieldwork conducted in 2017, three archaeological sites (KMR 002, KMR 003 and KMR 005) and two historical structures (KMR 001 and KMR 004) were identified. The archaeological findspot of a single fragmented stone tool (KMR 002) did not constitute a site of heritage value or significance. Two sites which comprised low-density scatters of stone tools (KMR 003 and KMR 005) were given a low heritage significance and it were graded as Generally Protected (Grade GP. B). The historical structure, KMR 001, required no mitigation due to low heritage significance but the historical structure, KMR 004, was given a medium heritage significance rating.

During the 2019 assessment, one additional site, a burial ground (KMR 007) was identified. The site has a heritage grading of Generally Protected A (GP. A) (Figure 12-18).

Figure 12-18: Heritage finds from previous heritage impact assessments undertaken by PGS (PGS Heritage 2019

The fieldwork for this proposed project was conducted in July 2021. A background scatter of MSA and LSA stone tools was observed throughout the area. All sites and structures identified were logged with handheld GPS and documented with digital camera. During the fieldwork, the following sites were identified:

- Five Stone Age sites (KLIP-002, KLIP-004, KLIP-005, YORK-002 and YORK-003)
- Three historic structures (KLIP-001, KLIP-003 and YORK-001)
- Three burial grounds (TELELE-001, DEVON-001 and HOTAZEL-001)

It is important to note that site HOTAZEL-001 identified during the current field assessment is the same site as KMR007 identified in the 2019 heritage assessment by PGS.

Table 12-34 provides and overview as well as the location of the sites identified within the KMR property boundaries.

Table 12-34: Identified heritage sites on Hotazel 280, Devon 277 and Kipling 277

Heritage ID No.	Co-ordinates	Type	Significance	Impact assessment
DEVON-001	S 27.26313 E 22.93252	Burial Ground	Generally Protected A (GP. A) or High/Medium Significance	Impact not assessed due to low significance
HOTAZEL-001	S 27.208445 E 22.917942	Burial Ground	Generally Protected A (GP. A) or High/Medium Significance	Impact assessed as within proposed development area
KLIP-001	S 27.19999 E 22.92373	Structure	Generally Protected B (GP.B) or Medium significance	Impact assessed as within proposed development area
KLIP-002	S 27.20226 E 22.92213	MSA and LSA Stone Tool Scatter	Generally Protected C (GP. C) or Low Significance	Impact not assessed due to low significance
KLIP-003	S 27.1990398 E 22.9230983	Structure	Generally Protected B (GP.B) or Medium significance	Impact assessed as within proposed development area
KLIP-004	S 27.20048 E 22.92115	MSA and LSA Stone Tool Scatter	Generally Protected B (GP.B) or Medium Significance	Impact assessed as within proposed development area
KLIP-005	S 27.202879 E 22.921808	MSA and LSA Stone Tool Scatter	Generally Protected C (GP. C) or Low Significance	Impact not assessed due to low significance

12.10 Groundwater

The information presented in this section is extracted from the Groundwater specialist study undertaken by Delta H in 2021 (Appendix I).

12.10.1 Hydrocensus

The aim of the groundwater census was to determine the extent of groundwater users and forms part of a quantitative approach to determine baseline water conditions.

Thirty-seven (37) boreholes (Figure 12-19) were verified while five (5) water samples were taken and submitted to the accredited laboratory (Waterlab PTY Ltd). A total of 23 groundwater level measurements could be obtained during the hydrocensus. The water levels measured during the hydrocensus in the area ranged between 5.93 mbgl to 75.6 mbgl, with an average groundwater level of 29.8 mbgl.

Summary of the following geo-sites and observations were noted during the hydrocensus, based at each farm:

- Kudumane mining rights areas:
    - On the farm TELELE five (5) boreholes are currently being used for monitoring purposes. These boreholes, i.e. T1, T2, T3, T4 and T6, are unequipped. The water levels range from 10.3 mbgl to 37.36 mbgl.
    - On the farm YORK A six (6) boreholes were located. Most of these boreholes are unequipped and used for monitoring, i.e. YGW01, YGW03, YGW04 and YGW05, however boreholes YKDW04 and Windmill-4 are not used for monitoring purposes. The groundwater levels range from 17.54 mbgl to 31.17 mbgl.
    - On the farm HOTAZEL three (3) unequipped monitoring boreholes were identified, i.e. HTWM04, HTDW02 and HTWM05. The water levels range from 27.35 mbgl to 44.17 mbgl. Boreholes HTWM04 and HTDW02 are adjacent to the current opencast pit.
- Mokala Mine
    - Four (4) boreholes were identified at the Mokala Mine on the farm GLORIA. Borehole GL27 is equipped with a submersible pump, borehole WU06 is unequipped, with a water level of 13.3 mbgl, borehole MK01 is unequipped with a depth of more than 100m (dip meter max depth) and borehole MK02 is unequipped and dry at 25 mbgl.
- Kgalagadi Mine
    - On the farm UTMU four (4) boreholes were identified close to the Hotazel pit (Kudumane mine). Two boreholes, i.e. boreholes KU20-09 and KSX23 were dry around 12 mbgl and 17 mbgl. Boreholes KU20-12 and KU20-13 are unequipped with water levels at 37.26 and 35.8 mbgl, respectively.
- North of East Manganese Mine
    - On the farm EAST two (2) monitoring boreholes were identified, borehole EM BH01D and EM BH01S. Borehole EM01S was dry at 18 mbgl and borehole EM BH01D had a water level of 48.35 mbgl.
    - On the farm RHODES one equipped (submersible pump) borehole, i.e. EM HC06, was identified.
    - On the farm ANNEX LANGDON two boreholes, i.e. MBH6 and Windmill-01, were identified at the York Wash Bay and next to the main Hotazel road, located east of the mining right area. Borehole MBH6 is equipped with a submersible pump whereas Windmill-06 is a broken windmill.
    - On the farm LONDON one borehole, i.e. UMK7, was identified at the fuel station, located east of the mining right area. Borehole UMK7 had a water level of 16.47 mbgl and is equipped with a submersible pump.
    - On the farm LIZBETH, two windmills (boreholes) were identified. It must be noted on the farm LIZBETH and adjacent farm ADAMS many windmills were seen; however, no access could be obtained. It is clear from the number of windmills at these farms that groundwater acts as a source of water / supply.
    - No access could be gained at Mamatwan mine.
    - On the farm MIDDLEPLAATS one borehole was identified, i.e. JB25. Borehole JB25 is equipped with a submersible pump.
    - A farmer owning the farms OLIVWOOD, EPSON and TIGERPAN had seven (7) boreholes. Boreholes OW1, EP1 and EP2 are equipped and used for domestic and cattle drinking lot use. Boreholes EP3, EP4 and EP5 are unequipped. Borehole TP1 is equipped with a windmill. The groundwater ranges from 5.93 to 75.6 mbgl.

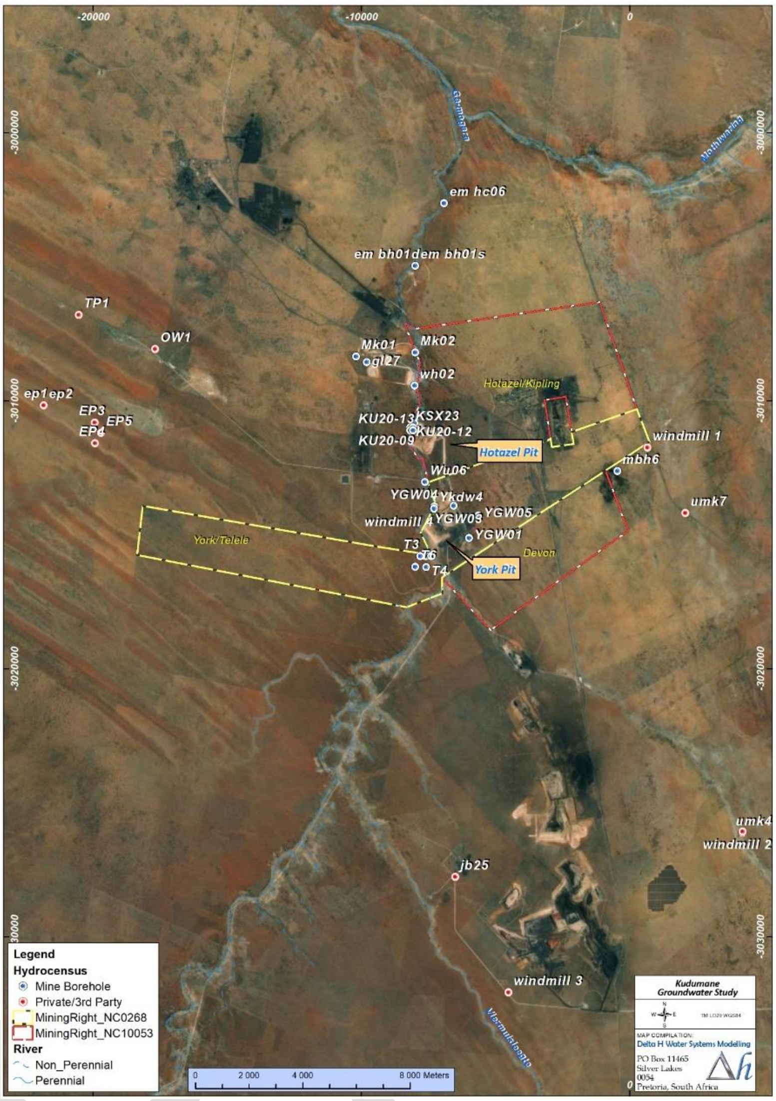


Figure 12-19: Spatial distribution of the borehole hydrocensus.

The farms in the area use groundwater typically for domestic and garden irrigation purposes. Groundwater users (and households) typically abstract groundwater to store in tanks for water supply. The groundwater volumes are not pumped continuously for 24 hours but only on a need be basis. Overall, forms groundwater the main and only source of water for the surrounding farms.

Water Quality

The water quality analysis from the five sampled boreholes were compared to the SANS 241-1:2015 Drinking Water Standard (Table 12-35). In general, the Electrical Conductivity (EC) of the groundwater ranged from 84 to 258 mS/m with pH values varying between 7.3 and 8.3 (pH units), indicating neutral to slightly alkaline conditions. The groundwater in the area is generally high in salt content (i.e. Na and Cl) with deeper chloride-enriched hydrochemical facies typical for the Kalahari beds with low recharge rates (slow movement of groundwater) and high evaporation. Private borehole EP4 show an extremely high ammonia content which may be related to the direct infiltration of the nearby feedlot’s run-off. The elevated nitrate as N observed for boreholes UMK7 and EM-HC06 is often associated with the usage of nitrate-based explosives in the mining region.

Table 12-35: Summary of the hydrocensus water quality results.

BH ID	pH	EC (mS/m)	TDS (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	Alk. ($CaCO_3$)	Cl (mg/l)	SO_4 (mg/l)	NO_3 (mg/l) as N	F (mg/l)	NH_4 as N (mg/l)
SANS241-1:2015	5.0/9.7	170	1200	-	-	200	-	-	300	500	11	1.5	1.5
UMK7	7.3	219	1438	172.1	132.8	73.6	2.8	420	285	69	60	0.4	<0.1
HTWM4	8.3	112	638	9.0	17.2	212.4	3.6	340	143	26	<0.1	1.2	1
EP4	7.4	102	170	27.0	6.9	6.6	22.6	464	12	<2	<0.1	0.2	81
EM-HC06	7.3	258	1290	205.0	118.4	166.6	5.3	396	466	132	32	0.2	<0.1
OW1	7.5	84	518	70.6	35.8	50.0	7.8	260	81	27	10	<0.2	0.1

12.10.2 Aquifers

Based on the various hydrogeological studies undertaken in the area as summarized by SLR (2015) as well as newly developed conceptual understanding of the site, the aquifer systems can be differentiated within the study area as:

1. Intergranular (Kalahari sediments) (unconfined)

- The calcrete with relatively low permeability retards and restricts the movement of water, but acts as a storage unit where saturated.
- The intergranular aquifers are presented by the upper as well as basal sand and gravel beds of the Kalahari sediments. These aquifers have low exploitation potentials with borehole yields generally less than 2 l/s, but the ability to store large volumes of water. They are separated by the red clays of the Budin Formation, acting as a confining layer.

2. Fractured aquifer (semi-confined)

- The Kalahari weathered aquifer is underlain by a deeper semi-confined to confined fractured aquifer in which fracture flow dominates.
- In the project area the main hard rock formations considered in the modelling study are the Dwyka Formation, the Hotazel Formation and the Ongeluk Formation.
- The Mooidraai (dolomite) Formation occur predominantly west of the KMR mining area. The Mooidraai Formation could potentially hold large volumes of water, but no evidence of significant dissolution cavities exists from available exploration drilling data (SLR, 2015).

Kalahari aquifer and aquiclude

The Kalahari sand, and the sediment beds with its associated underlying calcrete layer overlies the bedrock formations. According to the KMR exploration drilling data the thickness of the Kalahari Formation is approximately 40 m in areas east of the Ga-Mogara River (and is predominantly underlain by lava of the Ongeluk Formation), while it increases west of the river to a maximum observed thickness of approx. 110 m.

While the sediments and calcretes could have a relatively higher hydraulic conductivity, the clay must be assumed to be relatively impermeable (SLR, 2015). Hydraulic conductivities for the Kalahari sediments range from 0.01 to 10 m/d (SLR, 2015). The hydraulic connection between the upper, unconfined Kalahari aquifer and the deeper, confined fractured aquifer is largely determined by the thick clay bed, and the low permeability of the tillite horizon of the Dwyka Group.

Fractured aquifer

Dwyka Formation:

- The developed diamictite (tillite) with clay lenses of the Dwyka Group forms occur up to a depth range of 260 m below surface is generally thought to form an important vertical flow barrier (aquiclude) at the base of the Karoo rocks. Hydraulic conductivities for the Dyka tillite range from 0.24 to 1E-4 m/d (SLR, 2015).

Hotazel Formation (BIF):

- Groundwater associated with the Hotazel Formation rocks appears to be associated with fracture systems that are generally of limited extent. The observed average thickness of the manganese beds is 40 m, ranging between 1 m east of the Ga-Mogara River and at depths > 200 m towards the immediate west of the KMR mining area.
- The BIF aquifer and underlying dolomite aquifer can be regarded as one hydraulic unit or aquifer system.

Ongeluk Formation (lava):

- Towards the eastern parts of the mining area, the Ongeluk (lava) Formation is directly overlain by Kalahari sediments. The expected borehole yields for the Ongeluk aquifer unit range here between 0.1 and 0.5 L/s.

12.10.3 Groundwater levels

Using a total of 23 measured groundwater table elevations, Delta H established the correlation between surface topography and elevation of the groundwater level (Figure 12-20) for the wider study area. A rather poor correlation 52 % (R^2 = 0.52) which may relate to the occurrence of two distinct aquifer systems (plus local perched aquifers) with different water levels and can be attributed to the semi-confined nature of the fractured aquifer, the occurrence of thick clay beds perching the aquifer above them, as well as hydraulic heads not yet in equilibrium with the surrounding aquifer due to low borehole yields. However, locally the current groundwater flow regime is towards the open pits due to the dewatering effects caused by the mining of the pits below the rest water level of the surrounding aquifer. As a result, the pit act as a local groundwater sink (where dewatering and evaporation exceeds inflows) and groundwater flow is towards the pit from the surrounding aquifer.

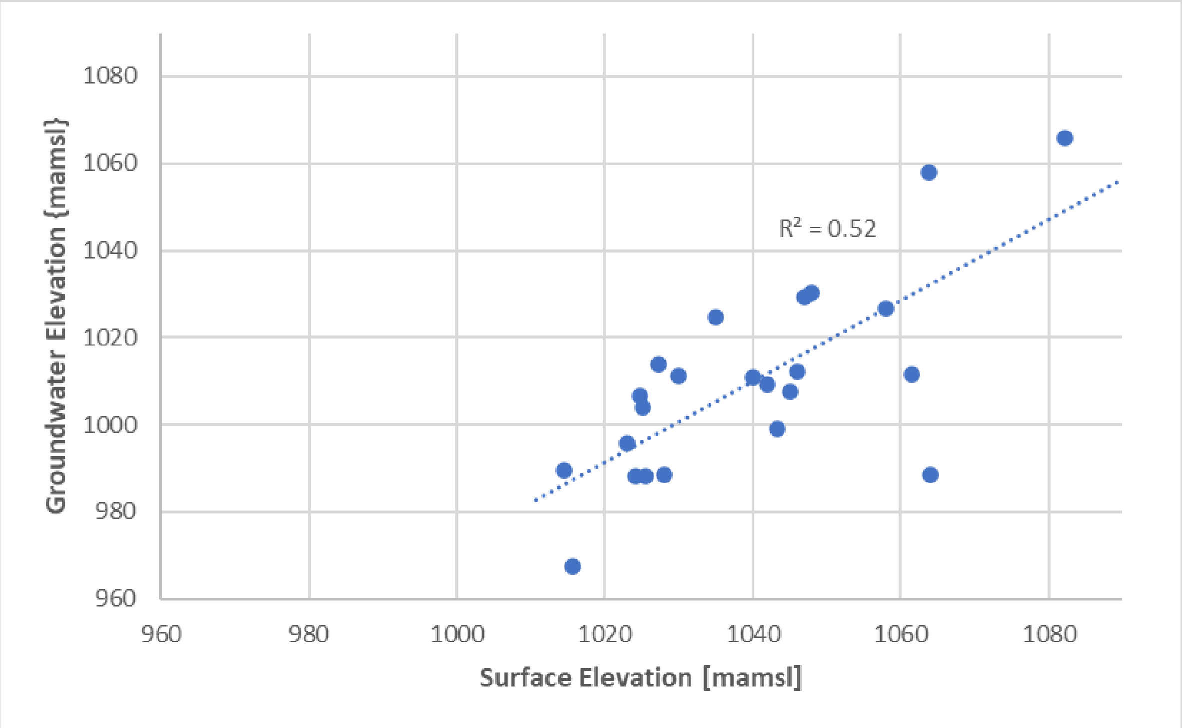


Figure 12-20: Correlation between surface topography and potentiometric heads.

12.10.4 Groundwater (monitoring) quality

The spatial distribution of the monitoring boreholes in relation to the mine infrastructure is shown in Figure 12-21. The map also indicates the active and non-active monitoring boreholes. A summary of the 2020 groundwater quality results is shown in Table 12-36. The results were compared to the (WUL 2016) water quality limits as well as the SANS 241-1:2015 Drinking Water Standard.

Note that the comparison to drinking water standards and guidelines does not suggest that drainage from the emergency stockpile will be used for drinking purposes. Drinking water standards are understandably stringent, less stringent (mine) effluent guidelines should in this case be applied.

The water quality of the sampled groundwater monitoring boreholes can be described as neutral (pH levels range between 7.2 and 8.22), non-saline to saline (EC range between 76 mS/m to 303 mS/m) with elevated nitrate concentrations of up to 256 mg/l (more specifically the York Farm borehole (YGW03). Although several variables exceeded the limits set out in the WUL many of them are still within the SANS 241:2015 guideline. There are exceptions in terms of EC, TDS, Cl, NO_3, NH_4 and Mn which are above the recommended levels.

Given the hydrogeological setting and generally low hydraulic conductivities of the underlying aquifer/s, the groundwater quality is expected to be relatively saline with sodium and chloride dominating the cation and anion content respectively due to natural ion exchange reactions.

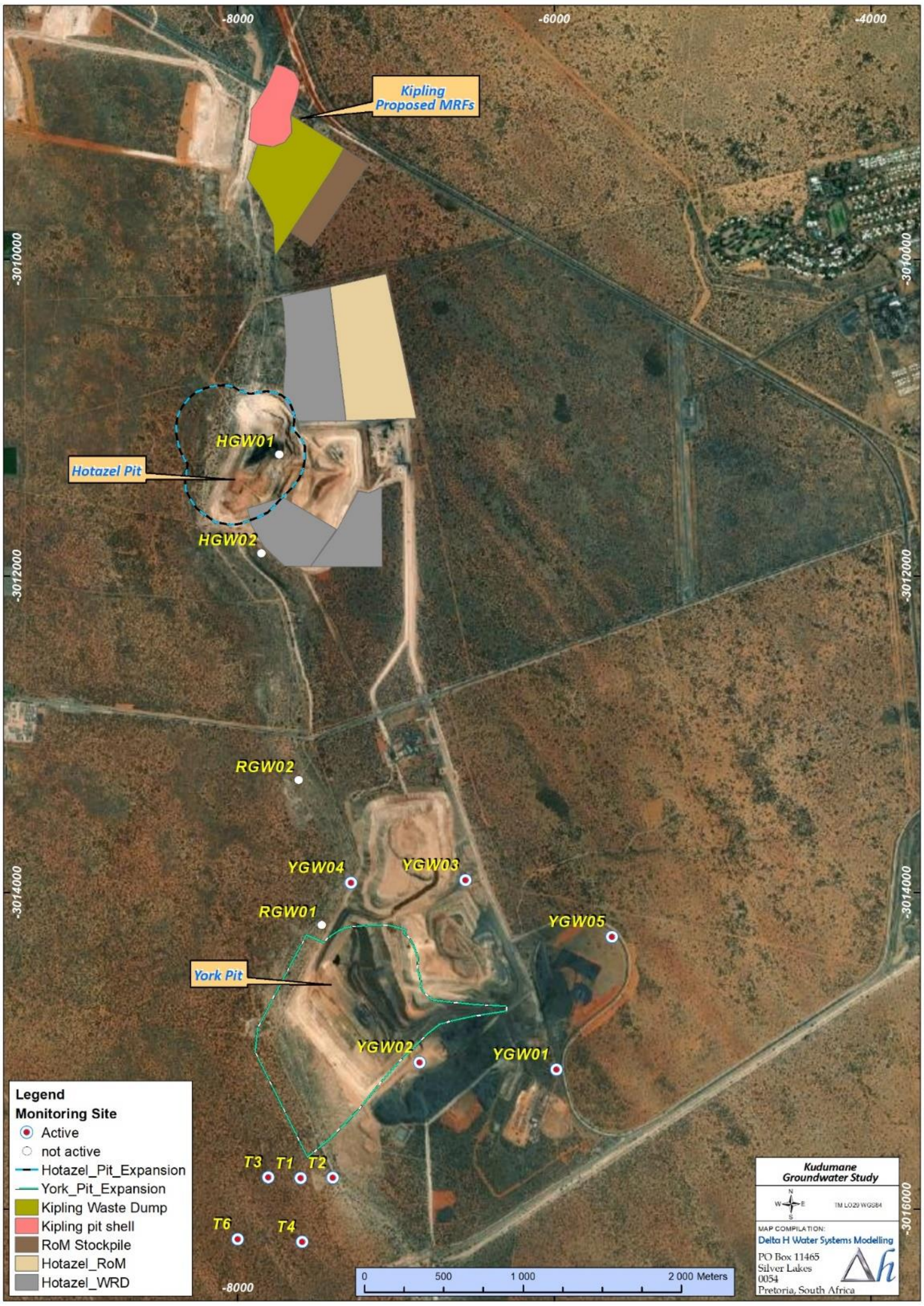


Figure 12-21: Location of the KMR monitoring boreholes in relation to the KMR mine and proposed activities.

Table 12-36: Summary of the groundwater monitoring quality (captured from the August 2021 report, Aquatico, 2021).

BH ID	Aug. 21 Status	GW level (mbgl)	pH	EC (mS/m)	TDS (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	Alk. ($CaCO_3$)	Cl (mg/l)	SO_4 (mg/l)	NO_3 (mg/l) as N	F (mg/l)	Mn	Al (mg/l)	NH_4 as N(mg/l)
WUL Table 09 GW Quality		-	8.69	106.65	-	90.48	66.44	27.01	-	-	118.8	36.17	10	0.39	0.4	-	-
SANS241-1:2015		-	5.0/9.7	170	1200	-	-	200	-	-	300	500	11	1.5	0.1	0.3	1.5
T1	Sampled	29.05	7.61	146	852	29.8	69.5	187	10.9	510	225	<0.141	0.272	<0.263	0.035	<0.002	2.35
T2	Sampled	10.29	7.93	107	574	21	48.8	127	11.7	360	127	<0.141	0.281	<0.263	0.112	<0.002	7.81
T3	Sampled	33.74	7.4	76.2	379	19.1	23.7	88.1	5.09	85.6	186	<0.141	0.272	<0.263	0.18	<0.002	0.424
T4	Sampled	32.74	7.69	159	913	26.6	47.3	205	14.6	522	258	<0.141	0.485	<0.263	0.05	<0.002	27.1
T6	Sampled	37.36	8.42	151	887	8.57	27.8	289	6.73	409	292	<0.141	0.326	0.506	0.071	<0.002	8.37
YGW01	Sampled	17.72	7.11	241	1637	188	124	114	5.22	296	315	53.1	137	<0.263	0.009	<0.002	0.082
YGW02	Demolished		7.14												0.013		
YGW03	Sampled	17.54	7.14	303	2248	274	160	77.6	7.18	281	309	26.7	256	<0.263	0.013	<0.002	0.068
YGW04	Sampled	18.85	7.19	211	1423	172	106	105	6.49	421	282	84.2	75.7	<0.263	0.015	<0.002	0.061
YGW05	Sampled	31.17	7.24	204	1283	169	107	77	4.93	284	280	34.7	85.7	<0.263	0.005	<0.002	0.081
HGW01	Demolished	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HGW02	Dry	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
RGW01	Sampled	9.9	7.85	194	1165	47.5	109	237	3.76	538	295	124	0.477	<0.263	0.261	<0.002	1.09
RGW02	No Access	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-

Pit Dewatering (groundwater ingress)

Based on the recognisance site visit water seepage or inflow into the pits are managed in situ. Pit dewatering volumes are meter. Monthly dewatering rates for York pit and Hotazel pit is shown in Table 12-18. Average monthly flows relate to around 1180 m3/month and 179 m3/month, respectively. Based on the results it can be inferred that limited groundwater seepage into the pit is observed and water make within the pit is largely due to direct rainfall, rainfall-runoff, and interflow.

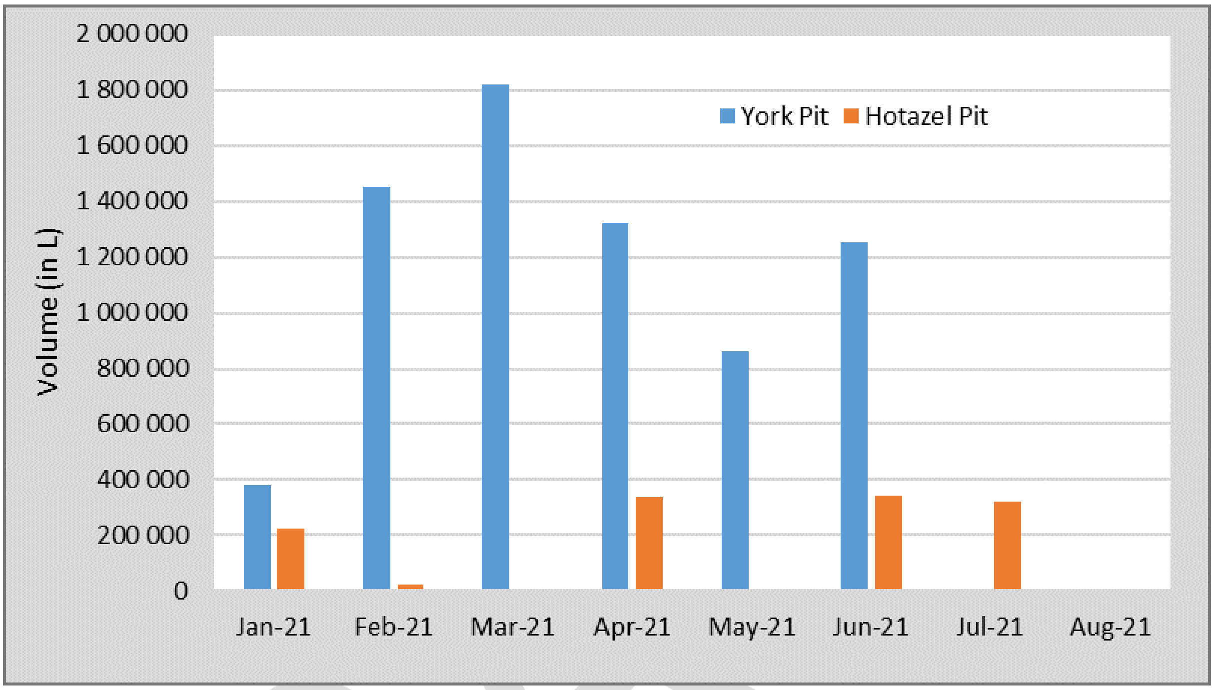


Figure 12-22: Pit dewatering volume measured from Jan-21 to Jul-21

12.10.5 Aquifer Characterisation

Groundwater vulnerability

Groundwater vulnerability gives an indication of how susceptible an aquifer is to contamination. Aquifer vulnerability is used to represent the intrinsic characteristics that determine the sensitivity of various parts of an aquifer to being adversely affected by a contaminant load imposed from surface.

Figure 12-23 shows the national groundwater vulnerability ratings underlying the project area, indicating the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer. The method is based on the DRASTIC method which includes the following parameters: Depth to water table; Recharge (net); Aquifer media; Soil media; Topography; Impact of the vadose (unsaturated) zone; conductivity (hydraulic).

Based on the national results, the aquifer underlying the project area has a low to medium vulnerability rating. The underground mine workings fall towards the north and south within a medium vulnerability rating whereas the Shaft and surface infrastructure fall within a low vulnerability rating. The worst-case scenario, i.e. medium vulnerability rating, is used in the assessment.

However, it must be kept in mind that the compilation of groundwater vulnerability map, which rely on the intrinsic natural properties of an area and aquifer, are not very meaningful in the context of the historically undermined project area. The natural aquifer properties in the project area are extensively altered by the existence of open underground mine voids, land subsidence due to shallow undermining, neighbouring mining activities, mine residue deposits and acid rock drainage. The maps should therefore only be seen in regional context.

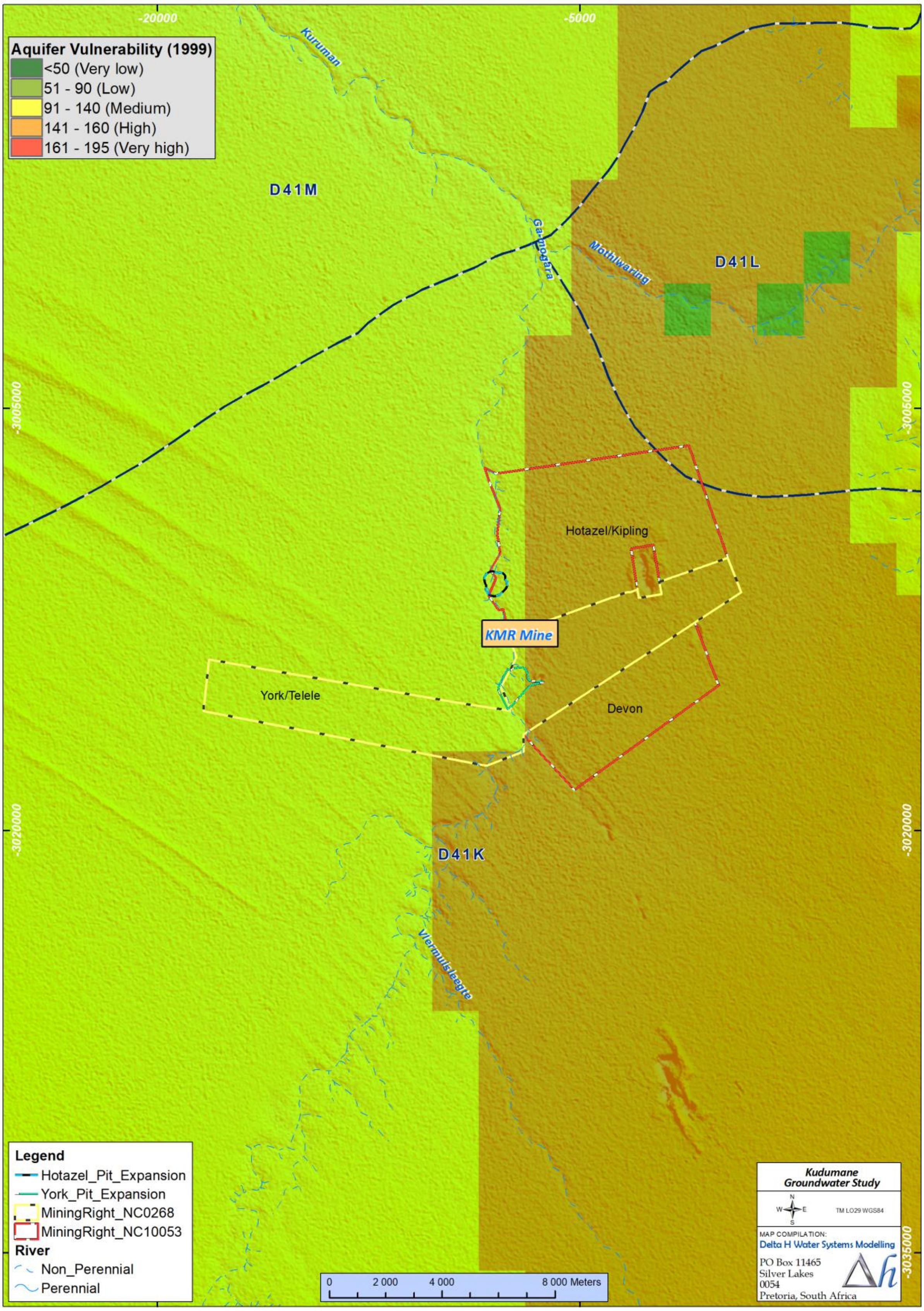


Figure 12-23: Groundwater vulnerability map

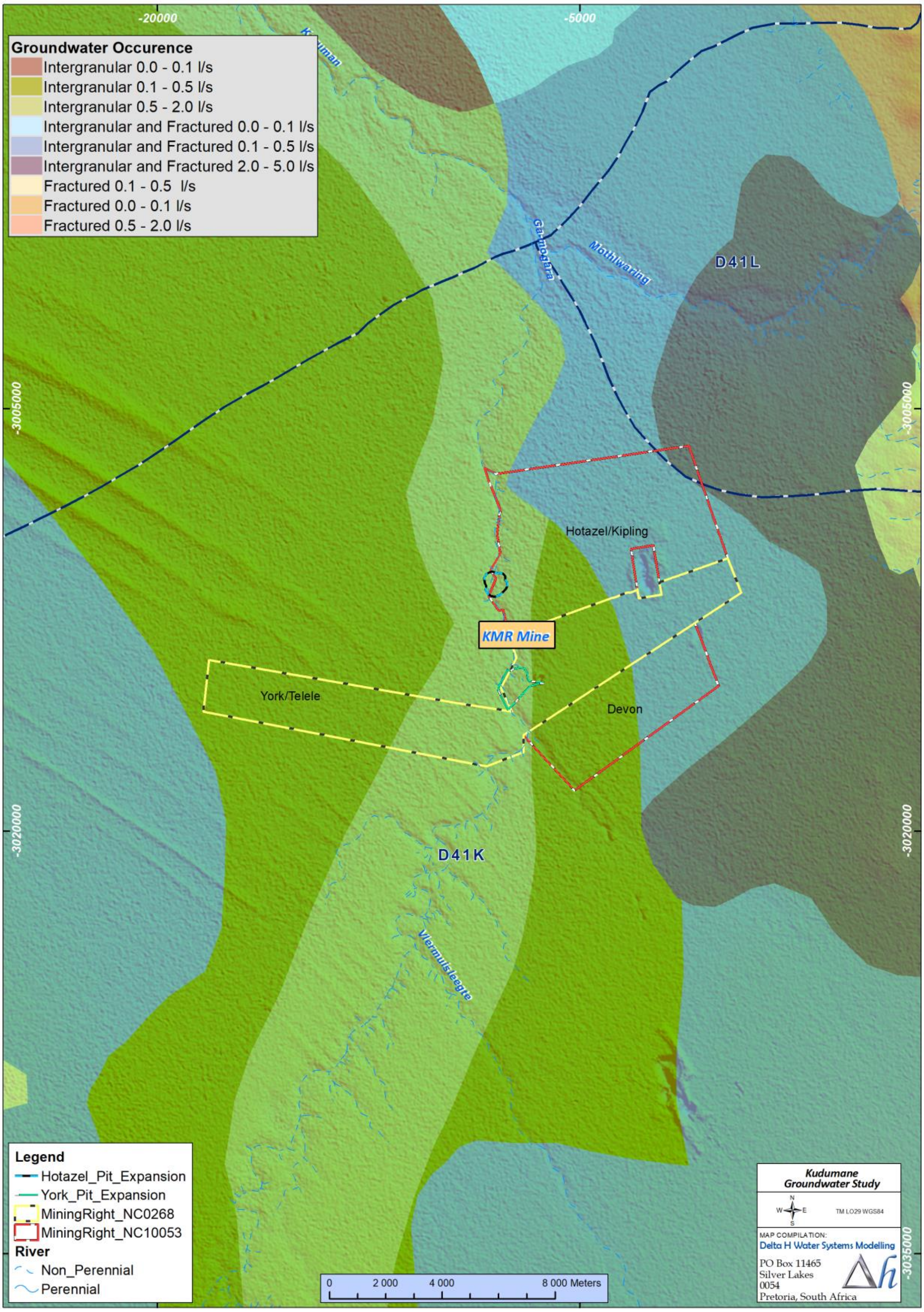


Figure 12-24: Aquifer classification

Aquifer classification

According to the Hydrogeological Map (1:500 000) series, the regional hydrogeology is characterized as an 'intergranular and fractured aquifer' with a typical potential yield of 0.1 – 0.5 litres per second (Figure 12-24). Based on the aquifer classification map (Parsons and Conrad, 1998), the aquifer system underlying the project area is regarded a "minor aquifer".

A summary of the classification scheme is provided in Table 12-37. In this classification system, it is important to note that the concepts of Minor and Poor Aquifers are relative and that yield is not quantified. Within any specific area, all classes of aquifers should therefore, in theory, be present.

Table 12-37: Aquifer classification scheme after Parsons and Conrad (1998)

Aquifer	Description
Sole source aquifer	An aquifer used to supply 50% or more of urban domestic water for a given area, for which there are no reasonably available alternative sources, should this aquifer be impacted upon or depleted.
Major aquifer region	High-yielding aquifer of acceptable quality water.
Minor aquifer region	Moderately yielding aquifer of acceptable quality or high yielding aquifer of poor-quality water.
Poor aquifer region	Insignificantly yielding aquifer of good quality or moderately yielding aquifer of poor quality, or aquifer that will never be utilised for water supply and that will not contaminate other aquifers.
Special aquifer region	An aquifer designated as such by the Minister of Water

Aquifer protection classification

As part of the aquifer classification, a Groundwater Quality Management (GQM) Index is used to define the level of groundwater protection required (Parsons 1995). The point scoring system and classification of the site-specific project area are presented in Table 12-38.

Table 12-38: Groundwater Quality Management (GQM) Classification System

Aquifer System Management Classification		
Class	Points	**Project area**
Sole Source Aquifer System: Major Aquifer System: Minor Aquifer System: Non-Aquifer System: Special Aquifer System:	6 4 2 0 0 – 6	**2**
Aquifer Vulnerability Classification		
Class	Points	**Project area**
High: Medium: Low:	3 2 1	**2**

The recommended level of groundwater protection based on the Groundwater Quality Management Classification is calculated as follows: GQM Index = Aquifer System Management x Aquifer Vulnerability = 2 x 2 = 4.

A Groundwater Quality Management Index of 4 was estimated for the project area from the ratings for the Aquifer System Management Classification (Table 12-39). According to this estimate, a medium-level groundwater protection is required for the intergranular and fractured aquifer. Reasonable groundwater protection measures are recommended to ensure that no cumulative pollution affects the aquifer, even in the long term. DWS's water quality management objectives are to protect human health and the environment. Therefore, the significance of this aquifer classification is that if any potential risk exists, measures must be taken to limit the risk to the environment, which in this case is the protection of the underlying aquifer.

Table 12-39: GQM index for the project area.

Index	Level of Protection	Project area
<1	Limited	**4**
1 - 3	Low Level	
3 - 6	Medium Level	
6 - 10	High Level	
>10	Strictly Non-Degradation	

12.10.6 Groundwater Modelling

The existing regional groundwater model developed as part of the hydrogeological assessment in 2016 followed by further updates by Delta-H in 2021 will be used as basis to inform future groundwater flows as the mine is developed. The solute transport model code will be used to predict the development of plumes emanating from pollution sources during the life of mine as well as up to 50 years post closure.

Sources and Sinks

Recharge

Groundwater enters the model domains as direct recharge from rainfall. It was therefore implied that certain areas may have greater recharge potential and may thus contribute a larger proportion of recharge towards the aquifer systems. SLR (2015) modelling results indicated recharge rates range between 0.2% and 0.5% of MAP, representing the lower bounds of reported values for the Kalahari.

Open pit mine

The maximum depth of the open pits will be approximately 80 m for the Hotazel pit and 130 m for the extended York pit. The current life of mine plan (which is being updated) is based on a maximum combined 1.5 million tons of ore per annum extracted from Hotazel and extended York pits, subject to market demand (Kimopax, 2020). The Life of Mine schedule is provided in Figure 12-25.

The existing York) and Hotazel open pits were integrated into the model domain for the predictive simulations by updating the digital elevation model for the pit area and assigning a free seepage boundary to the pit area. It is assumed that any groundwater entering the pit is removed (pumped out &/ seeping groundwater evaporates) and that the pit bottom represents therefore the lowest drainage elevation. In other words, groundwater can seep freely into the pit with a subsequent development of a cone of dewatering.

YORK LIFE OF MINE PRODUCTION		FY2022	FY2023	FY2024	FY2025	FY2026
HG Ore	t	1 165 257	1 023 151	1 615 560	1 861 685	1 404 737
LG Ore	t	4 038 705	3 227 122	4 848 477	554 663	1 419 308
Waste	t	19 616 948	17 996 125	17 062 853	27 957	2 591 369
York Total	**t**	**24 820 910**	**22 246 399**	**23 526 889**	**2 444 304**	**5 415 414**
Stripping Ratio [(waste + LG ore) / HG ore]		**20.3**	**20.7**	**13.6**	**0.3**	**2.9**
Average Mn Grade - HG Ore [ROM]	%	**37.85**	**37.78**	**36.98**	**37.46**	**37.54**
Average Mn Grade - LG Ore [ROM]	%	**30.54**	**29.84**	**30.20**	**30.22**	**31.63**

HOTAZEL LIFE OF MINE PRODUCTION		FY2022	FY2023	FY2024	FY2025	FY2026
HG Ore	t	329 047	337 809	304 208	0	0
LG Ore	t	55 418	116 440	9 138	0	0
Waste	t	4 759 338	2 747 469	209 587	0	0
Hotazel Total	**t**	**5 143 803**	**3 201 719**	**522 932**	**0**	**0**
Stripping Ratio [(waste + LG ore) / HG ore]		**14.6**	**8.5**	**0.7**	**0.0**	**0.0**
Average Mn Grade - HG Ore	%	**43.29**	**41.77**	**41.72**		
Average Mn Grade - LG Ore	%	**28.03**	**21.96**	**21.45**		

Figure 12-25: KMR life of Mine schedule

Seepage quality

The existing York and the Hotazel waste rock dumps (WRDs) have the potential to impact on the ambient groundwater quantity and quality due to seepage with increased solute concentrations from these facilities. Geochemical tests and analyses provided indicate that the waste rock lithologies tested are non-acid generating, however a few metals are leachable including aluminium (Al), iron (Fe) and manganese (Mn). A Neutral pH (controlled by calcite dissolution) with a higher salinity (in the in the form of elevated calcium, sodium, magnesium, chloride, nitrate, and sulphate concentrations) can be expected. Based on the groundwater quality results a seepage source term of 2 100 mg/l TDS concentration and the median nitrate concentration of 100 mg/l was applied in the transport predictions.

Following the precautionary principle, an advective-dispersive transport of the constituents of concern without any retardation or transformation was simulated. Since no element specific retardation or transformation is simulated, concentrations for individual elements of concern can be easily derived by multiplying given percentages with the respective source concentration for an element. The TDS and Nitrate (as n) source term legend table is shown in Table 12-40.

Table 12-40: Contamination map legend used for the KMR model update

Legend (Unit %)	TDS (mg/l) (2100)	Nitrate as N (mg/l) (100)
10.00	210	10
20.00	420	20
30.00	630	30
40.00	840	40
50.00	1050	50
60.00	1260	60
70.00	1470	70
80.00	1680	80
90.00	1890	90
100.00	2100	100

Model results

Current seepage plume simulated

The simulated groundwater seepage plume emanating from the York and the Hotazel mine residue facilities is shown in Figure 12-26. The seepage plume is expected to develop mainly in the upper Kalahari aquifer and within the footprint areas of the site. The simulated plume is in range with the concentrations observed at the York monitoring boreholes.

Life of mine

The calibrated groundwater flow model was used to estimate the annual average groundwater inflows into the final, fully developed Hotazel pit void, as well at the fully developed York open pit. To reflect the changing mine topography (mined out areas), the following changes to the boundary conditions were performed:

- The seepage boundary conditions were assigned to the LoM plan.
- The digital elevation model was updated for the proposed mining areas.
- Already mined out areas reflect the post closure topography, assuming timeously backfilling thereof, i.e., behind the active mining window.
- The recharge rate and porosity of the areas mined out and assumed to be backfilled were adjusted to reflect levelled and rehabilitated spoils (1% of MAP and 25% porosity).

The average mine inflows of 3.8 and 1.7 l/s were simulated for the Hotazel and York mining area, respectively. Which is slightly lower compared to the model predictions in 2016, due to the lower permeability estimates from the aquifer tests.

Conceptually, the actively mined pits can be considered as a local groundwater sink (where dewatering and evaporation exceeds inflows) and groundwater flow is towards the pit from the surrounding aquifer. Potential seepage plume from the stockpiles and WRDs will be intersected in the pit and is managed as part of the dirty (process) water of the mine.

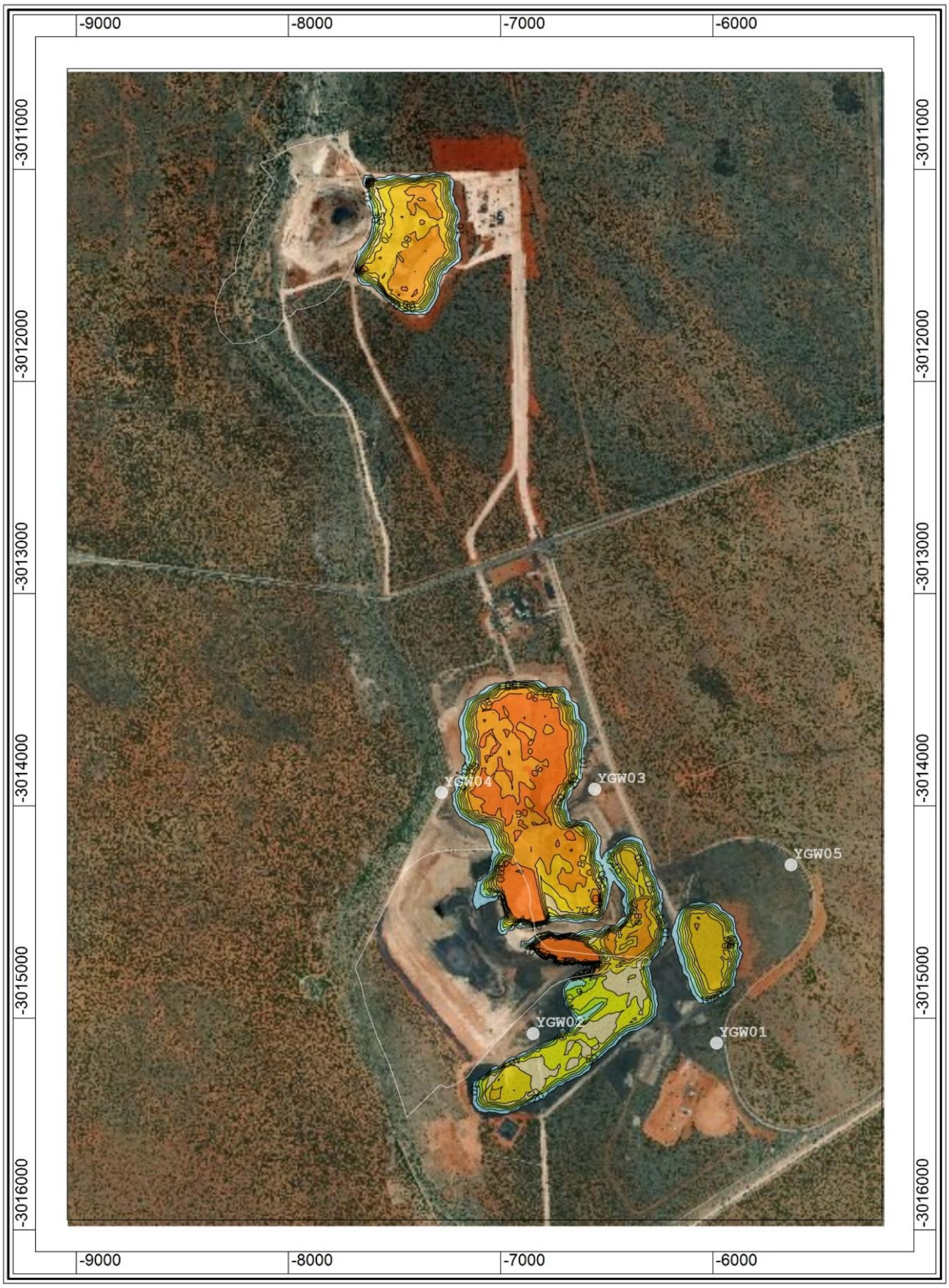


Figure 12-26: Simulated plume for the current York and Hotazel mine residue facilities.

12.11 Freshwater

The information presented in this section is extracted from the Freshwater specialist study undertaken by Scientific Aquatic Service in 2021 (Appendix I).

12.11.1 Watercourse delineation

During the site assessment undertaken in May 2021, a single watercourse, specifically the Ga-Mogara River, was identified within the eastern portion of the MRA, and delineated according to the method described by DWAF (2008).

Due to the episodic characteristics of the Ga-Mogara River, the primary indicators utilised to delineate the riparian zone were topography and vegetation. Although there is little difference in the species composition of the vegetation assemblage comprising the riparian zone and adjacent terrestrial areas, noticeable differences in the levels of greening and structure of the two vegetation assemblages provided a distinct guide in limited sections of the river. However, it must be noted that the majority of the MRA has been transformed, in particular by vegetation losses due to historical and current mining related activities, in particular various road crossings. In areas where vegetation was sparse, use was made of historical digital satellite imagery to refine the delineation. The delineations as presented in this report are nevertheless regarded as a best estimate of the riparian zone boundaries based on the site conditions present at the time of the assessment undertaken in May 2021.

Soil morphological characteristics (such as mottling and gleying), which are typically associated with a fluctuating water table, were not found during the site assessment, nor was soil wetness considered a reliable indicator due to the naturally arid conditions of the region and exacerbated by several years of drought conditions in the area.

12.11.2 Drainage System Characterisation

The Ga-Mogara River, an episodic river system, is situated along the western boundary of the MRA, draining in a northerly direction, and the Witleegte River (also episodic) enters the MRA in the south-eastern corner of York, confluencing with the Ga-Mogara River approximately 40 m from the farm boundary. Episodic systems generally only flow or flood once in several years in response to extreme rainfall events, usually within their catchment. Prior to January 2021, the last recorded flow in the Ga-Mogara River was in 1988 (SRK, 2020), however, following above-average rainfall in the region over December 2020 and January 2021, the Ga-Mogara River flowed, resulting in parts of the town of Deben (situated north of Sishen Mine and approximately 37 km south-west of KMR) experiencing flooding.

The MRA is located north, and therefore downstream of, the Sishen Iron Ore Mine. Sishen Mine started operations in 1953, and at that time it was assumed that little groundwater existed on the farm Sishen. Between the 1950's and mid-1970's groundwater was abstracted sporadically from boreholes near the Ga-Mogara River for mining and processing purposes. For water supply for the town of Sishen, today known as Dingleton, water was abstracted from boreholes near the Ga-Mogara River and the Khai Appel area. In 1970s it was recognized that systematic dewatering needed to be done to secure safe mining conditions.

However, since 2000, complaints from landowners in the area were received by Sishen, with claims of lowered water levels and a subsequent decline in the yield of their boreholes over a prior number of years, indicating that dewatering of the Ga-Mogara River within the relevant geological compartment is likely to be occurring, impacting on the natural hydrological regime of the system downstream of the Sishen operations with the impact considered regional. Between 2002 and 2007, Kumba Iron Ore commissioned external consultants to conduct geohydrological studies, which confirmed that a number of private landowners to the south of Sishen Mine had indeed been affected. Following heavy rainfall during February 2006, landowners in the vicinity of Sishen Mine informed Kumba that the flow of the Ga-Mogara River had been interrupted, at a point on the Kumba property, which prevented further downstream flow. Investigations found that riverbed swallets (sinkholes) had formed, as a result of dewatering activities6. These swallets have subsequently intercepted surface flow, thus resulting in loss of recharge of the Ga-Mogara River downstream of Sishen Mine, which includes the portion of the river within the MRA. This has impacted negatively on the hydraulic regime and connectivity of the river downstream of the impact site, notwithstanding the flooding experienced in January 2021.

The Ga-Mogara and Witleegte Rivers were classified according to the Classification System as Inland Systems falling within the Southern Kalahari Aquatic Ecoregion, and within the Eastern Kalahari Bushveld Group 3 and Kalahari Dunveld Wetland Vegetation Types, both considered 'Least Threatened' according to SANBI (2012) and Mbona et al (2015). The table below presents the classification of the watercourses at Levels 3 and 4 of the Classification System (Ollis et al, 2013) (Table 12-41).

Table 12-41: Characterisation of the watercourse associated with the focus area, according to the Classification System (Ollis et al., 2013).

Watercourse	Level 3: Landscape unit	Level 4: Hydrogeomorphic Unit
Ga-Mogara River Witleegte River	Valley floor: The base of a valley, situated between two distinct valley side-slopes.	River: a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.

The locality and extent of the watercourses in relation to the MRA and investigation areas is depicted in the figure below. Although the Ga-Mogara and Witleegte Rivers extend beyond the boundary of the MRA, only the section of the Ga-Mogara River within the MRA was assessed. Nevertheless, the potential impacts of activities within the greater catchment such as mining, agriculture, construction of infrastructure within and adjacent to the river (particularly river diversion structures upstream of the MRA), transformed vegetation assemblages, clearing of natural vegetation and erosion were taken into consideration during the assessment. The Witleegte River is unlikely to be impacted by the proposed activities (the confluence with the Ga-Mogara River is approximately 515 m from the proposed attenuation dam wall thus construction thereof is unlikely to impact on the river), and was therefore excluded from further assessment.

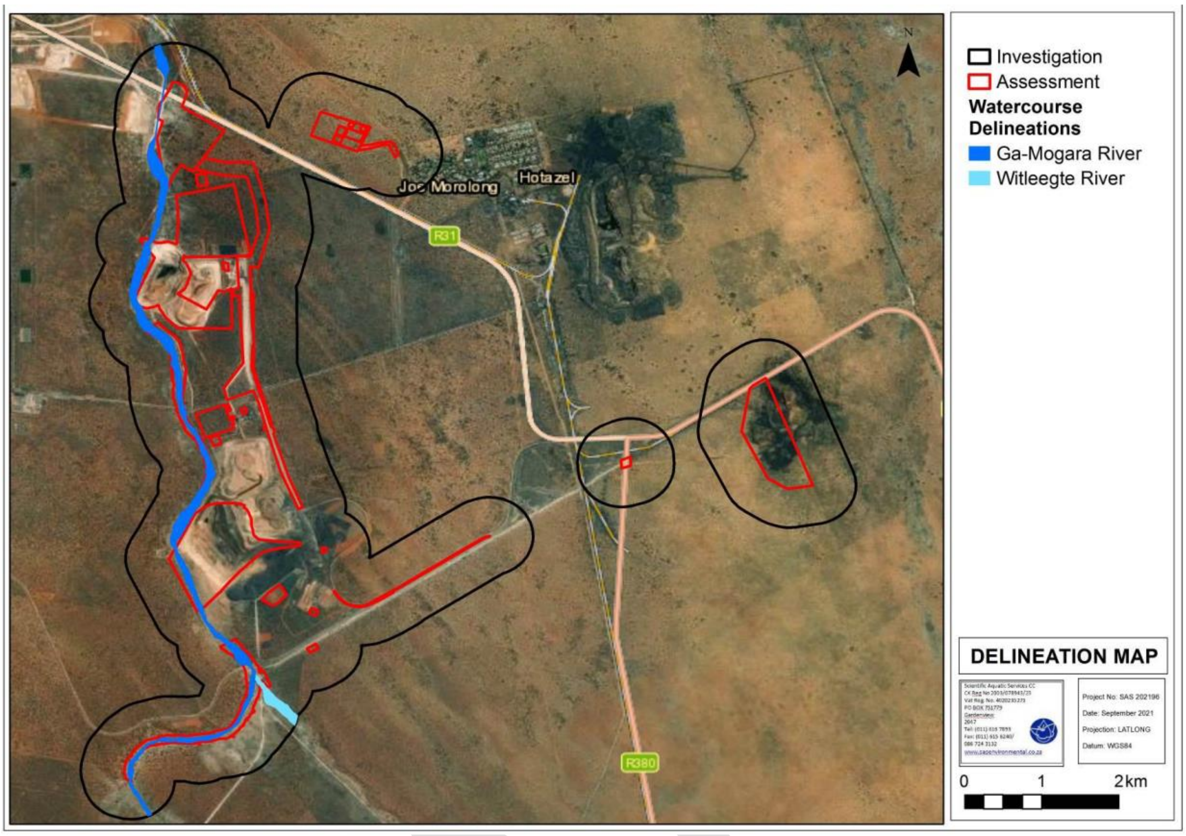


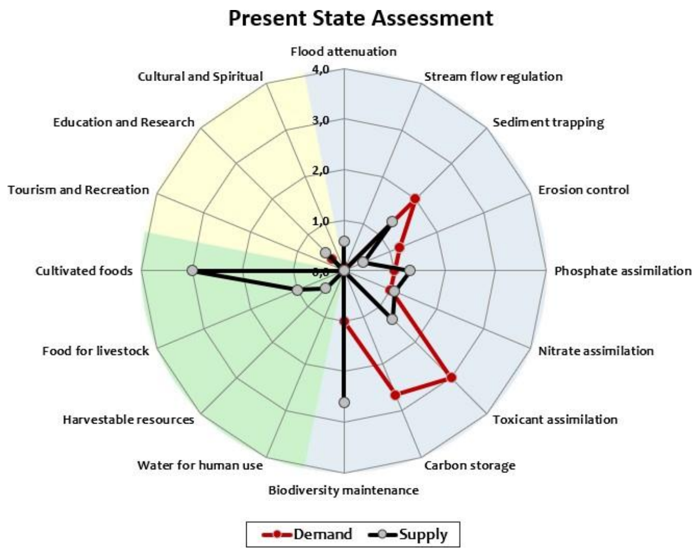
Figure 12-27: The reach of the Ga-Mogara and Witleegte Rivers associated with the MRA and investigation area

12.11.3 Field Verification Results

Table 12-42 summarise the findings of the field verification in terms of relevant aspects (hydrology, geomorphology and vegetation components) of freshwater ecology. It should be noted that although water quality parameters are included in the method of assessment used, due to the episodic nature of the watercourse, testing of these parameters could not be undertaken. Given the surrounding land uses (predominantly agriculture though some mining occurs in the catchment) it is likely that when surface water is present, it is not likely to be impacted significantly by pollutants. Therefore, whilst the tables below include a discussion on water quality, information contained therein was based on information contained within available databases, as well as the anticipated impacts of the surrounding land uses within the catchment on water quality. The results of the assessments are presented in the table below.

Table 12-42: Summary of results of the assessment of the reach of the Ga-Mogara River within the MRA.

Ecological & socio-cultural service provision graph:



Photograph notes:	Representative photographs of the reach of the Ga-Mogara River associated with the MRA, illustrating the clearing of non-marginal riparian vegetation in the vicinity of the York open pit (left) and severe proliferation of the alien invasive Prosopis sp. within the active channel north of the York open pit (right).

PES discussion

PES Category: C/D

Instream IHI: B/C

Riparian IHI: C/D

VEGRAI: C/D

Major impacts to the reach of the Ga-Mogara River associated with the MRA are largely associated with the authorised expansion of the existing open pits on York and Hotazel into the non-marginal riparian zone, as well as various disturbances relating to historical exploration activities, and livestock husbandry activities upstream of KMR's existing operations. Additionally, impacts downstream of KMR, such as the diversion of the river through the

Mokala Mine MRA have contributed to an overall decrease of the river's ecological integrity.

Ecoservice provision

Moderately low to very low

Ecological service provision of the riparian zone associated with the assessed reach of the Ga-Mogara River is considered moderately low to very low, largely due to the absence of water although the reach immediately upstream of the MRA provides grazing for domestic livestock. The semi-arid climate means that vegetation cover is rarely as extensive as it was at the time of assessment, leading to a reduction in the capacity of the riparian zone to effectively provide services such as flood attenuation, sediment trapping and nutrient and toxicant assimilation. Nevertheless, the contribution made by the system to those services should not be overlooked on a larger

scale.

EIS discussion

EIS Category: Moderate to low

The ecological importance and sensitivity of the Ga-Mogara River is deemed moderate to low, largely due to the combined taxon / species richness of both instream and riparian biota which is minimal. Aspects such as habitat diversity, potential occurrence of populations of unique or threatened species and faunal utilisation of the riparian zone are only marginally important.

Watercourse drivers and receptors discussion (hydrology, geomorphology and topography, water quality and habitat and biota):

The Ga-Mogara River is a highly episodic system, flowing sporadically only when large volumes of rainfall are received in the region. The river most recently flowed in January 2021, flooding the town of Deben situated approximately 45 km south of the MRA, but apparently not reaching Mokala, according to KMR mine personnel as well as residents of the town of Deben (Pers. Comm. July 2021). Although hydraulic connectivity and impacts to the reach of the river associated with the MRA are limited in extent, although are severe where they have occurred, numerous upstream impacts have occurred, including various river diversions several kilometres south of the MRA and most notably, the formation of swallets in the active channel south of the Sishen Mine operations (due to dewatering of the aquifer). The episodic nature of the river means that the severity of most impacts to the hydrology are likely to be relatively low, although the swallet formation has negatively affected recharge of the reaches downstream thereof. Whilst the increasing extent of mining operations in the catchment and the MRA may contribute to increased runoff entering the river, again, due to the semi-arid climate the risk of this occurring is reduced.

The MRA is largely characterised by relatively flat, homogenous topography. Some bank incision was evident but was not considered to be extensive in extent nor severe. Geomorphological characteristics in the assessed reach have been altered as a result of the authorised encroachment of the open pits into the riparian zone thus disturbing soil and increasing sedimentation of the river, and in the upstream reaches, various river diversions have contributed to altered geomorphological characteristics and processes. The proposed attenuation dams will further contribute to cumulative impacts to the geomorphological and hydraulic processes of the river.

Surface water was absent at the time of assessment and therefore, water quality parameters could not be assessed. Nevertheless, with the exception of possible contamination originating from mining activities in the catchment, surface water when present may be impacted by large volumes of iron-rich sediment thus increasing turbidity, as seen in January 2021.

Habitat diversity is low, as the weakly formed riparian zone is mostly characterised by graminoid species and a few low shrubs, as well as the alien invasive Prosopis sp. Historical agricultural and mining-related activities encroaching on the riparian habitat have contributed to altered floral assemblages, leading to increased occurrence of alien and encroacher species. However, due to above-average rainfall received in the preceding rainy season, vegetation cover was good and likely provides suitable habitat for a number of small mammals and reptiles. Although the episodic nature of the river is a notable limiting factor for instream biota, e.g. egg banks of some less sensitive aquatic macroinvertebrates such as Nepidae (water scorpion) may be present, hatching out when sufficient rainfall is received. The proximity of mining activities is likely to deter more sensitive fauna from utilising the river as a migratory corridor, however it is nevertheless likely to provide some cover and foraging habitat.

<table>
<tr>
<td>REC, RMO

and BAS Categories</td>
<td>REC Category: C/D

BAS Category: C/D

RMO Category: Maintain

The Ga-Mogara River is under increasing pressure from expansion of mining activities in the catchment. It is imperative therefore that appropriate mitigation measures are implemented to avoid (preferable) or minimise perceived impacts which may arise as a result of the proposed KMR expansion activities, to maintain the ecostatus of the reach of the Ga-Mogara River associated with the MRA.</td>
<td>Business case, Impact Significance, Conclusion and Mitigation Requirements:

The majority of the proposed expansion activities can be adequately mitigated to minimise the significance of impacts; however, the proposed attenuation dams and open cast mining through the Ga-Mogara River will result in irreversible, long-term latent impacts on the system. A detailed impact and risk assessment along with activity-specific mitigation measures are provided in Section 5, however, key mitigation measures are summarised below:
Sound environmental management practices, such as dust suppression, limiting disturbance footprints, alien vegetation management, erosion monitoring and soil management and continued monitoring of ground and surface water quality (amongst others) must be applied to all activities throughout the life of mine to minimise the impact significance of edge effects;
Options to retain hydraulic connectivity of the Ga-Mogara River must be investigated, including alternatives such as inclusion of diversion berms in conjunction with the attenuation dams or approaching the mineral resource from the west of the river so as to prevent open cast mining through the river. Should it not be possible to avoid mining through the river, the proponent must engage with the DWS with regards to implementing appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent;
Design of infrastructure (WRDs, PCDs etc.) should be environmentally and structurally sound, compliant with GN704 regulations and all possible precautions taken to prevent spillage or seepage
Measures to contain and reuse as much water as possible within the mine process water system must be sought, and very strict control of water consumption must take place. Detailed monitoring must be maintained to ensure that all water usage is continuously optimised; and
The attenuation dams will need to be desilted intermittently to ensure the storage capacity is maintained. During desilting, all silt within the dam basin should immediately be removed from site in order to prevent sedimentation of the downstream areas.
Additionally, it was observed that the proposed pit at Kipling encroaches on the diverted reach of the river within the Mokala Mine MRA (SLR, 2021). Assuming that no agreement has been reached between KMR and Mokala Mine in this regard, it is recommended that the pit footprint be optimised to prevent encroachment or that the proponent engage with Mokala Mine to come to a mutual agreement regarding activities in that vicinity.

Careful consideration and planning of the rehabilitation and closure of the pits and the associated cost is deemed critical to ensure that the most cost effective design and management solution is implemented, at the outset, for the operational phase of mining while ensuring that the long term (post closure) functionality and connectivity of the Gamagara River is maintained and that the RMO of the system is achieved.</td>
</tr>
<tr>
<td>Extent of modification anticipated</td>
<td>High</td>
<td>The proposed attenuation dams, the further expansion of the open pits at York and Hotazel and the proposed new pit at Kipling into the delineated extent of the Ga-Mogara River will have a potentially irreversible impact on the affected reach of the river, since no diversion thereof is planned. The proposed activities will result in loss of hydraulic connectivity to the downstream reach of the river and therefore loss of recharge when there is flow.</td>
</tr>
</table>

12.11.4 Ecological Reserve Determination

Hydrological assessment

The natural flows at the EWR site (GaM_EWR1) was simulated using the WRSM2000 rainfall-runoff model and the WR2012 information for the Ga-Mogara River in quaternary catchments D41J and D41K. The Ga-Mogara River is a tributary of the Kuruman River and forms part of the Lower Orange Water Management Area. The EWR site was chosen at the outlet of D41J, downstream of the mining activities. No changes were made to the model parameters as there are no gauging weirs in close vicinity of the site to undertake calibration of the flows.

The Mean Annual Precipitation (MAP) is low for both the quaternaries, with a MAP of 358 mm and 344 mm for quaternary catchments D41J and D41K respectively. The Mean Annual Evaporation for the area is very high at 2 350 mm. As the river is dry for large periods (more than 50% of the time) and with no continuous baseflows, it can be classified as an ephemeral to episodic system. The natural Mean Annual Runoff (nMAR) at the EWR site for the period 1920 to 2009 was simulated as 13.783 x 106m3. This flow time series was used as the base hydrology for the Desktop Reserve Model (DRM) to determine the Ecological Water Requirements (EWR).

Present day flows were not modelled as almost no water use from the river is present in the upper catchment due to its ephemeral nature. The mean and median monthly hydrographs for the natural flows at the EWR site is shown Figure 12-28.

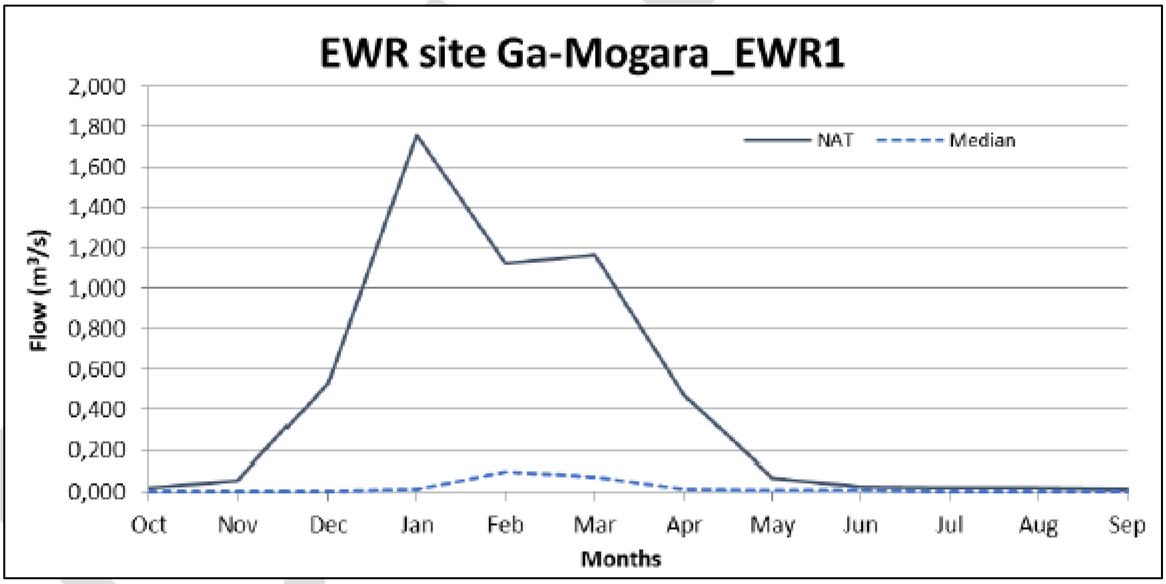


Figure 12-28: Monthly hydrograph for the Ga-Mogara River at EWR site (GaM_EWR1) in D41K

As can be seen in the graph, the monthly means show flows for all the months, but compared to the median monthly flows, it is clear that the system is flood driven and dry most of the time.

12.11.5 Determination of Ecological Water Requirements

Integration of results and Recommended Ecological Category

No hydrological site surveys were undertaken for this river and the results from the Department of Water and Sanitation 2014 Desktop PES/EI/ES study was used to specify the PES and REC along with the findings of the freshwater ecological assessment. The desktop PES for reach D41K-02068 was determined as a C category (DWS, 2014) with the EI as moderate and ES as very low (DWS, 2014). Thus, an ecological category C was recommended to determine the EWR at the EWR site.

Ecological Water Requirements (quantity)

The Desktop Reserve Model (DRM) (SPATSIM, version 2.12) was used to calculate the Ecological Water Requirements for a REC of C for the Ga-Mogara River in quaternary catchment D41K at EWR site GaM_EWR1.

As no hydraulic cross-section was surveyed or discharges measured at the site, the EWR flow data could not be converted to hydraulic conditions (i.e., depths and flow velocities at discharges measured in m3/s) using a hydraulic model. The final EWR for the Ga-Mogara River at site GaM_EWR1 in D41K is shown in the seasonal distribution graph (Figure 12-29) and summarised in the Table 12-43.

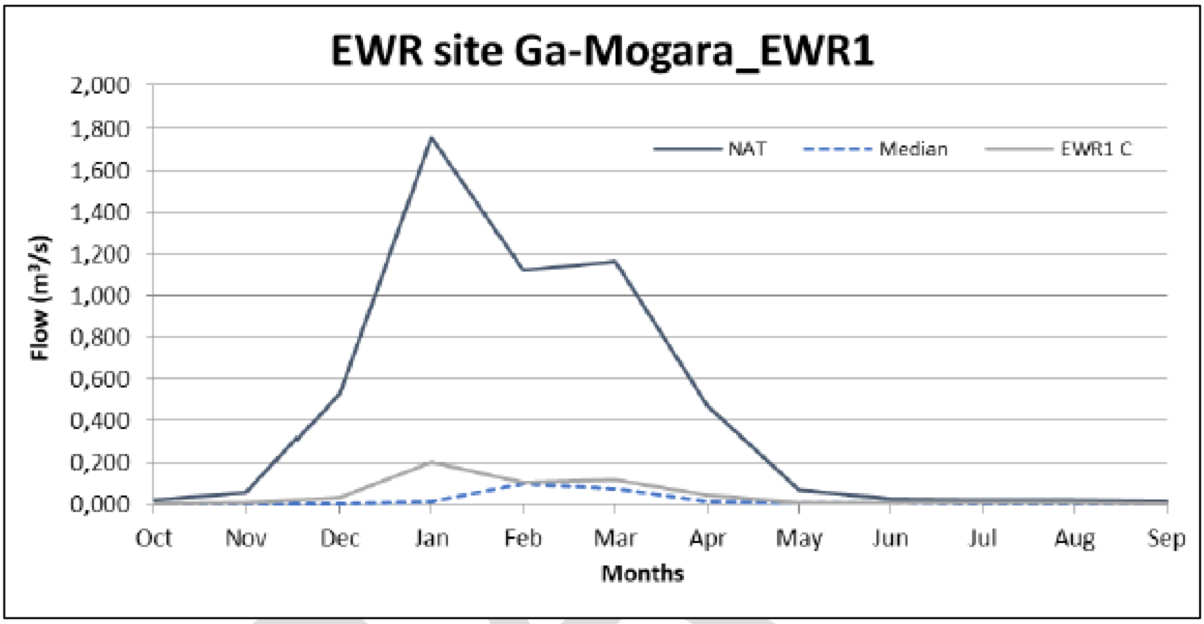


Figure 12-29: Seasonal distribution graph of the EWR at GaM_EWR1 (Ga-Mogara River)

These EWR results are used to produce the final ecological reserve quantity results in the format of an assurance table or EWR rule curves. These curves specify the frequency of occurrence relationships of the defined maintenance and drought flow requirements for each month of the year. The tables thus specify the percentage of time that defined flows should equal or exceed the flow regime required to satisfy the ecological Reserve.

Table 12-43: Summary of the final EWR results at GaM_EWR1 (flows in million m3 per annum)

Quaternary Catchment	D41K
River	Ga-Mogara
Recommended Ecological Category	C
NMAR at EWR site	13.783
Total EWR	2.394 (17.37 %MAR)
Maintenance Low flows	0.664 (4.82 %MAR)
Drought Low flows	0.000 (0.00 %MAR)
Maintenance High flows	1.730 (12.55 %MAR)
Overall confidence	Very low

Ecological Water Reserve Conclusions and conditions

The Ga-Mogara River is an ephemeral to episodic system with long periods of no flows and infrequent large floods. No groundwater contribution is present in the system as the depth to groundwater in the vicinity of the project area is estimated at 20 – 30 meters below ground level (DeltaH, 2021).

The final EWR as specified for the months of May to December is between 0.004 m3/s to 0.020 m3/s. These requirements are based on the average flows in the system for the period 1920 to 2010. If one considers the median flows, it is clear that naturally the system is dry most of the time, with no flows for the vast majority of the time above the 50th percentile (Table 12-44). Thus, it is important that these large floods are not impeded to ensure the movement of sediments through the system.

Table 12-44: Natural flow distribution of the Ga-Mogara River at GaM_EWR1 (flows in million m3/s)

Percentiles	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0.1	0.576	1.331	26.809	66.618	26.133	27.051	9.334	1.412	0.513	0.463	0.429	0.333
1	0.381	0.951	10.298	24.750	15.277	25.983	8.892	1.182	0.340	0.325	0.295	0.240
5	0.048	0.302	0.778	8.385	5.583	3.209	2.462	0.290	0.092	0.062	0.051	0.041
10	0.019	0.123	0.451	1.134	2.515	2.134	0.760	0.153	0.055	0.034	0.034	0.024
15	0.007	0.050	0.285	0.601	1.252	1.402	0.444	0.062	0.037	0.025	0.021	0.014
20	0.007	0.012	0.149	0.340	0.869	0.937	0.274	0.039	0.027	0.019	0.015	0.008
30	0.001	0.001	0.027	0.209	0.369	0.459	0.150	0.020	0.015	0.009	0.007	0.005
40	0.000	0.000	0.004	0.092	0.180	0.195	0.048	0.009	0.008	0.007	0.000	0.000
50 (median)	0.000	0.000	0.000	0.011	0.094	0.071	0.012	0.007	0.004	0.000	0.000	0.000
60	0.000	0.000	0.000	0.004	0.025	0.026	0.008	0.000	0.000	0.000	0.000	0.000
70	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000
80	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
85	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
90	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
95	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
99	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
99.9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

The proposed attenuation dams in the river will have little to no impact on the larger flood flows in the system due to their small size (maybe add height of weirs), if these floods should occur during the lifespan of the mine. Small flood events might be impeded by the attenuation dams. However, due to the sandy nature of the system and the high evaporation, the impact will be limited.

The process of dewatering of the opencast pit in the event of a large flood will need to be undertaken in such a way to minimise the impact on the river downstream from a flow as well as sediment balance perspective.

12.12 Surface water hydrology

The information presented in this section is extracted from the Surface Water specialist study undertaken by SRK Consulting (Pty) Ltd in 2021 (Appendix I)

12.12.1 Water management area

The KMR mine is located within the Lower Vaal water management area in quaternary catchment D41K which has a total catchment area of 4216 km^2. The site is located within the Ga-Mogara River catchment which consists of the quaternary catchment D41K, and upstream quaternary catchment D41J. The Ga-Mogara River is a non-perennial river and flows into the Kuruman River downstream of the KMR mine, which then flows in a north-west direction joining into the Orange River. The Ga-Mogara River catchment sits within the primary Orange River basin.

The Ga-Mogara River enters the KMR mine area on the southern boundary and flows along the western boundaries of the York, Hotazel and proposed location of the Kipling open-pit mines before exiting the KMR mine area on the north boundary, from where it then flows into the Kuruman River. The proposed expansion of the York and Hotazel open-pit mines will cause mining activities to cross the Ga-Mogara River, which will require the construction of attenuation dams along the Ga - Mogara River upstream of the site to store a certain portion of the flood water. After completion of the mining of the Open Pits, the Ga-Mogara River will be rehabilitated and re-instated.

The catchment area of which D41K and D41J form a part is classified as endoreic, which identifies that the rivers in the area do not produce runoff for the wider catchment areas, as the rivers tend to end in flat areas of inland pans.

The Ga-Mogara River basin is characterised by higher elevated areas along the boundaries on the eastern and western sides. The headwater regions in quaternary catchment D41J are characterised by elevations exceeding 1800 masl which are reduced with progression downstream. At the confluence where the Ga-Mogara River flows into the Kuruman River, the elevation is around 1000 masl. The higher elevations found around the headwaters within quaternary catchment D41J are due to the surrounding steep outcrop hills which are characteristic of the river basin boundary. The majority of the Ga-Mogara River basin is characterised by flat surroundings with a very low topographical gradient. The flat landscape characteristic lends to natural areas of ponding in depressions which can occur during periods of high rainfall which are associated with storm events. As a result, it is understood that within this catchment, runoff within the river course is a result of groundwater rise, rather than storm runoff generated by overland flow. The Ga-Mogara river in the locality of the KMR mine has not flowed in recent years, with the most recent available evidence of flow being the accounts of Farmers in 1988. Upstream of the KMR mine, during the heavy rainfall event of January 2021, the town of Deben (47 km upstream of KMR mine) was flooded, with flow visible in the Ga-Mogara river approximately 25 km upstream of the KMR mine. Despite the two days of heavy rainfall, no flow was evident in the Ga-Mogara River in the vicinity of the KMR mine.

12.12.2 Surface water use

Domestic use

The KMR mine has one main water source which is from the Sedibeng Municipal inlet. Domestic water use is the KMR mines main water consumption. The KMR lodge located on the York Farm utilises the water from the Sedibeng pipeline. The KMR mine reservoir is also filled from the Sedibeng pipeline, and then used to provide water for domestic use in the Change Houses, Stores and Offices.

Industrial use

The KMR mine industrial water use component is related to mine operation. The main use is for dust suppression.

12.12.3 Surface water hydrology

The project area is located in the Orange River Basin, in quaternary catchment D41K and downstream of D41J. The total catchment area of the ephemeral Ga-Mogara River is about 8000 km² and joins the Kuruman River at the north and downstream of the project site.

The Kudumane Manganese Mine site falls within the Northern Steppe climatic zone as defined by the South African Weather Bureau. The general characteristics of the area is defined as a semi-arid region, which shows low rainfall, but high temperature and evaporation. Thus, the project site catchment is classified as endoreic with large areas, which do not contribute to runoff as the watercourses.

srk cons	**KUDUMANE EIA** Typical View of Ga-Mogara Riverbed	Project No. 574378

12.12.4 Catchment characteristics

Soil texture data and spatial distribution was obtained from a remote sensing programme called SoilGrids 250 m Database of International Soil Reference and Information Centre (ISRIC, 2017). The general soil characteristics that affect the rainfall runoff relationship in this catchment area (Figure 12-30) is dominated by Sandy Loam and Loamy Sand. Some Sandy Clay Loam and Sand type of soil is also prevalent in the study area. In addition to the available data, the site observations also support that the catchment soil is formed with high sandy texture, that allows for a high infiltration rate and a low water holding capacity.

In addition to the soil characteristic, the land cover classification of the catchment was also evaluated by using the National Land Cover database (NLC, 2009). The majority of the catchment area is classified as a natural land cover of semi-arid scrub. Due to the dry climate condition of the site, plantation and cultivation areas is minimal. Secondary land cover classes are presented by mine sites and degraded areas. The land cover classification over the catchment is presented in Figure 12-31, below.

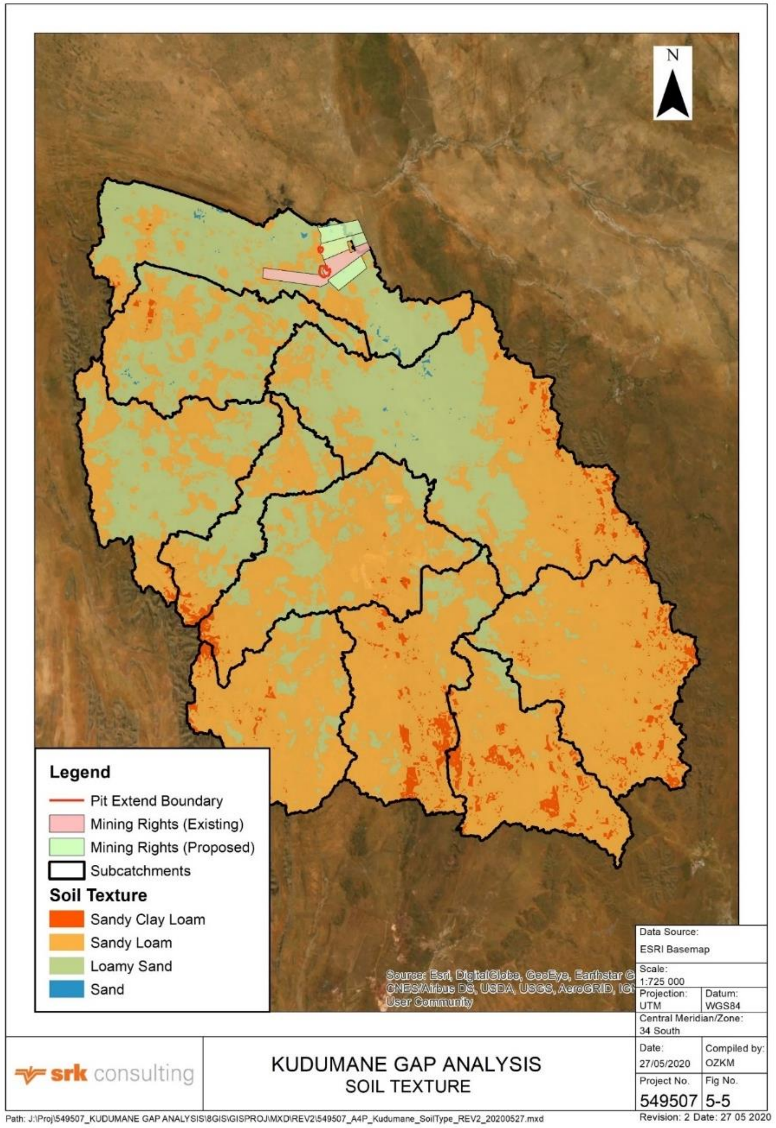


Figure 12-30: Soil Texture of Ga-Mogara Catchment (ISRIC, 2017)

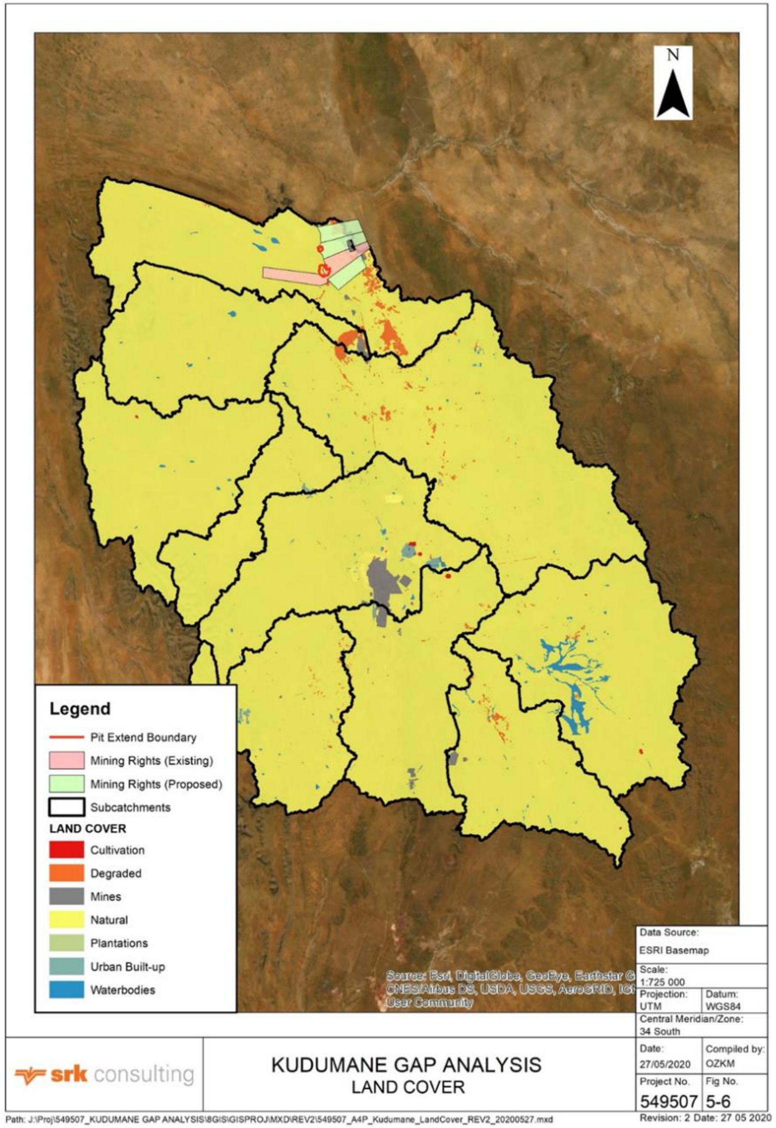


Figure 12-31: Land Cover of Ga-Mogara Catchment (NLC, 2019)

12.12.5 Flood peaks

The design flow rate information was obtained from the previous hydrological studies as listed below:

- The Hydrological Assessment for the Proposed Kudumane Mine (Metago Environmental Engineers, 2010);
- The Integrated Waste and Water Management Plan (SLR Consulting, 2012);
- The New Mining Right Application for Devon, Kipling and Hotazel Surface Water Study, (SLR Consulting, 2014); and
- The Water Use Licence Application (WULA) Storm Water Management Design (SLR Consulting, 2015).

The initial hydrological assessment study carried out by Metago presents flood peak numbers that are determined by using the Regional Maximum Flood (RMF) method, as implemented in the Utility Programs for Drainage (UPD) software (SANRAL, 2006). Accordingly, 402.7 m³/s was calculated for 1:50-year and 517.7 m³/s for the 1:100-year design storm. Related floodlines were modelled by using the HEC-RAS software.

The probability of the flow in any one year is estimated to be 1:13 and the approximate peak flow was calculated as 35 m³/s at the cross section by developing a HEC-RAS model at the ungauged river.

In addition to the historical flood events based on farmers observation, the floodline study was supported by using the aerial images. 100 m³/s and 250 m³/s Floodlines were evaluated and a comparison was made based on the border of the darker brown alluvial soils and dense grass cover at the river banks. As a result, the largest peak flow is estimated to be likely less than 250 m³/s at the study area.

In addition to the flood assessment based on the historical flow observations in the ungauged catchment, SLR Consulting (SLR) also carried out peak flow analysis by using the RMF method, which is an empirical method based on maximum peak flow records all around Southern Africa. Due to recorded flood flow rates and catchments, a regional K Value was related through the catchments.

In the 2010 studies performed by Metago, the K value was taken as 2.8 with the result of 403 m³/s for a 1:50-year and 517.7 m³/s for the 1:100-year. Based on the peak flow estimations based on catchments C3H004 and C3H017, the K value was mentioned a better representation with 1.7. As a result of revised peak flow estimations by SLR, estimated flow rates are presented Table 12-45 where the numbers also participated in the WULAs.

Table 12-45: RMF Method Peak Flow Estimations (SLR, 2014)

Event	Peak Flow (m³/s)
	K=1.7
Regional Maximum Flow (RMF)	400
1:200	251
1:100	198
1:50	154

Regarding to the previous studies, the following diversion option studies are evaluated based on 1:100-year design flow of 198 m³/s calculated by SLR and presented in the previous Environmental Impact Assessment (EIA) and WULA reports.

12.12.6 Floodlines

This section outlines the floodlines calculated for the site. The 1:50 and 1:100 year floodlines determined for the Ga-Mogara River and presented in Figure 12-32: The floodlines were calculated using the HEC-RAS model by SRL in 2017 within the scope of EIA works. Within the scope of current work, floodline study did not performed.

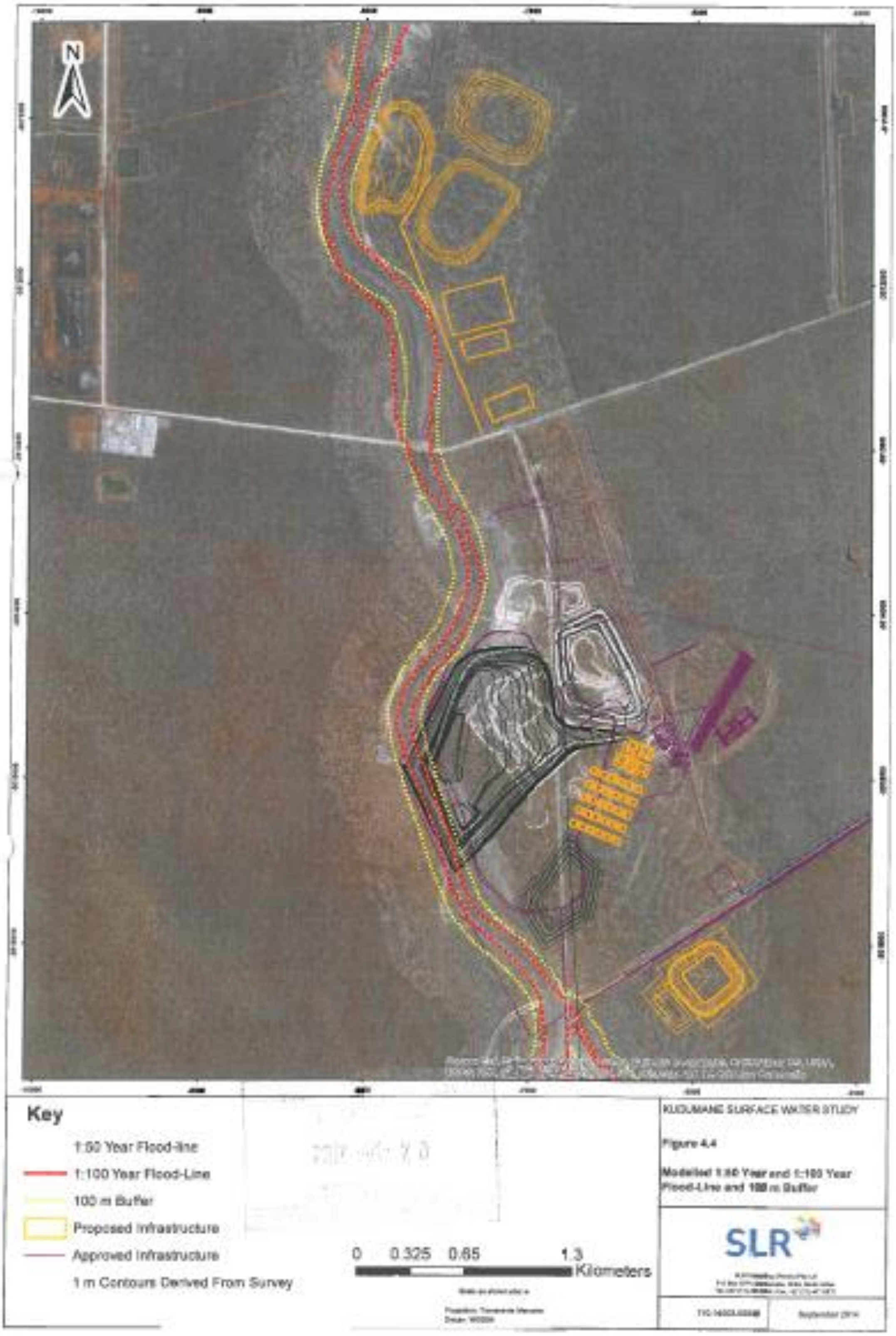


Figure 12-32: Modelled Floodline for 1:50 and 1:100 Storm Events (SLR, 2017)

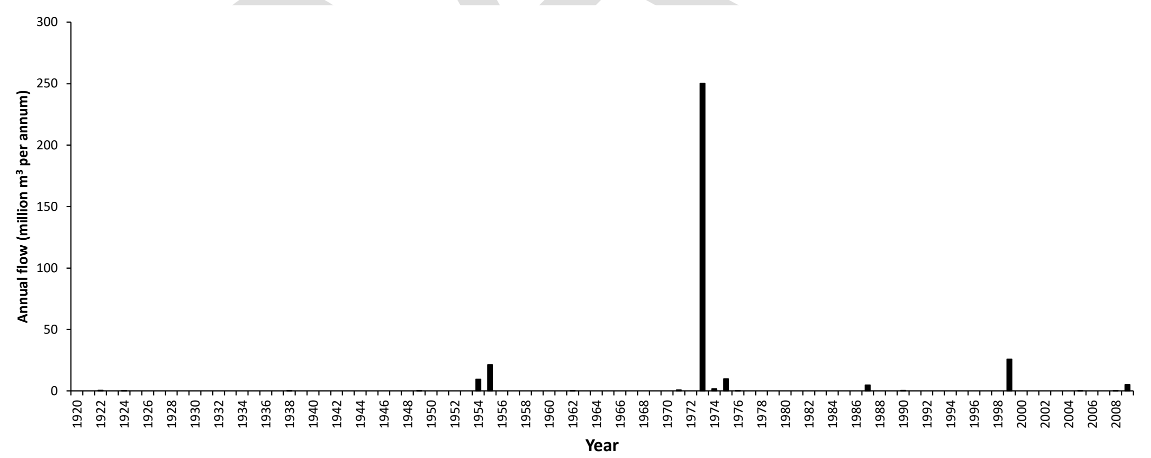
12.12.7 Normal dry weather flows

The normal dry weather flow is defined as the flow which occurs 70 % of the time in the three driest months (June, July, August). The system has negligible flow during the dry season and can therefore be classified as non-perennial.

12.12.8 Mean annual runoff

The KMR mine is located in quaternary catchment D41K which has a gross catchment area of 4216 km^2. According to WR2012, the catchment has a Mean Annual Runoff (MAR) of 6.53 million m^3 per annum. This was increased from the Water Resources of South Africa 2005 study (WR2005) MAR of 1.92 million m^3 per annum as when the WRSM2000 model was revisited, more realistic Sami groundwater parameters were applied. The challenge with modelling this catchment area, is that no streamflow gauges are available for calibration, and therefore MAR estimates are based on similarities with areas where streamflow gauges are available. Following a site visit, it was determined that the average flow within the Ga-Mogora River at the outlet of D41K would more likely be zero, with the occasional flow as reported during events of 1974, 1976 and 1988 as confirmed by local accounts. For modelling purposes, the MAR of 1.92 and 1.75 million m^3 per annum for quaternary catchments D41K and D41J as determined by WR2005, were used as a guide as they were deemed more realistic than the WR2012 MAR. A previous Surface Water Study by SLR Consulting (Africa) (Pty) Ltd in 2014 concluded that even the WR2005 MAR values appear incorrect and do not correspond with local observations. The report stated that the probability of flow within the river in any one year is estimated to be 1:13.

The WRSM2000 model was used to simulate the annual runoff at the outlet of quaternary catchment D41K from 1920 to 2009. The annual hydrograph is presented in Figure 12-33.



srk consulting	**KUDUMANE EIA** Annual Streamflow Results (WRSM 2000)	Project No. 574378

Figure 12-33: The annual streamflow for the Ga-Mogara River catchment from 1920 to 2009 as determined using the WRSM2000 model

The highest annual flow simulated was 250.3 million m^3 and occurred during the 1973 hydrological year, which is considered to be driven by the four months of high rainfall (December, January, February, March) which occurred in 1974. As no streamflow gauge is available for comparison, previous accounts from farmers were used to verify the simulated runoff. It is known that flooding did occur during this period, and flow was seen within the river. Notable flows were also witnessed in 1976 and 1988 within the Ga-Mogara River, which were simulated by the model. There is no evidence to account for flows before 1974. The flows simulated in 1999 and 2009 are one or two months of flow between December and February. No accounts of flow within the Ga-Mogara River have been accounted for during these periods. The possible reason for the simulation of these events, is due to a single month of high rainfall. Within the model, this generates runoff. It is understood, that within this catchment, flow is not generated by a single high intensity storm event or storm runoff, but rather a continued period of high rainfall sustained over time. This is suggested to be due to the freely draining soils of the area and the flat terrain. Shorter storm events are more local, while longer duration rainfall events may not be as intensive but, would be more evenly spread across the entire catchment generating runoff through groundwater response. As was witnessed during the recent 2021 floods near Deben, flow may occur within the river basin, but remain localised and subsides before reaching the catchment outlet. Although the accuracy of the annual streamflow values cannot be determined as no streamflow values for the Ga-Mogara River catchment are available, the simulation provides a confirmation and representation of the non-perennial nature of the river and the catchments response to months of continued above average rainfall.

12.13 Socio-economic structure

The information presented in this section is extracted from the socio-economic specialist study undertaken by SRK Consulting (Pty) Ltd in 2021 (Appendix I).

The demographic profile of the area of influence (AoI) is important to consider due to the number of potential socio-economic impacts (positive or negative) that the project may trigger. The area of influence refers to communities affected from either a primary (i.e., direct), secondary (i.e., further spin-off effects)or livelihood perspective. The area of influence is not limited to those within direct proximity to the project site and may include communities located several kilometres away. The area of influence includes both project affected persons and communities, as well as those who may benefit from the proposed expansion project. These therefore include, but are not limited to, the doorstep mining communities.

In defining a Project-Affected Community (PAC),, the following questions were asked:

- What project related social impacts are anticipated?
- Which villages/communities surrounding the proposed area would be directly or indirectly affected by these impacts (i.e., the beneficiaries especially)?
- Which other communities/businesses would be the beneficiaries of the project?

The socio-economic status of communities (pre-development) is important to assess in order to provide a measure of comparison post-development (longitudinal assessment). Since the project will likely impact on socio-economic development and employment, KMR must have an overview of the current socio-economic status of the AoI (including the labour-sending areas). The demographic analysis therefore determines the age profile, current employment status and skills, and income of the AoI.

The socio-economic baseline starts with an overview of JMLM, followed by migrancy patterns, population trends and education. The baseline further describes the accessibility of social services, the area's economy and employment sectors.

12.13.1 Socio-Economic context

The project site covers a small footprint of JMLM and JTGDM. JMLM is one of three LMs in the district, alongside the Gamagara and Ga-Segonyana LMs. JTGDM is one of the smallest in the Northern Cape Province, occupying only 6% of the province's land area (GoSA, 2020a). JTGDM comprises of nearly

200 settlements; the majority (80%) which are located in JMLM. Evidently, JMLM is also the district's largest LM at an extent of 20,215 km2. The administrative seat of JTGDM is the town of Kuruman. Apart from the Kathu Forest (2,245 ha) and the Tswalu Private Nature Reserve (100,000 ha), there are no other protected areas in the district (ibid.).

According to the JMLM's IDP (2018-2019) (GoSA, 2018), the municipality can be divided into three broach character zones, based on the main economic activity in each region. These zones include:

- Character Zone 1: northern section of the Gamagara Mining Corridor - privately owned, with large portions of mining land (area arounds Hotazel and Black Rock)
- Character Zone 2: western part of the municipality - privately owned and dominated by commercial cattle farming and game and
- Character Zone 3: eastern part - largely managed by tribal land and is largely dominated by subsistence farming

JTGDM is largely characterised by a mixture of different land uses, with agriculture and mining being the most dominant. In fact, the JTGDM IDP (JTGDM, 2021) notes that the district used to be the richest mining region in the Northern Cape prior to a decline in mining employment and the near extinction of asbestos mining in the 1980s (GoSA, 2020a). Some of the minerals which are still mined include manganese ore, iron ore and tiger's eye. It is therefore not surprising that the iron-ore railway from Sishen Town to Saldanha along South Africa's West Coast is still one of the longest iron-ore carriers in the world (ibid.). Apart from mining, the land is also very rural in nature and extensively used for cattle, sheep, goat and game farming. Commercial hunting and tourism are also important drawing cards for the area, especially in winter. Approximately 60% of the district's land comprises of virgin land surface (ibid.).

The project site covers a small footprint of Ward 4 (one of 15 wards) of JMLM which falls within Character Zone 1 (northern section of the Gamagara Mining Corridor). This area is known for its rural and sparsely populated human settlements, and predominant commercial farms and mining activities. Closer to the project site, the land is dominated by mining activities. This is not surprising, as South Africa has one of the largest mineral reserves of manganese in the world. South Africa holds around 80% of the global manganese reserves (KMR, 2021). The majority of this manganese comes from the Kalahari Manganese Belt, which is known as the largest manganese deposit in the world.

KMR is one of 12 operating mines in the area. Some of these include UMK, South 32, Assmang Black Rock, Tshipi-e-Ntle, Kalagadi, Sebilo and Aquila Mine (KMR, 2018). Although many farms are still owned by farmers, several of the surrounding farms have been bought by mining companies in the last century, who are now renting such land out to farmers. It is the view of some key informants, that this is why much of the existing farmland is in a general poor environmental condition, as farmers who rent the land do not maintain the land properly. Some informants argue that this results in land which is being over-grazed. The JMLM's IDP (JMLM, 2021) also refers to the deterioration of the natural vegetation through overgrazing, poor fire regimes, wood harvesting, the misuse of wetlands, and the encroachment of Invasive Alien Species (GoSA, 2020a). However, much of this degradation is still limited to the eastern and northern parts of the district.

Approximately 60% of JTGDM's land is privately owned, whilst the remaining 40% is state land (GoSA, 2020a). According to the JTGDM's IDP (2021), state land is co-managed by nine traditional authorities and the state. State land in JMLM is controlled by two traditional authorities, namely the Batlharo Ba Ga Phadima (seated in Ga-Morona) and Batlhaping Boo Phuduhutswana Ba Ga Thaganyane (seated in Cassel) (GoSA, 2020a). The traditional authorities are managed by paramount chiefs, traditional leaders and headmen under a Traditional Council System. Around 50% of the land mass of JMLM is trust land under the custodianship of traditional leaders. In terms of state land being converted into traditional land by means of the South African Reconstruction and Development Programme (RDP), the JTGDM's IDP (2021) refers to seven land claims; four of which are in JMLM. Most of these claims have not been resolved.

The district at large was declared by the government in 2000 as a "nodal zone" due to its high abstract poverty levels in some of its most rural communities (KMR, 2018). JMLM is the poorest municipality within JTGDM, with limited infrastructure, poor schooling and healthcare, and high levels of unemployment (ibid.).

12.13.2 Socio-demographic profile

Population size and density

Based on its mid-year population estimates, StatsSA reports a total number of 1,263,875 people currently living in the Northern Cape (StatsSA, 2019a). Of these, approximately 20% of the people (242,265 people) live in JTGDM, whilst the area around Kuruman and its surroundings has the largest concentration of people in the district (StatsSA, 2016; GoSA, 2021). This is followed by smaller human concentrations around Bathlaros and Morupen in the Ga-Segonyana LM, as well as Olifantshoek, Kathu and Dibeng in Gamagara LM (*ibid*.). Concerning Ward 4, the 2011 Census indicates a total population of 6,803 people, which was approximately 8% of the municipality's population in 2011, and 3% of JTGDM (StatsSA, 2012). According to the ward council committee members, each of the doorstep communities around the Hotazel mines consist of approximately 4,000-4,500 people (2021 figures).

In terms of JMLM, longitudinal data indicates a steady decline in population numbers, from 112,435 people in 1996 to 84,201 in 2016 (GoSA, 2020). This means that the 2016 population figures for the municipality is only around 75% of what it was in 1996. This amounts to approximately 7% of the province and 25% of JTGDM. Although most of the population in the ward is from the Northern Cape (around 85%), a large section of the ward's population seems to originate from the North West Province (4.3%), followed by just over 2% who moved to the area from the Free State and Gauteng provinces respectively (StatsSA, 2012). The same trend is observed for JMLM, although for the district, less than half of the population were born in the Northern Cape (only 45.2%). A large section of the district's population was born in the North West Province (24.6%), followed by around 5% of people who were born in the Free State and close to 4% born in the Western Cape (*ibid*.).

Despite an initial population decline in JTGDM prior to and leading up to the 2011 and 2016 census and community surveys, the district and municipality had a slow population increase in the last few years. According to the ward council committee members in Magobing, there is a general influx of people from other areas in search of jobs that are staying in the mine's doorstep communities often renting houses or shacks. This is despite the fact that the district is seeing a lot of out-migration to bigger cities where there is more work (GoSA, 2020a). In illustration, a report by JTGDM in 2020 indicates that, between 2008 and 2018, the district showcased an average annual positive growth rate of 2.83%, followed by a positive (although significantly less) 0.55% growth rate for JMLM (GoSA, 2020a). This is very similar to the annual growth rate for the province for the same period (2.10%) and that of South Africa (1.6%) (*ibid*.). For example, the 2011 Census already indicates a positive net-migration of 8,192 people for the province from 2006 to 2011, which increased to a positive 10,861 people between 2011 and 2016, and around 13,000 people between 2016 and 2021 (Stats, 2019). As the area generally showed a shrinking population at least between 1996 and 2011, the reason for such a growth can actually be due to the incorporation of Van Zylsrus and Hotazel into the geographical area of the municipality. The fact is that the municipality, and ward specifically, remains very rural in nature, whilst many people out-migrate especially to Ga-Segonyana and Gamagara; areas which are closer to business opportunities (GoSA, 2018).

In terms of gender, the district's male-to-female ratio in 2011 was 1:1.17, which means that the district had slightly more females than men (*ibid.*). This figure is very similar for JMLM at 1:1.06 (*ibid.*). More recent gender statistics for 2018 suggest that the district's female population remained slightly higher at approximately 51.1% females (GoSA, 2020a). Ward 4 has a male-to-female ratio of 1:0.87, which means that men slightly outnumber their female counterparts (StatsSA, 2012). Figure 12-34 illustrates that men comprise 53.48% of the ward's population.

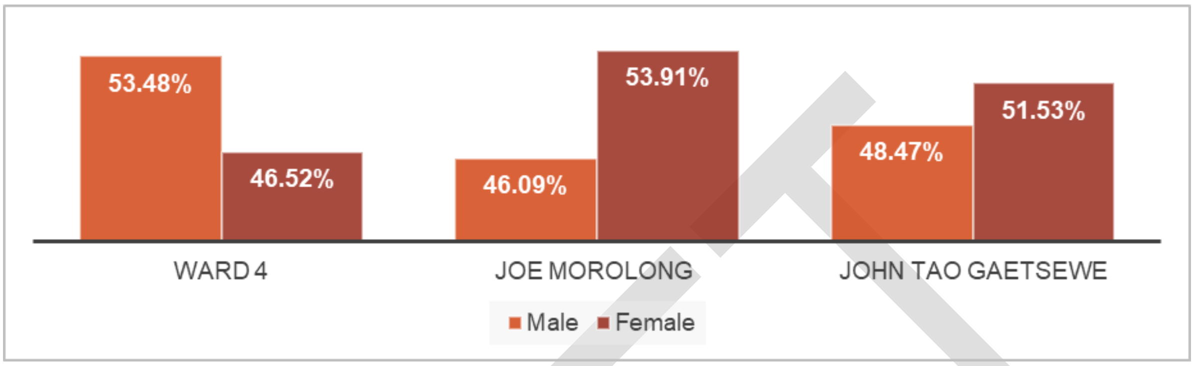


Figure 12-34: Gender at ward, municipality and district levels (%)

Source: StatsSA, 2012

The majority of people within JMLM speak Setswana (90%), followed by Afrikaans (3.6%), English (1.9%) and other indigenous languages[2] (4.4%) (StatsSA, 2012). At ward level, approximately 60% of the population speak English (0.33%), Sesotho (0.14%) and IsiNdebele (0.13%).

Based on 2016 data, the district is sparsely populated with around 8.8 people/km^2 (StatsSA, 2016). Although covering the largest land mass of the district (73.9% of JTGDM), JMLM is more sparsely populated with 4.4 people/km^2 (GoSA, 2018). In comparison, JMLM's neighbouring municipality, Ga-Segonyana LM, covers around 16.5% of the district's land mass, and has a much higher population density of 15.54 persons/km^2 (GoSA, 2021). Furthermore, Black African residents comprise around 97% of JTGDM's population (2016), followed by White (29%) and Coloured residents (1%) (*ibid*.). At ward level, the largest racial group is Coloured residents at 41.51%, followed by 38.56% White residents and 18.94% of people who are Black African residents (Table 12-46).

Table 12-46: Ward, municipality and district racial composition

Population groups	Ward 4	Joe Morolong	John Tao Gaetsewe
Black African	18.94%	96.60%	85.32%
Coloured	41.51%	1.96%	9.31%
Indian or Asian	1.00%	0.27%	0.38%
White	38.56%	1.17%	4.99%
Total	100.00%	100.00%	100.00%

Source: StatsSA, 2012

The 2016 South African Community Survey (StatsSA, 2016) estimated that there are 23,922 households in the district; a figure which is less than 5% of the figure for the Northern Cape (353,713). More recent figures for 2019 (GoSA, 2020a) indicate a much higher number of households (72,900). This equates to an average annual growth rate of 3.68% in the number of households between 2009

[2] Tshivenda, Xitsonga or Setswana

and 2019 (*ibid*.). Household sizes in JTGDM seem to be decreasing from around 3.9 individuals per household in 2009 to 3.6 individuals per household in 2019 (*ibid*.).

Towns and settlements

JMLM and JTGDM is largely rural in nature with a few sparsely populated (on average approximately 60 km apart) peri-urban areas In addition, between 150 and 200 settlements, many of which are villages including informal settlements include are listed in Table 12-47 below, according to first, second and third order settlements. A first order settlement means it has one of the greatest ranges of services and facilities (typically a town). A second order settlement means it has a residential dominance with services and facilities, whilst a third order settlement usually lacks serves and facilities, and is more rural.

Table 12-47: Settlements

Settlement category	Settlement names
First order settlements	• Kuruman • Churchill
Second order settlements	• Van Zylsrus • McCarthysrus
Third order settlements	• Kathu • Deben • Olifantshoek • Bothitong • Mayeding • Laxey • Batlharos • Mothibistad • Hotazel • Heuningvlei

Hotazel, Santoy, Van Zylsrus and Black Rock are the largest towns within close proximity to the project site. Black Rock is classified as one of the important area nodes where higher economic activities take place (JMLM, 2017; GoSA, 2020a).

Age

Table 12-48 indicates that approximately 33% of the province's population are between 15 and 34 years of age, whilst more than 60% of the province's population are within the working-age bracket of between 15 and 64 (64.04%). Only around 6% of the province's population are 65 years or older.

Table 12-48: Age breakdown at province level (% of all people)

Age categories	Province (2019)
0-4	9.88
5-9	9.62
10-14	9.51
15 - 19	8.16
20 - 24	7.70
25 - 29	8.52
30 - 34	9.00

Age categories	Province (2019)
35 - 39	7.69
40 - 44	6.07
45 - 49	5.30
50 - 54	4.50
55 - 59	3.84
60 - 64	3.27
65 - 69	2.60
70 - 74	1.83
80 - 84	1.22
75 - 79	1.30
85+	9.88
Total	100%

Source: StatsSA, 2019a

Table 12-49 illustrates that 66% of people in the ward are within the working age group of between 15 and 64 years, which is more than the municipal (50.69%) and district (approximately 60%) average. The ward 4 youth (between 14-35 years) comprise around 34% of its population, which is similar to the figure in JTGDM (35%). Only 28% of persons living within JMLM are aged 14 to 35.

Table 12-49: Age categories at ward, municipality and district level (% of all people)

Age categories	JTGDM	JMLM	Ward 4
0 - 4	12.60%	15.81%	10.66%
5 - 10	11.58%	15.25%	9.88%
11 - 14	10.55%	13.26%	10.04%
15 - 19	10.04%	11.83%	8.00%
20 - 24	9.30%	8.83%	8.50%
25 - 29	8.92%	7.04%	9.49%
30 - 34	7.63%	0.61%	8.07%
35 - 39	6.29%	0.53%	7.47%
40 - 44	5.20%	4.81%	7.22%
45 - 49	4.78%	4.79%	5.82%
50 - 54	4.33%	4.71%	5.09%
55 - 59	3.60%	4.30%	4.53%
60 - 64	0.26%	3.24%	2.10%
65 - 69	1.76%	0.24%	1.34%
70 - 74	1.25%	1.81%	0.72%
80 - 84	0.56%	0.85%	0.38%
75 - 79	0.89%	1.33%	0.44%
85+	0.46%	0.75%	0.28%
Total	100.00%	100.00%	100.00%

Source: StatsSA, 2012

Land usage, tenure status and dwellings

The 2011 Census classifies 60.96% of all land in Ward 4 as farmland, followed by 31.79% of urban land (StatsSA, 2012). Table 12-50 indicates that 7.25% of land in Ward 4 is classified as tribal or traditional land in comparison to. 92.86% in JMLM.

Table 12-50: Land categorisation (%)

Categorisation	JTGDM	JMLM	Ward 4
Urban area	71.29%	2.42%	31.79%
Tribal or traditional area	20.74%	92.86%	7.25%
Farm	7.98%	4.73%	60.96%
Total	100.00%	100.00%	100.00%

Source: StatsSA, 2012

The JTGDM IDP (2021) indicates that most of the households in the Ga-Segonyana LM and JMLM own their own properties (Table 12-51 and Figure 12-35).

Around 80% of people in both JTGDM and JMLM own and have paid off their living houses in full (StatsSA, 2016). Around 1.6% of people in JMLM rent from a private individual, which is significantly lower than the rate for JTGDM (8%). A lower percentage (4.14%) of people in JTGDM rent their dwelling rent-free, compared to people living in JMLM (6.63%).

Table 12-51: District and municipality tenure status (2016)

Categories	JTGDM	JMLM
Owned and fully paid off	76.89	80.61
Rented from private individual	7.83	1.62
Other[3]	5.00	4.88
Owned; but not yet paid off	4.93	5.00
Occupied rent-free	4.14	6.63
Rented from other (incl. municipality and social housing)	0.88	0.94
Do not know	0.20	0.17
Unspecified	0.14	0.15
Total	100.00	100.00

Source: StatsSA, 2016

[3] The “other” category refers to a few people who rent from a private individual, or who rent from the municipality or a social scheme. It also includes people who “do not know”.

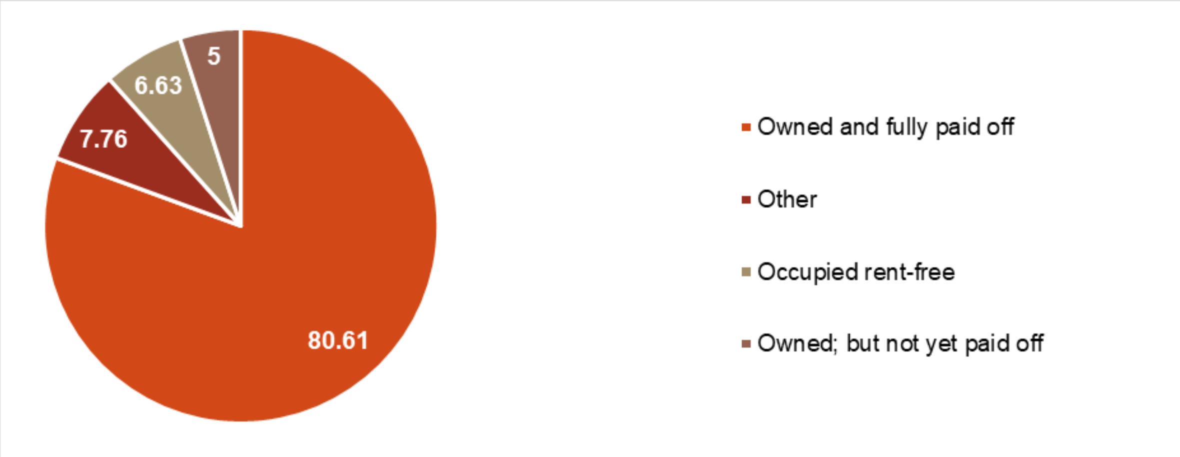


Figure 12-35: Tenure status for JMLM (2016; % of total population)

Source: StatsSA, 2016

Table 12-52 indicates that in alignment with JTGDM and JMLM nearly 80% of houses in Ward 4 seem to comprise of brick/concrete structures on a separate stand or yard. A small percentage (2.15%) of houses are informal dwellings in an informal/squatter settlement; a percentage which most likely increased since 2011. Around 6% of houses in JTGDM can be considered to be informal dwellings; nearly half the figure for the Northern Cape, where approximately 13% houses are classified as informal dwellings (StatsSA, 2012).

Table 12-52: District, municipality and ward dwelling types (%)

Categories	JTGDM	JMLM	Ward 4
House or brick/concrete block structure on a separate stand or yard or on a farm	73.09	70.93	78.95
Traditional dwelling/hut/structure made of traditional materials	11.65	22.36	4.94
Informal dwelling (shack; not in backyard; e.g., in an informal/squatter settlement or on a farm)	5.75	1.88	2.15
Informal dwelling (shack; in backyard)	4.86	2.35	7.22
Flat or apartment in a block of flats	1.51	0.57	2.92
Other	0.98	0.75	1.59
House/flat/room in backyard	0.77	0.37	0.60
Cluster house in complex	0.37	0.44	0.30
Townhouse (semi-detached house in a complex)	0.37	0.02	0.04
Room/flatlet on a property or larger dwelling/servants quarters/granny flat	0.27	0.14	0.39
Semi-detached house	0.18	0.03	0.13
Caravan/tent	0.18	0.17	0.77
TOTALS	100	100	100

Source: StatsSA, 2012

Figure 12-36 shows that 70% of houses within JMLM are formal houses, followed by a significantly smaller percentage of houses which are informal (10.86%) and around 5% which are very informal. Of the informal households, around 50.7% are female-headed households (KMR, 2018). Concerning the very informal houses (or shacks), around 20% are usually rented out to migrant labour but are not considered by KMR to cause any significant social tension in the area (*ibid*.).

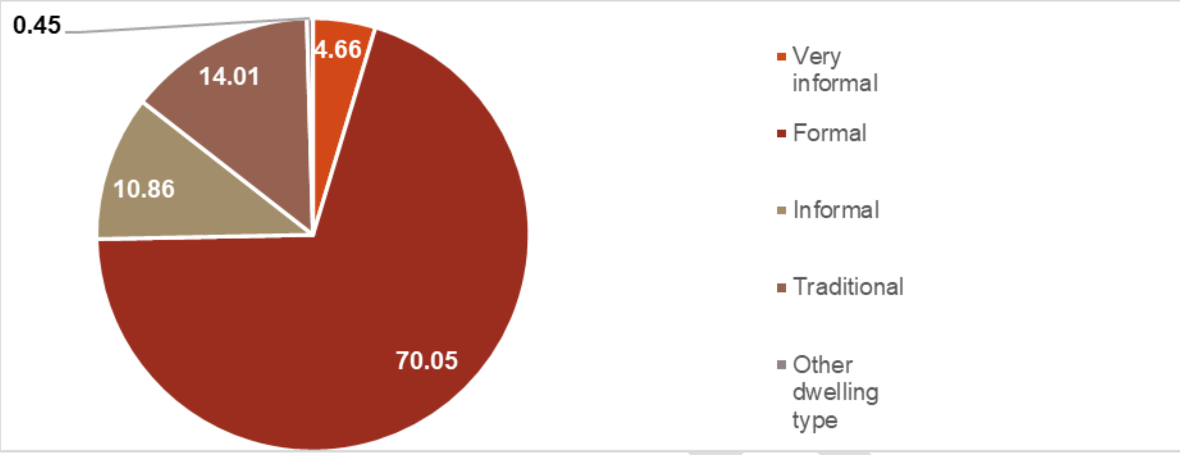


Figure 12-36: District dwelling units for JMLM (% of all housing units)

Source: StatsSA, 2016

Figures for 2018 suggest that more than half of the households in JTGDM have formal houses (61.84%), followed by 18.66% who live in very informal dwelling units (GoSA, 2020a). Just under 10% of JTGDM households comprise of informal dwelling units (*ibid*.).

12.13.3 Access to basic social services and related infrastructure

Electricity, water and sanitation

Figure 12-37 illustrates that most people in JTGDM and JMLM have access to in-house pre-paid electricity meters (84.98% and 86.21% respectively). Significantly less people have no electricity for JTGDM (8.81%) and JMLM (10.23%), whilst around 5% or less have in-house conventional meters. There is no significant difference in access to electricity for the district and municipality households.

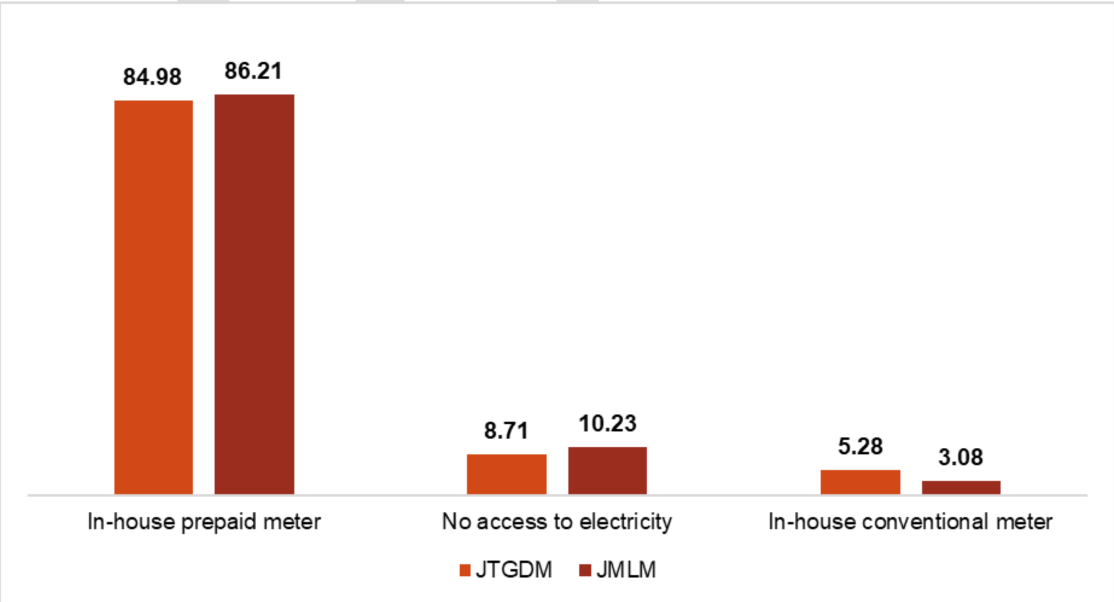


Figure 12-37: Electricity for JTGDM and JMLM (%) [4]

Source: StatsSA, 2016

[4] The table excludes various "other" insignificant categories, which include solar home systems, generators or batteries, for example.

Data suggest that JTGDM has a backlog of 4% of households who still do not have electricity (GoSA, 2020). It is therefore not surprising that, according to the ward council committee members, some villages around the project site, such as Magobing, have no streetlights.

In terms of water, the area is claimed by some of the key informants to have no surface water, as the Gamagara River runs dry as is not classified as a wetland area. KMR's annual report on groundwater monitoring confirms that there is limited groundwater (KMR, 2019). A geochemical and groundwater study undertaken for KMR indicates that the closest watercourses to the project site include the (SLR, 2014a):

- Ga-Magora River (a non-perennial river alongside the western boundary of the York Pit);
- Vlermuisleegte River (a non-perennial river along the southwest of the project site); and
- Witleegte River (a non-perennial river to the south-east of the project site.

Figure 12-38 shows that the majority of households (27.43%) in JTGDM have access to piped water on a communal stand compared to 44.45% in JMLM. A smaller percentage (24.40%) of JTGDM households have access to a public communal tap as compared to JMLM (33.03%). There is a significant difference between the district and municipality considering access to piped water inside a house (i.e., a tap), or piped water (tap) inside yards, as more people in the district seem to have access to these sources, compared to the municipality. Lastly, few people have access to borehole water both in JTGDM (3.32%) and JMLM (6.64%).

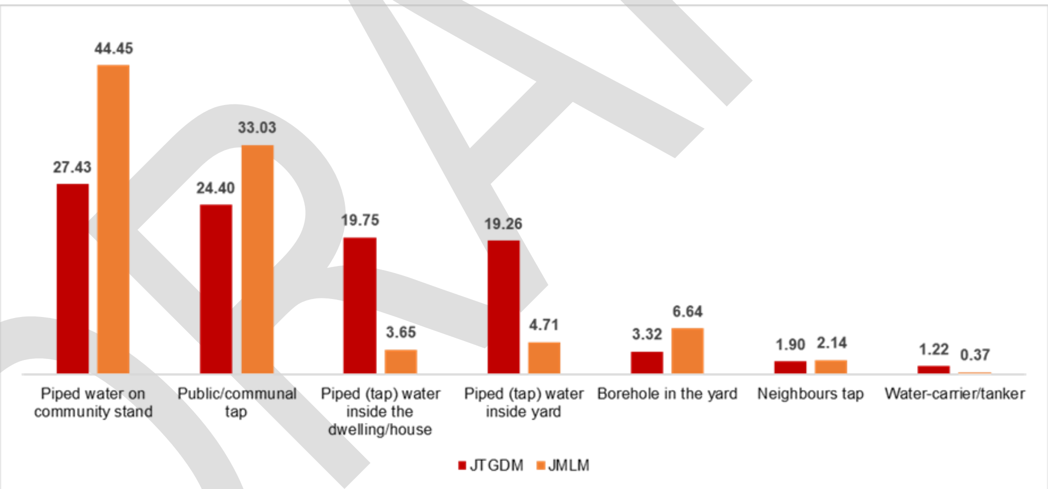


Figure 12-38: Water for JTGDM and JMLM (% of households)[5]

Source: StatsSA, 2016

Around 26.86% of households in JTGDM have access to piped water inside their dwelling, whilst around 23% have access to piped water inside their yard (GoSA, 2020). Around 2% of households in JTGDM have no formal piped water, with JMLM recording the lowest percentage (14.05%) of households with piped water inside their dwellings (*ibid*.).

According to key informants, the project site and surrounding areas are known for lacking ground- or surface water. This is also confirmed by KMR in its Social and Labour Plan (SLP) (KMR, 2018), noting that water is a scarce resource, with most communities in the area relying on shared services from communal boreholes (i.e., piped water from an access point outside main dwellings). It is also

[5] Excludes various "other" insignificant categories, which include rainwater tanks, or wells.

concerning that the mines, in some key informants' views, have been dewatering the area and impacted on the ground aquafers. In this line of reasoning, some informants argue that, as soon as water dries up, conflict between mines and communities erupts.

According to key informants, and in particular the ward council committee members, most households around the mine have no access to water taps or piped water inside their yards. Boreholes are mostly privately owned either in villages or on surrounding farms (source). According to KMR's SLP (KMR, 2018), 33 villages and 910 households in the district have no access to water. JMLM relies on water tankers to provide around 68 villages with water (KMR, 2018), which means that the principal water sources in the area are water tankers or windmills. Key informants in Magobing indicated that the mines in the area occasionally support the communities with boreholes. According to KMR (2018), the Churchill-, Loopen-, Manyeding- and Magobing West communities frequently struggle with water access. Around 11 villages have been identified in the SLP to have sufficient water infrastructure, but who lack access to water due to source-related problems (*ibid*.). The SLP notes that bulk water supply, which include the development of new water schemes or other connections to existing water sources are required in these communities (*ibid.)*. The ageing water infrastructure and poor operation and maintenance exacerbates these issues.

Figure 12-39 illustrates that more than 50% of people in JMLM have access to a pit latrine or toilet with ventilation pipe, which is considerably higher than that of JTGDM (29.05%). Access to a pit latrine or toilet without any ventilation pipe (25.18%) is much lower in JMLM, as compared to a relatively constant level for the JTDM (28.89%). The data further shows that a significant higher percentage of people in the district have access to a flush toilet, as compared to the municipality (28.29% and 3.97% respectively). Other types of lesser used sanitation services include bucket toilets (1.59% for JTGDM and 3.93% for JMLM).

More recent figures (GoSA, 2020) suggest that during 2018, 37.52% of households in JTGDM had flush toilets, followed by 26.83% who had pit toilets with ventilation (ventilation improved pits, or VIPs), and 27.92% with pit toilets. JMLM is the municipality with the greatest number of households with VIPs, as compared to all municipalities within JTGDM (*ibid*.). According to JMLM's IDP (GoSA, 2018), 10,153 households in JMLM have pit toilets, without any distinction in the IDP as to whether these have ventilation systems or not. JMLM has 511 households who still use the bucket system (*ibid*.).

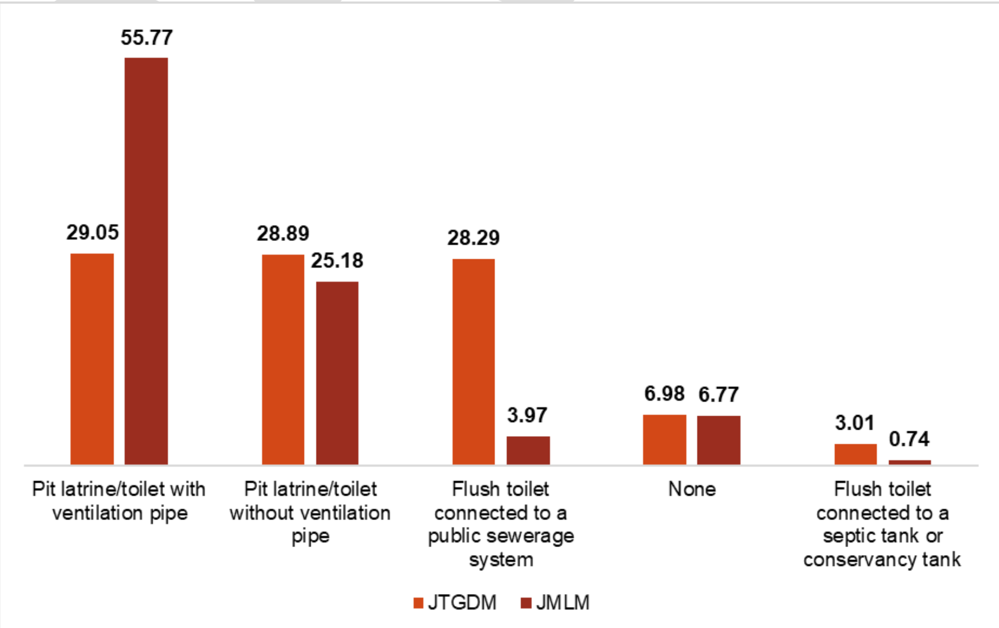


Figure 12-39: Sanitation for JTGDM and JMLM (% of households)

Source: StatsSA, 2016

12.13.4 Education and healthcare

Table 12-53 and Figure 12-40 indicates that 50% of JMLM and JTGDM residents older than 18 years have completed grades 6-11. A small number of residents 18 years or older have completed Grade 12 (only approximately 14% for both the district and municipality). However, this figure is likely to be slightly higher, as the 2016 South African Community Surveys indicated that 32.5% of people above 20 years of age have a matric (GoSA, 2020).

Table 12-53: Education status for those 18 years or older (%)[6]

Category	JTGDM	JMLM
No schooling	14.23	14.72
Grade 0	0.22	0.23
Grade 1	2.08	2.16
Grade 2	2.89	3.00
Grade 3	3.53	3.61
Grade 4	4.88	5.02
Grade 5	4.30	4.36
Grade 6	5.33	5.44
Grade 7	5.12	5.09
Grade 8	7.40	7.16
Grade 9	8.20	7.75
Grade 10	10.31	9.96
Grade 11	10.00	9.84
Grade 12	14.43	14.35
Other	7.08	7.30

Source: StatsSA, 2016

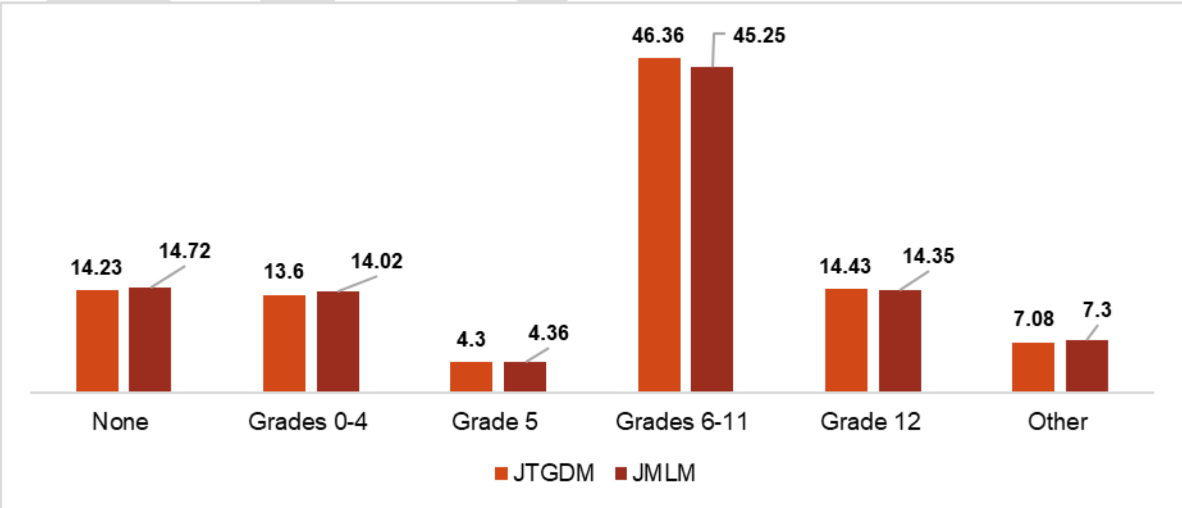


Figure 12-40: District and municipal education status (% of those 18 years or older)

Source: StatsSA, 2016

[6] The "other" category refers to other forms of education, such as occupational certificates, higher education (including masters and doctor degrees). It also includes those members who "did not know".

The functional literacy rate (predominantly referring to reading and writing skills) for JTGDM was estimated at 76% in 2019, which is slightly lower than the provincial rate (79.74%), but lower still than the national rate of 85% (GoSA, 2020). JMLM has the lowest literacy rate in the district with a total of 63.3% (*ibid*.).

According to the JMLM's IDP (JMLM, 2019), there are 168 schools in the municipality . The nearest school is a combined high and primary school in Hotazel.

Causes of deaths is a good indication of household health status. Data for the period 2013-2015 indicates that, in JTGDM, more than 75% of deaths for babies under the age of 1 year can be attributed to communicable diseases, which also include maternal, perinatal and nutritional conditions (GoSA, 2020a). For those citizens older than 50 years, the most common death is related to non-communicable disease (*ibid*.). In the IDP for JTGDM (2020-2021), the government acknowledges a number of health problems, which specifically affect child and maternal health (GoSA, 2021). Health problems are worsened by constraints related to the area's geographical remoteness, low household income status, and inadequate health services (*ibid.*).

From the years of asbestos mining, the ward council committee members confirmed that lung cancer is common in the area, especially amongst the older generation.

KMR indicates that around 85% of citizens in the area rely on a public services for medical service (KMR, 2018). JMLM has 28 health facilities; 24 which are clinics and three health centres (*ibid.*). There is no hospital, with none of the afore-mentioned facilities which operate 24 hours, whilst some are also closed on weekends. The district lacks medical, eye and oral healthcare services. Although there is a clinic in Hotazel, this clinic is claimed to only provide services to mine workers. For the mine's doorstep communities, the closest clinic around the mining project is in Tsineng, approximately 20 km in an adjacent ward (*ibid*).

12.13.5 Safety and security

There are 13 police stations in the district, of which five are located in JMLM (KMR, 2018). The closest police station to the project site is Hotazel. Figure 12-41 depicts that 5.9% of households in JTGDM have been a victim of crime in the 12 months leading up to the household survey, which is slightly less for JMLM at 4.5%. A small percentage of households experienced theft of livestock, whilst murder was only experienced by under 0.5% of JTGDM and JMLM (0.9%).

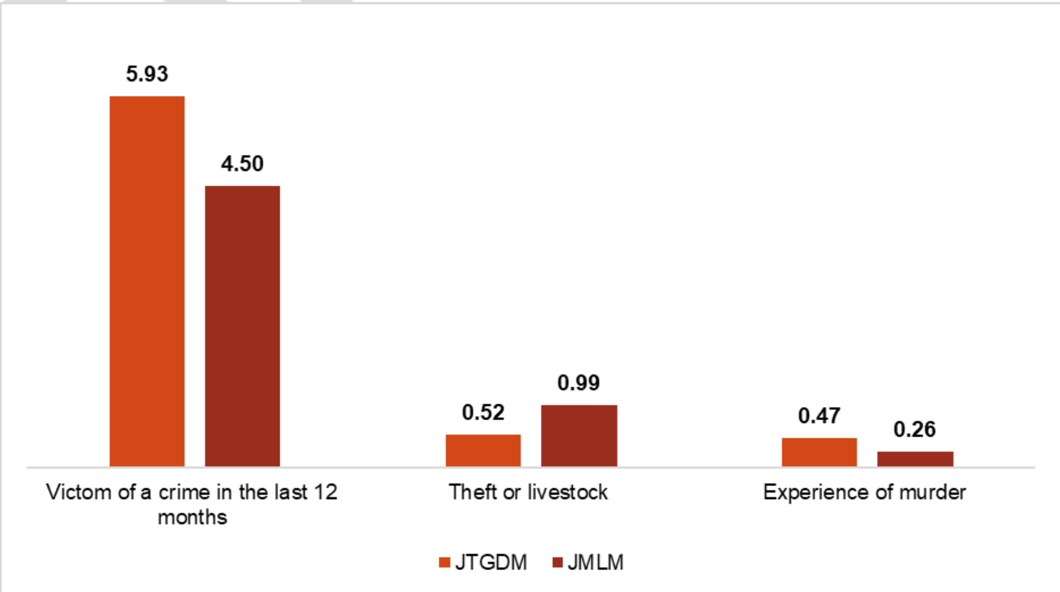


Figure 12-41: Crime (% of total people)

Source: StatsSA, 2016

For the period 2008/2009 to 2018/2019, overall crime in JTGDM has decreased at an average annual rate of 1.53% (GoSA, 2020).

According to statistics from these police stations, common in the district are assaults with the intention of inflicting bodily harm, and “common assault” (GoSA, 2020). The highest concentration of such assaults occurs in Kuruman and Kathu. Considering more serious crimes (such as murder or attempted murder), these are most prominent in Kuruman (*ibid.*). Around the project site, key informants, both from the affected land users and surrounding settlements, refer to common livestock theft, which seems to be prevalent, as well as substance abuse. Having referred to this, the specialist was informed that the people in the area rather welcome employment opportunities, and do not believe the expansion of the mine should affect their safety negatively.

According to some key informants, local strikes are common in the district, and although these are not frequent around the project site (or between the mine and adjacent farmers), their spin-offs affect the region in general. This is particularly the case as the road servicing Hotazel is the main route going to Botswana and Van Zylsrus. If this route is affected by strikes, it affects service delivery and the transportation of food and goods for the entire region. Such strikes are claimed to be mostly fuelled by tension between mining companies, labour and/or surrounding communities who expect the mines to provide more employment or development. As the mine’s expansion is moving closer to human settlements, such conflict could possibly worsen or lead to road closures when strikes flair up. The village of Magobing, for example, is a mere few kilometres from the expansion area. In fact, in a meeting with the ward council committee members on 21 July 2021, many referred to cracks in their houses due to mine underground blasting activities.

Lastly, the ward council committee members refer to a concerning increase in the number of taverns in this villages. This, as well as general substance or alcohol abuse, could worsen if the mining industry expands without any government support or monitoring in terms of social ills.

12.14 Traffic

The information presented in this section is extracted from the traffic specialist study undertaken by Siyazi in 2021 (Appendix I).

12.14.1 Existing road characteristics and modal distribution

Table 12-54 provides the information related to the existing intersections which will be used as part of the KMR Expansion Project.

Table 12-54: summary of intersection control at existing intersections under investigation

Point	Description	Intersection Control	Pedestrian Activities	Intersection Photo
A	Road R380, Gloria Mine Access Road and Mokala Mine Access Road	Free flow along Road R380	Pedestrian activity observed during surveys	
B	Road R380, Hotazel Airfield, and Hotazel West Access Road	Free flow along Road R380	Pedestrian activity observed during surveys	

C	Road R380, Hotazel East Access Road and Local Mine Access Road	Free flow along Road R380	Pedestrian activity observed during surveys	
D	Road R380 and Road R31	Free flow along Road R380	No pedestrian activity observed during surveys	
E	Road R380 and Kudumane Haul Access Road	Free flow along Road R380	No pedestrian activity observed during surveys	

In addition to the above information, Figure 12-42 provides the existing road network layout of the roads around the KMR study area. It also provides the various layouts of the intersections around the KMR property. Table 12-55 provides a summary of the surrounding road characteristics.

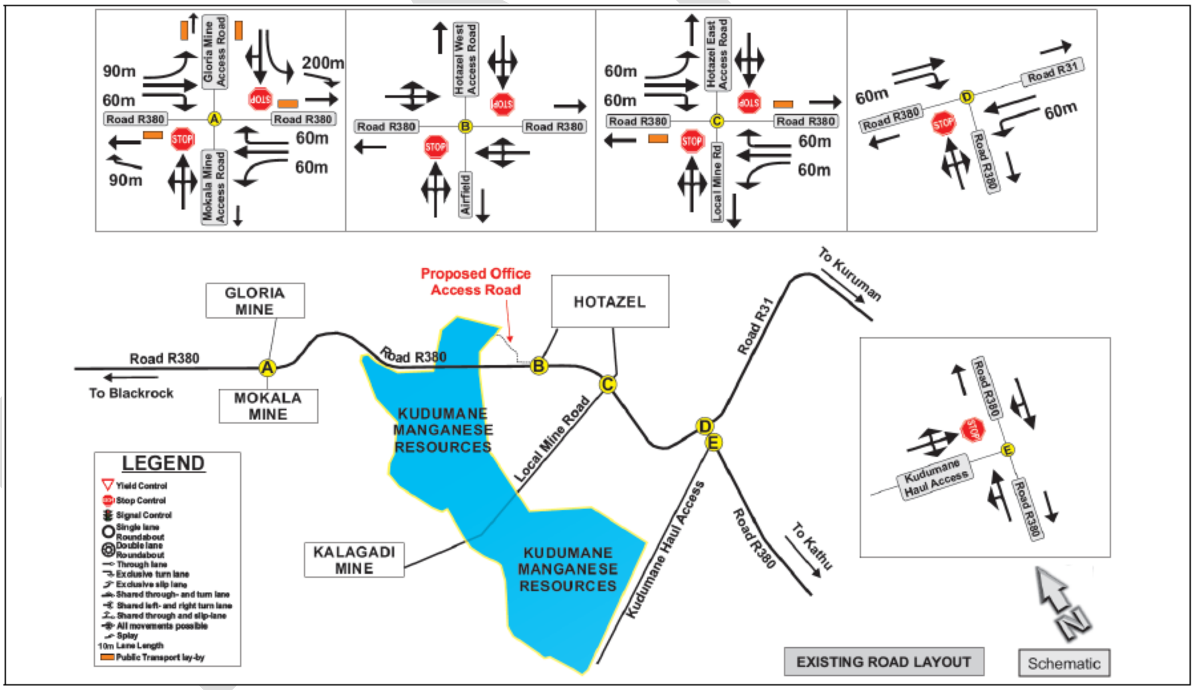


Figure 12-42: The existing road network layout for the area under investigation

Table 12-55: Summary of road characteristics

Relevant road section	Picture of road section	Existing class of road	Functional class of road	Road Authority	Road Reserve (M)	Number of Lanes	Lane Width	Type of Surface	Median	Anticipated Traffic Growth per Annum	Speed Limit
Road Section Relevant sectionof Road R31		**Primary Function:** Mobility **Class** / **Class No.** / **Route No.** Minor Arterial / R3 / R **Description:** Main Road **Spacing between Intersections:** 1.6km	**Operational Function:** Mobility **Class** / **Class No.** / **Route No.** **Minor Arterial** / **R3** / **R** **Description:** Main Road **Spacing between Intersections:** 1.6km		±30m	One lane per direction	3.6m wide	Asphalt	None	3%	100 km/h
Road Section 2 Relevant sectionof Road R380 (Points A to D)		**Primary Function:** Mobility **Class** / **Class No.** / **Route No.** Minor Arterial / U3 / R **Description:** Main Road **Spacing between Intersections:** 600m (±20%)	**Operational Function:** Mobility **Class** / **Class No.** / **Route No.** **Minor Arterial** / **U3** / **R** **Description:** Main Road **Spacing between Intersections:** 600m (±20%)	Northern Cape Department of Roadsand Public Works	±30m	One lane per direction	3.6m wide	Asphalt	None	3%	80 km/h

Road Section 3 Relevant sectionof Road R380 (Point D southbound)		**Primary Function:** Mobility **Class** / **Class No.** / **Route No.** **Minor Arterial** / **R3** / **R** **Description:** Main Road **Spacing between Intersections:** 1.6km	**Operational Function:** Mobility **Class** / **Class No.** / **Route No.** **Minor Arterial** / **R3** / **R** **Description:** Main Road **Spacing between Intersections:** 1.6km		±30m	One lane per direction	3.6m wide	Asphalt	None	3%	100 km/h
Road Section 4 Local Mine Road		**Primary Function:** Access / Activity **Class** / **Class No.** / **Route No.** **Collector Road** / **R4** / **N/a** **Description:** Collector **Spacing between Intersections:** 600 - 800m	**Operational Function:** Access / Activity **Class** / **Class No.** / **Route No.** **Collector Road** / **R4** / **N/a** **Description:** Collector **Spacing between Intersections:** 600 - 800m	Northern Cape Department of Roadsand Public Works	±50m	One lane per direction	3.7m wide	Asphalt	None.	3%	80 km/h

Road Section 5 Hotazel Eastern Access Road		**Primary Function:** Access / Activity **Class** / **Class No.** / **Route No.** **Collector Street** / **U4a** / **N/a** **Description:** Major Collector **Spacing between Intersections:** > 150m	**Operational Function:** Access / Activity **Class** / **Class No.** / **Route No.** **Collector Street** / **U4a** / **N/a** **Description:** Major Collector **Spacing between Intersections:** > 150m		±20m	One lane per direction	3.7m wide	Asphalt	None.	3%	60 km/h
Road Section 6 Hotazel Western Access Road		**Primary Function:** Access / Activity **Class** / **Class No.** / **Route No.** **Collector Street** / **U4a** / **N/a** **Description:** Major Collector **Spacing between Intersections:** > 150m	**Operational Function:** Access / Activity **Class** / **Class No.** / **Route No.** **Collector Street** / **U4a** / **N/a** **Description:** Major Collector **Spacing between Intersections:** > 150m	Northern Cape Department of Roads and Public Works	±20m	One lane per direction	3.7m wide	Asphalt	None.	3%	60 km/h

12.14.2 Traffic counts as basis for making traffic-engineering calculations

In order to gain a better understanding of the existing traffic patterns and movements adjacent to the existing development, 12-hour manual traffic counts were conducted at the existing intersections that would potentially be affected by the Proposed KMR Expansion Projects.

It is standard traffic engineering practice to conduct at least 12-hour manual traffic counts, as close as possible to a month-end Friday when traffic movement is expected to be at its highest.

The relevant 12-hour manual traffic counts were conducted on Friday 30 July 2021 at the following intersection under investigation:

a) Point A: Intersection of Road R380, Gloria Mine Access Road and Mokala Mine Access Road.

b) Point B: Intersection of Road R380, Hotazel Airfield Access and Hotazel West Access Road.

c) Point C: Intersection of Road R380, Hotazel East Access Road and Local Mine Road.

d) Point D: Intersection of Road R380 and Road R31.

e) Point E: Intersection of Road R31 and Kudumane Haul Access Road.

The respective peak-hour flows for the traffic count at the relevant intersections were identified as indicated in Table 12-56 below.

Table 12-56: Peak hour periods at the relevant intersection

Point	Intersection	Am peak hour		Pm peak hour	
		Time interval	Number of vehicles	Time interval	Number of vehicles
A	Road R380, Gloria Mine Access Road and Mokala Mine Access Road	06:00 – 07:00	371	13:15 to 14:15	389
B	Road R380, Hotazel Airfield Access and Hotazel West Access Road	06:00 – 07:00	471	13:15 to 14:15	472
C	Road R380, Hotazel East Access Road and Local Mine Road	06:00 – 07:00	557	13:15 to 14:15	520
D	Road R380 and Road R31	06:00 – 07:00	859	13:15 to 14:15	579
E	Road R31 and Kudumane Haul Access Road	06:00 – 07:00	444	13:15 to 14:15	191

12.14.3 Land use information, including existing and proposed latent developments in the area

A mining development to be known as Mokala Mine, for which environmental authorization has been granted and construction has been started, is proposed to the west of the existing KMR Mine and the proposed mining development would also make use of Road R380 and gain access from and to Road R380 at the existing intersection of Road R380, Gloria Mine Access Road and Mokala Mine Access Road (Point A in Figure 12-42).

The proposed mining development would entail the mining and selling of manganese and as per information obtained from the traffic impact assessment conducted by Siyazi in 2015, Table 12-57 provides information on the number of vehicle trips which are anticipated to be generated during the same peaks as determined as part of this study.

Table 12-57: Number of vehicle trips which are anticipated to be generated by the proposed Mokala Mine

Phase	**Construction Phase**		**Operational Phase**	
Trips	**In**	**Out**	**In**	**Out**
AM Peak	30	15	64	49
PM Peak	15	30	49	64

The above-mentioned vehicle trips were included as part of this investigation as latent approved vehicle trips. More detail regarding the proposed Mokala mining development is available upon request and authorization from the proposed mining development company.

12.14.4 Sensitive road sections and intersections related to existing and proposed conditions

Sensitive road sections and intersections related to existing conditions without and with the Proposed KMR Expansion Project in terms of vehicular traffic include the following:

- Where residents and schools are located (vehicle / pedestrian conflict).
- Free-flow legs of intersections where right turning movements take place and where no dedicated right-turn lanes are provided.
- Intersections with high volumes of vehicular traffic conflicts.
- Speeding.

The following figures are presented as part of the sensitive road sections **without** the Proposed KMR Expansion Project (status quo):

- Figure 12-43: Sensitive Road sections and Intersections indicating existing sensitive areas and Intersections **without** the Proposed KMR Expansion Project w**ithout** recommended mitigating measures.
- Figure 12-44: Sensitive Road sections and Intersections indicating existing sensitive areas and Intersections **without** the Proposed KMR Expansion Project **with** recommended mitigating measures.
- Figure 12-45: Sensitive Road sections and Intersections indicating existing sensitive areas and Intersections **with** the Proposed KMR Expansion Project **with** recommended mitigating measures.

With reference to Figure 12-43, without recommended mitigation, intersections B and E is considered to have a moderate significance due to the following reasons:

- The intersection of Road R380, Hotazel Airfield Access and Hotazel West Access Road (Point B) lack a dedicated right-turn lane on the southern approach of Road R380, which results in vehicles waiting to turn right from Road R380 having to do so within the through lane. Without a passing lane for other vehicles traveling straight through the intersection along Road R380, the lack of a dedicated right-turn lane creates the possibility of rear-ending collisions, therefore a road safety risk.
- The intersection of Road R380 and Kudumane Haul Access Road (Point E) lack a dedicated right-turn lane on the northern approach of Road R380, which results in vehicles waiting to turn right from Road R380 having to do so within the through lane. Without a passing lane for other vehicles traveling straight through the intersection along Road R380, the lack of a dedicated right-turn lane creates the possibility of rear- end collisions, therefore a road safety risk.
- These recommendations are required to assist in improving current third-party road safety.

- With reference to Figure 12-44, with the implementation of the recommended mitigation measures, the significance of this impact is considered to improve to a low significance and would improve road safety at these intersections
- It is important to take into consideration that the anticipated vehicle traffic to be generated due to the Proposed KMR Expansion Project is an insignificant volume of vehicle traffic during peak traffic times for the construction and operational phases. It follows, as depicted by Figure 12-45, that the Proposed KMR Expansion
- Project would have a negligible impact on the sensitivity of roads.

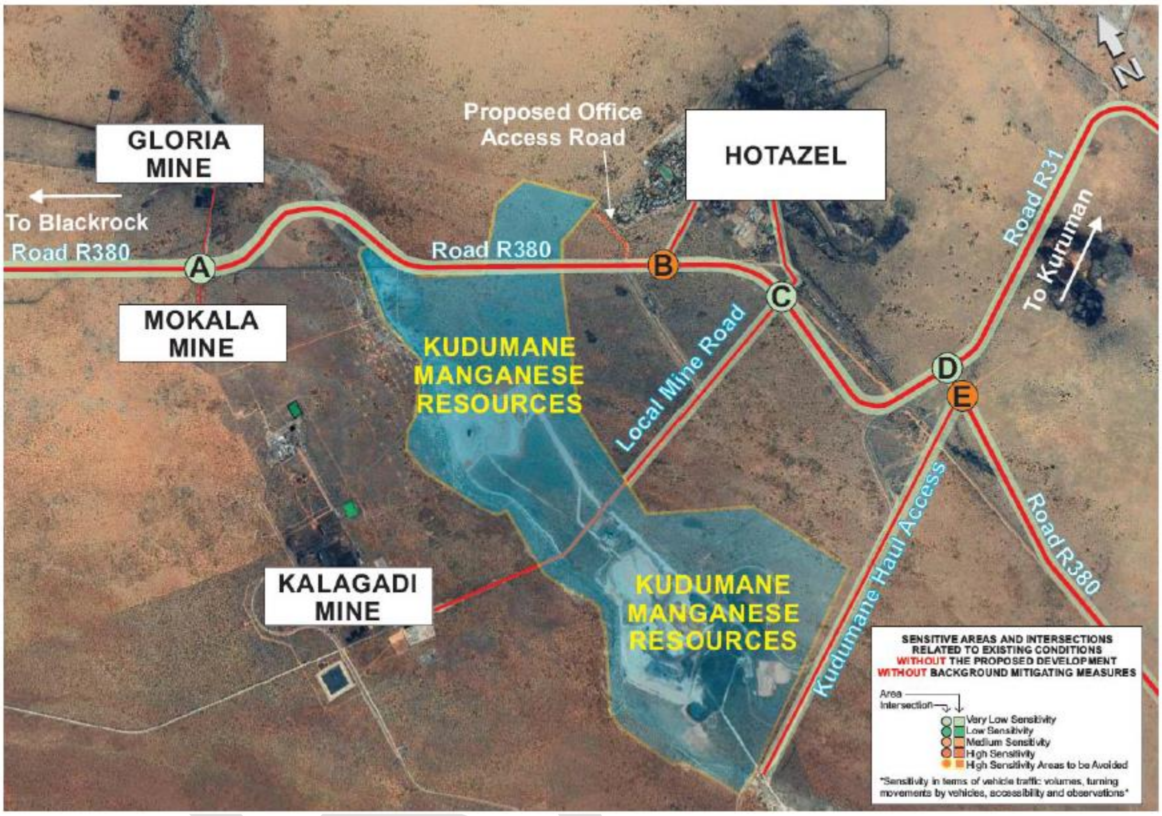


Figure 12-43: Sensitive road sections and intersections without the proposed KMR Expansion Project mitigating measures

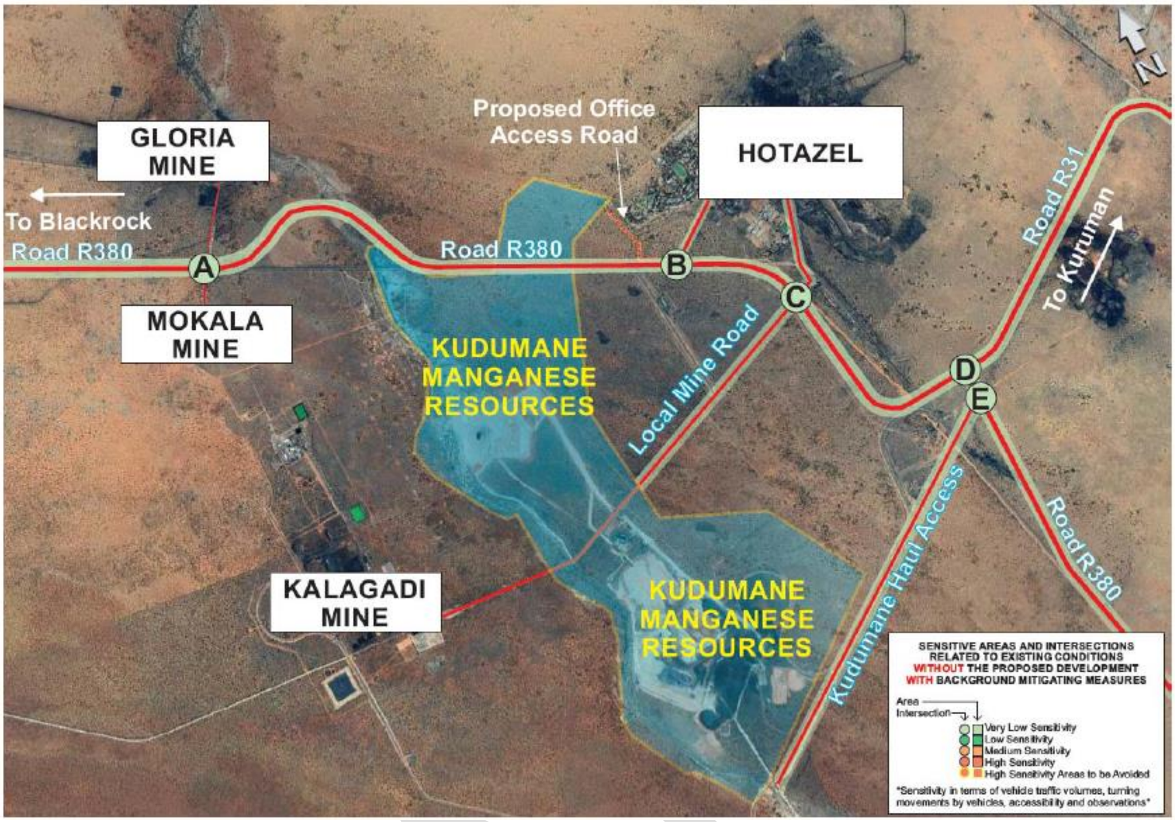


Figure 12-44: Sensitive road sections and intersections without the proposed KMR Expansion Project with mitigating measures

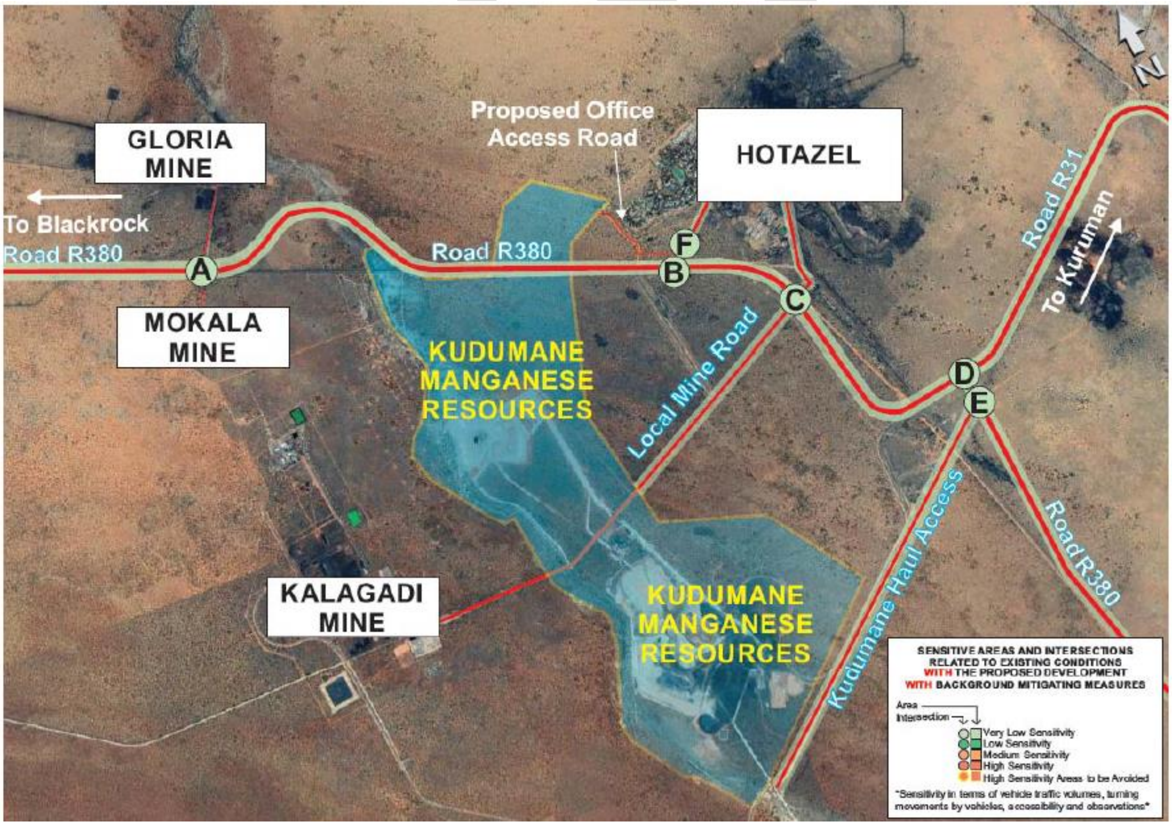


Figure 12-45: Sensitive road sections and intersections with the proposed KMR Expansion Project with mitigating measures

12.14.5 Access to and from the existing KMR mine and the proposed KMR expansion project

Access to and from the existing KMR Mine is currently gained from the intersection of Road R380, Local Mine Road and Hotazel East Access Road (Point C) which is the main access intersection, and the intersection of Road R380 and Kudumane Haul Access Road (Point E) which is mainly used by haul vehicles. Both these access intersections are existing approved intersections.

As part of the Proposed KMR Expansion Project, a new access intersection is proposed from Hotazel West Access Road (Point F) which would provide access to the proposed Kipling Administrative Office. Figure 2.6 provides a graphical presentation of the recommended locality of the last-mentioned access point. All other proposed activities as part of the Proposed KMR Expansion Project is proposed to gain access from the existing access intersections.

The following is important to take into consideration for the proposed access point from Hotazel West Access Road:

- Due to the locality of the proposed access intersection, which is near a railway crossing, low vehicle speeds were observed.
- The proposed access would be used by administrative staff only, which was determined as part of this report to be a low number of vehicles.
- Sight distance at the proposed intersection would be adequate.
- The life of mine for the KMR Mine due to the Proposed KMR Expansion Project is six years.
- Relevant road traffic warning signs at the railway line need to be provided where not done so already.

The access is therefore regarded as acceptable from a traffic engineering point of view. Final requirements and approval should be obtained as part of the detail design phase of the Proposed KMR Expansion Project.

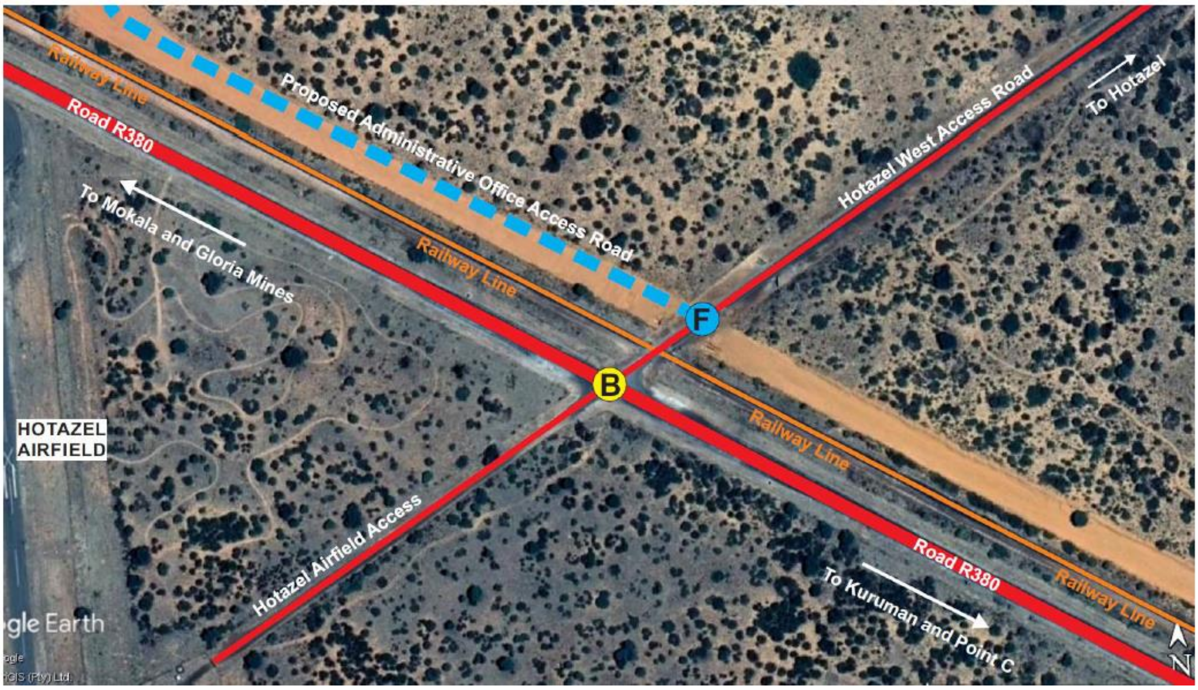


Figure 12-46: Proposed Kipling administrative office access from and to Hotazel west access road

13 Possible Mitigation Measures that Could be Applied

The proposed area where the expansion of the Hotazel opencast pit which is predominately brownfields, however, the Kipling opencast pit will be a new opencast mine, thus being a greenfield project. In addition to this, the Devon opencast pit will be rehabilitated as this is no longer viable.

The specialist studies assessed potential environmental and social impacts that may occur as a result of the proposed KMR Expansion Project. Appropriate mitigation and management measures to avoid and /or minimise the identified impacts associated with the project were developed and included in the EMPr (Part B, Section 27).

The mitigation hierarchy was applied throughout the scoping and EIA/EMPr Process. The mitigation hierarchy is an approach to mitigation planning and can be summarised into the following steps:

- Avoidance;
- Minimisation;
- Restoration and
- Offsets.

In the Scoping Phase, mitigation measures are predominantly focussed on avoidance and minimisation. This is done through activities, such as the site layout selection process and implementation of the environmental design criteria, including the environmental sensitivity plan, by the engineering team.

In the Impact Assessment Phase, the findings and recommendations of the specialist studies were used to develop the environmental and operational controls which are focused on impact minimisation and restoration (as part of mine rehabilitation and closure). The mitigation measures are fully described in Part B of this report.

With the mitigation measures applied, the residual risk significance for the assessed impacts and risks is generally low or medium.

14 Motivation Where No Alternatives Were Considered

Alternatives relating to location, infrastructure and transportation were considered in the previous EMPrs compiled for KMR. The location of the proposed KMR Expansion Project is therefore constrained to the location of the existing infrastructure which has been positioned based on the location of the mineral resource, and proven reserve. As such, no property alternatives were considered for this project. In addition, the infrastructure and activities associated with the proposed KMR Expansion Project will be situated within the current mining rights and surface areas. Existing technologies will also be applied to the expansion activities and therefore no technology alternatives are available at this stage of the study.

15 Statement Motivating the Preferred Site

Alternatives relating to location, infrastructure and transportation were considered for the authorisation of the previous KMR EMPrs. The location of the proposed project is therefore constrained to the location of the existing infrastructure which has been positioned based on the location of the mineral resource, and proven reserve. As such, no property alternatives were considered for this project. For this reason, no site selection was undertaken. The additional infrastructure will assist KMR in the optimal mining of their existing and future reserves.

16 Environmental Impact Assessment

This section provides an overview of the impact assessment methodology, specialist findings and recommendations. It also includes the findings of the impact assessment phase which includes both positive and negative impacts identified for the various phases of the project (pre-construction, construction, operation and decommissioning and closure).

16.1 Approach

16.1.1 Prediction of significant environmental issues

Potential environmental issues or impacts associated with the proposed Expansion Project were identified during the EIA phase through a review and consideration of the following:

- The nature and profile of the receiving environment which included both a desktop evaluation (available documents, existing EMPrs, GIS maps) and a site visit to areas where the proposed mining activities will be constructed and operated;
- Understanding of the direct and indirect effects of the project as a whole;
- Inputs received from the I&APs and the authorities during the pre-application phase, scoping phase and EIA phase;
- Inputs received from specialists appointed to conduct the various studies for the proposed Expansion Project; and
- Legal context.

Environmental and social issues have been highlighted in Section 16.2 for each environmental aspect considered. In addition to this, the cumulative impacts have been briefly described in Section 16.4.

16.1.2 Mitigation of impacts

A detailed assessment was conducted to evaluate possible impacts with input from the project team, the specialist studies and I&APs making use of the impact assessment methodology described in section 16.3.

Practical mitigation measures were identified with the following objectives:

1) To firstly strive to prevent the occurrence of the impact; and
2) If the impact cannot me prevented, then measures need to be put in place to minimise the significance of the impact

The mitigation measures associated with the proposed KMR Expansion Project have been included Table 16-4 to Table 16-7.

16.2 Summary of environmental and social impacts identified during the EIA process

The infrastructure associated with the proposed KMR Expansion Project and the areas to be disturbed fall within the KMR mining right area, hence the impacts associated with the proposed KMR Expansion Project in these areas are considered to be limited. With the exception of the proposed attenuation dam and Kipling operations, all other proposed activities will take place within areas which are already disturbed. If managed according to the proposed management measures in Table 16-4 to Table 16-7and Part B, Section 29, negative impacts associated with construction, operation, closure and post closure phases of the proposed KMR Expansion Project activities can be mitigated and positive impacts can be enhanced.

Table 16-1 includes a summary of the expected impacts, prior to the implementation of management measures, for the various phases of the proposed KMR Expansion Project which have been extracted from the specialist's studies, as well as from the comments received during the stakeholder engagement activities undertaken to date. These impacts have been assessed in line with the impact assessment methodology in Section 16.3.

Table 16-1: Expected impacts arising from project related activities during different project phases

Project Phase	Activity
Pre-construction	• Sedimentation of rivers due to preparation of the site for clearing • Site clearing and grubbing of the footprint areas associated with the proposed expansion project infrastructure and attenuation dam in preparation of the constructing of these infrastructures. • Preparation of the ground and surface water management measures for the WRD to receive waste rock • Preparation of the ground and surface water management for the PCDs to received contaminated water
Construction	• Natural vegetation loss, loss of habitat, impact on the flows of rivers located in close proximity to proposed infrastructure areas, impact on migration options for animals and birds in the area • Possible impacts to groundwater from seepage, reduced recharge of groundwater due to increased run-off • Pollution to rivers from hydrocarbon spills from construction machinery, deterioration of surface water quality
Operation	• Natural vegetation loss, loss of habitats, impact on the flows of rivers located in close proximity to proposed infrastructure areas, impact on migration options for animals and birds in the area • Possible impacts to groundwater from seepage and spillages such as hydrocarbons and tailings slurry • Flooding of the river could potentially cause erosion and/or damage to the existing and proposed river crossings • Reduced availability of water to downstream water users • Sedimentation of water courses due to operational activities
Closure/ Rehabilitation	• Pollution to surface water from hydrocarbon spillage from rehabilitation equipment
Post-closure	• Post closure surface water and groundwater quality impacts

16.3 Impact assessment methodology

This section presents the methodology that will be applied by SRK for determining the significance of potential environmental and social impacts during the EIA/EMPr phase.

The impact assessment methodology has been formalised to comply with Regulation 31(2)(l) of NEMA, which states:

> *(2) An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision …, and must include –*
>
> *(l) an assessment of each identified potentially significant impact, including –*
>
> *(i) **cumulative impacts**;*
>
> *(ii) the **nature** of the impact;*
>
> *(iii) the **extent** and **duration** of the impact;*
>
> *(iv) the **probability** of the impact occurring;*
>
> *(v) the **degree** to which the impact can be **reversed**;*
>
> *(vi) the **degree** to which the impact may **cause irreplaceable loss of resources**; and*
>
> *(vii) the **degree** to which the impact can be **mitigated**.*

The EIA methodology will require that each potential impact identified is clearly described (providing the nature of the impact) and assessed in terms of the following factors:

- Extent (spatial scale) → will the impact affect the national, regional or local environment, or only that of the site?;
- Duration (temporal scale) → how long will the impact last?;
- Magnitude (severity) → will the impact be of high, moderate or low severity?; and
- Probability (likelihood of occurring) → how likely is it that the impact may occur?

To enable the scientific approach for the determination of the environmental and/or social significance (importance) of each identified potential impact, a numerical value has been linked to each factor. Table 16-2 presents the applicable ranking scales.

Table 16-2: Ranking scales for environmental significance

Occurrence	**Duration:** 5 – Permanent 4 – Long-term (ceases with the operational life) 3 – Medium-term (5-15 years) 2 – Short-term (0-5 years) 1 – Immediate	**Probability:** 5 – Definite/don't know 4 – Highly probable 3 – Medium probability 2 – Low probability 1 – Improbable 0 – None
Severity	**Extent/scale:** 5 – International 4 – National 3 – Regional 2 – Local 1 – Site only 0 – None	**Magnitude:** 10 – Very high/uncertain 8 – High 6 – Moderate 4 – Low 2 – Minor

Once the above factors had been ranked for each identified potential impact, the environmental and/or social significance of each impact was calculated using the following formula:

Significance *= (duration + extent + magnitude) x probability*

The maximum value that can be calculated for the environmental significance of any impact is 100. The environmental significance of any identified potential impact is then rated as either: high, moderate or low on the following basis:

- More than 60 significance value indicates a high (H) environmental significance impact;
- Between 30 and 60 significance value indicates a moderate (M) environmental significance impact; and
- Less than 30 significance value indicates a low (L) environmental significance impact.

In order to assess the degree to which the potential impact can be reversed, cause irreplaceable loss of resources and be mitigated, each identified potential impact was assessed twice:

- Firstly, the potential impact was assessed and rated prior to implementing any mitigation and management measures; and
- Secondly, the potential impact was assessed and rated after the proposed mitigation and management measures have been implemented.

The purpose of this dual rating of the impact before and after mitigation is to indicate that the significance rating of the initial impact is and should be higher in relation to the significance of the impact after mitigation measures have been implemented. Table 16-3 provides an example of an impact assessment before and after mitigation using the SRK methodology.

The rating of the identified impact and mitigation and management proposed will be based on sound, validated scientific information and professional judgement in the context of the specific project and site conditions, and not emotion.

Table 16-3: Example of EIA Table

Nature of the impact	Significance of potential impact ***before*** mitigation						Mitigation measure	Significance of potential impact ***after*** mitigation					
	P	**D**	**E**	**M**	**Significance**			**P**	**D**	**E**	**M**	**Significance**	
Construction Phase													
Description	3	4	3	6	39	**Moderate**	*Description*	1	4	3	6	13	**Low**
Operational Phase													
Description	5	4	3	6	65	**High**	*Description*	3	4	3	6	39	**Moderate**
Rehabilitation and Decommissioning Phase													
Description	3	4	3	6	39	**Moderate**	*Description*	1	4	3	6	13	**Low**

16.4 Environmental and social impacts and mitigation measures

The main environmental disturbance / impact will occur during the pre-construction and construction phase of the project as a result of clearing the area as well as the movement of construction vehicles and trucks on the mine during the establishment the various activities associated with the Proposed KMR Expansion Project.

KMR is already an operational mine thus many of the impacts have been assessed as part of the previous EIA/EMPrs (Matego, 2010 and SLR, 2014).

The identified impacts associated with the proposed KMR Expansion Project are provided in Table 16-4 to Table 16-7.The rating of impacts, as per the methodology described in section 16.3, is also provided. In addition, mitigation measures that may alleviate or result in avoidance of the potential impacts have been included.

The footprint areas that will be disturbed in terms of the pre-construction, construction and operation of the proposed infrastructure are summarized below:

<u>Devon Footprint Area</u>

- Rehabilitation activities at the pit: 58 ha
- Establishment of monitoring boreholes: 25 m2
- Establishment of an explosive magazine: 4 100 m2

<u>Kipling Footprint Area</u>

- Opencast Pits Combined : 18 ha (6 ha and 12 ha)
- Waste rock dump: 25 ha
- RoM Stockpiles: 11 ha
- Haul road (approx. 0.6 km): 0.6 ha
- New Kipling Office area: 20 ha
- Sewerage Treatment Facility within the proposed new Kipling Office area: 0.4 ha
- Potable water tank within the proposed new Kipling Office area: 0.3 ha
- Diesel bay and fuel storage within the proposed new Kipling Office area: 0.7 ha
- Waste storage facility within the proposed new Kipling Office area: 0.8 ha
- Crushing facility within the proposed new Kipling Office area: 5.5 ha
- Potable water pipeline from the farm York A279 to through Hotazel 280 to Kipling 271: 2.4 ha in total
- Pollution control dam: 1.5 ha

- Construction and upgrading of access gravel road to Kipling offices: 2 ha

Hotazel Footprint Area

- Expansion of the Hotazel Pit: 25 ha
- RoM Stockpile: 36 ha
- Waste Rock Dump North, South and East: 48.5 ha in total
    - North – 28 ha
    - South – 6 ha
    - East – 14.5 ha
- Attenuation dam: 20 ha
- Haul road (approx. 4 km): 4 ha
- Potable water tank: 0.5 ha
- Sewage Treatment Plant (Lilliput plant setup): 0.3 ha
- Relocation of Admin offices and security building: 3 ha

It is important to note that the activities currently being undertaken on site were approved as part of the Metago EIA/EMPr conducted and approved in 2010 (Matego, 2010) and the SLR EIA/ EMPr conducted and approved in 2014 (SLR, 2014). These activities are still applicable and all mitigation measure will continue to be implemented

The following sections provide further details on the potential impacts (negative and positive), in terms of the various environmental and social aspects for each aforesaid activity and the associated actions that will be undertaken during the implementation of the project.

The potential identified impacts were rated, as discussed in Section 16.3, in terms of the Probability, Duration, Extent and Magnitude that may be associated with the potential impact. The following abbreviations were used in the Impact Assessment Tables to indicate the said impact assessment aspects:

- Pr→ Probability;
- D→ Duration;
- E→ Extent; and
- M→ Magnitude.
- LoR→ Loss of Resource

16.4.1 Proposed impacts anticipated during pre-construction

The tables below provides the potential impacts associated with the pre-construction phase of the project.

Table 16-4: Pre-construction impacts applicable to all the proposed expansion activities

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
Freshwater	Kipling Anomaly Site preparation prior to intended activities (not confirmed at the time of this assessment) including potential vegetation clearing, placement of contractor laydown areas and storage facilities and associated disturbances to soil. Activities include but not limited to: • Vehicular transport and access to the site including possible road crossings over the river, site clearing • Removal of vegetation and associated disturbances to soils • Miscellaneous activities by construction personnel Potential impacts include: • Exposure of soil, leading to increased runoff, erosion and stream incision, and thus increased sedimentation of the watercourse • Increased sedimentation of already transformed riparian habitat, leading to smothering of flora and benthic biota and potentially altering surface water quality • Decreased ecoservice provision • Proliferation of alien vegetation as a result of disturbances	-	4	2	1	4	3	**28**	**Low**	• Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential • Retain as much indigenous vegetation (riparian and terrestrial) as possible • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired and • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas	2	2	1	2	2	**10**	**Low**	64.3
	Kipling Pit Shell (partially encroaches on diverted reach of Ga-Mogara River) Site clearing prior to commencement of construction activities related to the proposed open pit, including placement of contractor laydown areas and storage facilities, including: • Vehicular transport and access to the site, site clearing; • Removal of vegetation and associated disturbances to soils; • Miscellaneous activities by construction personnel.	-	4	2	1	6	3	**36**	**Moderate**	• The footprint provided to the specialist in August 2021 indicates that the Kipling pit shell will extend into a diverted reach of the Ga-Mogara River, within the Mokala Mine MRA (SLR, 2021). It is strongly recommended that the footprint be optimised to avoid encroaching on the river any further as this will contribute to the cumulative impacts to the river posed by the proposed expansion activities; Notwithstanding the above, the following mitigation measures apply: •Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone (or diverted reach of the river) and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major	3	2	1	4	3	**21**	**Low**	41,7

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas.								
	Kipling Waste Rock Dump within 20 m of diverted reach of Ga-Mogara River • Removal of topsoil from project footprint, and stockpiling thereof for rehabilitation. • Clearing of vegetation / levelling of soil. • Earthworks, creating potential sources of sediment, which may be transported to the watercourse by stormwater runoff. Potential impacts include: • Increased risk of transportation of sediment from exposed soil in stormwater runoff, leading to increased turbidity of surface water, sedimentation of watercourse, smothering of vegetation and/or altered vegetation composition.	-	4	2	1	6	2	**36**	**Moderate**	• Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas. • The stockpiles may not exceed 2m in height or the height recommended by the Soil and Land Capability study (ZRC, 2021);	3	2	1	4	2	**21**	**Low**	41,7

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										• All exposed soils must be protected for the duration of the construction phase in order to prevent erosion and further sedimentation of the reach of the watercourse proximal to these stockpiles.								
	<u>Expansion of open pits (Hotazel)</u> • Site clearing prior to commencement of construction activities related to the open pit expansion area, including placement of contractor laydown areas and storage facilities. • Removal of topsoil from open pit footprint, and stockpiling thereof for rehabilitation. Potential impacts include: • Damage to marginal and non-marginal vegetation, leading to exposure and compaction of soil, in turn leading to further increased runoff and erosion; • Exposure of soil, leading to increased runoff from cleared areas and further erosion of the river, and thus increased potential for further sedimentation of the river; • Changes to the sediment balance of the river may lead to changes in instream habitat, potentially altered surface water quality when present and smothering of vegetation and/or altered vegetation composition; • Decreased ecoservice provision; • Further decreased ability to support biodiversity, specifically downstream of the MRA; and • Increased proliferation of alien vegetation as a result of disturbances.	-	5	2	1	6	3	**45**	**Moderate**	• Alternative options to avoid mining through the Ga-Mogara River should be sought, such as accessing the mineral resource from the western side of the river. • Notwithstanding the above, no unauthorised activity may be permitted within the Ga-Mogara River, including vehicular movement, indiscriminate disposal of waste material, or removal of vegetation; Notwithstanding the above, the following mitigation measures apply: • Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone (or diverted reach of the river) and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • The watercourse areas beyond the propose footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas.	4	2	1	4	2	**28**	**Low**	37,8
	<u>WRD North and South (Hotazel) within 120 m and 150 m respectively of the Ga-Mogara River</u> • Clearing and levelling of land for the WRDs within 120 m and 150 m (north and south WRDs respectively) of the Ga-Mogara River. • Removal of topsoil from WRD footprint areas, and stockpiling thereof for rehabilitation. Potential impacts include:	-	4	2	1	6	1	**36**	**Moderate**	• Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major	3	2	1	2	1	**15**	**Low**	58,3

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	• Exposure of soil, leading to increased runoff, erosion and wind-blown sediment, and thus potential increased sedimentation of the river; • Alteration of sediment balance of the river leading to changes in riparian and/or instream habitat, leading to smothering of flora and benthic biota and potentially altering surface water quality when water is present; • Decreased ecoservice provision; and • Proliferation of alien vegetation or encroacher species as a result of disturbances.									earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas. • The stockpiles may not exceed 2m in height or the height recommended by the Soil and Land Capability study (ZRC, 2021); • All exposed soils must be protected for the duration of the construction phase in order to prevent erosion and further sedimentation of the reach of the watercourse proximal to these stockpiles.								
	The attenuation dams within the Ga-Mogara River (Site clearing of vegetation) • Site preparation prior to construction activities related to the construction of the dam wall, including placement of contractor laydown areas and storage facilities. • Removal of topsoil from project footprint, and stockpiling thereof for rehabilitation. • Potential indiscriminate disposal of hazardous and non-hazardous waste within the river. Potential impacts include: • Loss of vegetation, leading to exposed/compacted soil, in turn leading to potential increased runoff and erosion; • Exposure of soil, leading to increased runoff from cleared areas and potential erosion of the river, and thus increased potential for further alteration to the sediment balance of the river; • Alteration of the sediment balance of the river may lead to further changes in instream habitat, potentially altered surface water quality particularly in the downstream reaches of the system, and smothering of vegetation and/or altered vegetation composition; • Potential impacts on water quality due to leaks and spills; • Further decreased ecoservice provision; • Further decreased ability to support biodiversity; and • Further proliferation of alien vegetation as a result of disturbances.	-	5	2	1	8	2	55	Moderate	• Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation; • •All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • •All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • •All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • •Retain as much indigenous vegetation (riparian and terrestrial) as possible; • •It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • •Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • •The watercourse areas beyond the proposed footprint of development and the NEMA zone of	4	2	1	6	1	36	Moderate	34,5

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas.								
Floral	All proposed KMR Expansion Activities: • Unnecessary clearing of vegetation and floral SCC outside of the authorised footprint. • Overall increased decline of floral diversity and habitat for the local area. Potential impacts include: • Potential failure to demarcate the project footprint areas before construction commences. • Potential inconsiderate planning of infrastructure placement and design, leading to the loss of intact floral habitat, as well as unnecessary edge effect impacts on areas outside of the proposed mining footprint.	-	3	4	2	6	3	**36**	**Moderate**	• Minimise loss of indigenous vegetation where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as other specialist studies. • It must be ensured that, as far as possible, all proposed infrastructure, including temporary infrastructure, is placed outside of sensitive habitat units. • Access roads should be kept to existing roads, as far as possible, so as to reduce fragmentation of natural habitat outside of the authorised footprint. • It is recommended that prior to the commencement of construction activities that the entire construction servitude be fenced off and clearly demarcated. • Design of infrastructure should be environmentally sound, and all possible precautions taken to prevent potential spills and /or leaks. All spills and /or leaks from equipment must be immediately remedied and cleaned up to ensure that these chemicals do not enter the soils	2	2	1	4	2	**14**	**Low**	61,1
	All proposed KMR Expansion Activities: • Direct loss of floral SCC from the mining footprint (all proposed KMR expansion activities), with the potential for knock-on effects to result in population declines of range-restricted floral SCC (local to regional impacts). • Pre-construction removal and/or rescue and relocation of floral SCC (NEMBA TOPS plants, NCNCA-Protected plants and/or NFA-protected tree species) within the KMR expansion activities. Potential impacts include: • Potential failure to conduct a walkdown of the footprint areas before construction activities where floral SCC are searched and marked for either rescue and relocation (only eligible species), for harvesting of propagules (where SCC cannot be relocated but can be propagated in a plant nursery to form part of rehabilitation activities later down the line), or to obtain numbers of SCC individuals that will be destroyed.	-	3	5	3	6	4	**42**	**Moderate**	• Floral SCC recorded within the proposed mining footprint included species protected under the NFA, the NEMBA TOPS regulations, as well as species protected under Schedule 1 and 2 of the NCNCA (refer to sections 3.2.1-3.2.3). A walkdown of the footprint area is required before construction activities commence, where all anticipated floral SCC/protected species are searched, and marked for relocation and/or destruction, so that all necessary permits can be obtained from the DENC and DFFE.	1	2	2	4	2	8	**Low**	81,0
	All proposed KMR Expansion Activities: • Direct loss of floral SCC from the mining footprint (all proposed KMR expansion activities), with the potential for knock-on effects to result in population declines of range-restricted floral SCC (local to regional impacts). • Pre-construction removal and/or rescue and relocation of floral SCC (NEMBA TOPS plants, NCNCA-Protected plants and/or NFA-protected tree species) within the KMR expansion activities. Potential impacts include: • Potential failure to relocate all floral SCC that are eligible for relocation to appropriate habitat outside the	-	5	4	4	6	3	**70**	**High**	• For NFA protected tree species, attempting to relocate mature individuals are often too expensive and/or result in unsuccessful re-establishment due to unavoidable damage to their root systems during their excavation. Where possible, seedlings of affected tree species should be targeted for relocation, and seeds must be harvested prior to vegetation clearance to use in rehabilitation activities. It is important that seedlings and seeds be harvested within a close proximity of an area to be impacted, so as to prevent alteration of population genetics.	5	4	2	4	2	**50**	**Moderate**	28,6

Aspect	Nature of the impact	Significance of potential impact BEFORE mitigation								Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	proposed mining footprint, or failure to harvest sufficient propagules of SCC to propagate for rehabilitation later down the line. • Potential failure to comply with national (NFA and TOPS) and provincial (NCNCA) legislation regarding permit applications for the removal, destruction, harvesting, or relocation of floral SCC that will be impacted by the proposed KMR Expansion Activities.									• Geophytes and succulents are good candidates for rescue and relocation (e.g., the Nerine and Harpagophytum species recorded on site), and these should be targeted for such initiatives. Where possible, propagules of such species must also be harvested and propagated in a plant nursery to use in rehabilitation activities during the closure and rehabilitation phase of the project. • A Rescue and Relocation plan must be drafted and approved by the relevant authorities for all floral SCC that will be impacted by the proposed mining activities. The Rescue and Relocation Plan must be used in conjunction with an approved Rehabilitation Plan for KMR to ensure successful translocation and/or reinstatement of floral SCC and habitat for such species.								
	All proposed KMR Expansion Activities: • Spreading of AIPs, leading to potential loss of floral habitat and species diversity from surrounding natural habitat. Potential impacts include: • Potential failure to update the existing Alien and Plant (AIP) Management/Control plan before the commencement of mining activities, resulting in the spread of AIPs from the mining footprint to surrounding natural habitat (propagules "hitch-hike" with construction vehicles).	-	3	4	3	8	3	**45**	**Moderate**	• Prior to the commencement of construction activities, the AIP Management/Control Plan (Eco-Pulse & EMS. 2019b) should be updated to cover all mining activities as well as the newly proposed KMR Expansion Activities. • Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction and operational phases, as well as post-decommissioning. No AIP propagules should be allowed to spread with construction rubble; and • The AIP Management/ Control Plan should be implemented by a qualified professional. No uncertified chemical control of AIPs to occur within the Ga-Mogara Habitat Unit	1	2	1	4	2	**7**	**Low**	84,4
	All proposed KMR Expansion Activities: • Loss of floral habitat outside of the direct, authorised mining footprint. Decreased potential for successful rehabilitation later down the line. Potential impacts include: • Potential failure to set up an Erosion Control Plan for sloped areas that could lead to increased erosion and potential slope failure of stockpiles. Loss of a nutrient-rich topsoil layer and degradation of soil structure may also result. • Potential inadequate design of stormwater management that could lead to increased erosion.	-	3	2	1	6	3	**27**	**Low**	• Prior to the commencement of construction activities, an erosion control plan and stormwater management plan should be developed.	1	2	0	2	1	**4**	**Low**	85,2
Fauna	All proposed KMR Expansion Activities: • Extensive, unnecessary site clearing and the removal of indigenous vegetation. • Unnecessary clearing of vegetation (outside of the authorised footprint. • Overall increased decline of faunal diversity and habitat for the local area. Potential Impacts include: • Potential failure to demarcate the project footprint areas before construction commences;	-	3	4	2	6	3	**36**	**Moderate**	• Where possible, and feasible, all access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Minimise loss of indigenous vegetation where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as other specialist studies; • It must be ensured that, as far as possible, all proposed infrastructure, including temporary	2	2	1	4	2	**14**	**Low**	61,1

Aspect	Nature of the impact	Significance of potential impact BEFORE mitigation								Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	• Inadequate layout optimisation and inconsiderate planning of infrastructure placement and design, leading to the loss of intact faunal habitat, as well as unnecessary edge effect impacts on faunal habitat outside of the proposed mining footprint.									infrastructure, is placed outside of sensitive habitat units; • At all times, ensure that sound environmental management is in place during the planning phase. Design of infrastructure should be environmentally sound, and all possible precautions taken to prevent potential spills and /or leaks. All spills and /or leaks from equipment must be immediately remedied and cleaned up to ensure that these chemicals do not enter the soils.								
	All proposed KMR Expansion Activities: • Direct loss of faunal SCC from the mining footprint (all proposed KMR expansion activities), with the potential for knock-on effects to result in population declines of faunal SCC. • Pre-construction removal and/or rescue and relocation of faunal SCC within the KMR expansion activities. Potential Impacts Include: • Potential failure to have an action plan for the likelihood of encountering a SCC during construction activities; • Potential failure to conduct a site walk down of the proposed footprint areas for SCC prior to vegetation clearing; • Potential failure to obtain the necessary provincial and national permits for the removal of protected faunal species resulting in delays to the mining activities and relocation of SCC	-	3	4	1	8	3	**39**	**Moderate**	• A rescue and relocation plan must be compiled prior to commencement of construction activities so all personnel are aware of the requirements should a SCC be encountered. This is of specific importance for species listed in NEMBA: TOPS list of 2007 and Schedule 1 and 2 of NCNCA (2009) that may occur on site; • Prior to vegetation clearing activities, the site should be inspected for the presence of SCC, including reptiles and scorpions. If located, these species should be carefully rescued and relocated as per an approved rescue and relocation plan; • All relevant permits are to be obtained from Department of Forestry and Fisheries (DFFE) and the Department of Environment and Nature Conservation (DENC) prior to the relocation of any faunal SCC.	2	3	1	4	2	**16**	**Low**	59,0
	All proposed KMR Expansion Activities: • Spreading of AIPs, leading to loss of faunal habitat and species diversity from surrounding natural habitat. Potential Impacts Include: • Potential failure to update the existing Alien and Invasive Plant (AIP) Management/Control plan before the commencement of mining activities, resulting in the spread of AIPs from the mining footprint to surrounding natural habitat.	-	3	4	3	8	3	**45**	**Moderate**	• Prior to the commencement of construction activities, the AIP Management/Control Plan (Eco-Pulse & EMS. 2019b) should be updated to cover all mining activities and the newly proposed KMR Expansion Activities; • Removal of alien invasive species should occur during the pre-construction phase and continue throughout the construction, operational and post-decommissioning phases. No AIP propagules should be allowed to spread with construction rubble; • The AIP Management/Control Plan should be implemented by a qualified professional. No uncertified chemical control of AIPs to occur within the Ga-Mogara Riverine Vegetation Habitat Unit.	1	2	1	4	2	**7**	**Low**	84,4
Soils and land capability	**Proposed Key Infrastructure (Open Cast Pits)**																	
	Key Infrastructure development: • A new Opencast Pit mine on Kipling; and • Expansion of the Hotazel and York Opencast Pits to allow for the mining of KMRs boundary pillar associated with each pit. Potential Impacts include: Potential poor planning leading to excessive placement of infrastructure outside of the demarcated open pit areas leading to increased soil erosion	-	4	4	3	8	3	**60**	**High**	• The footprint of the proposed infrastructure areas should be clearly demarcated to restrict vegetation clearing activities within the open pit footprint as far as practically possible.	3	2	2	4	2	**24**	**Low**	60

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	Key Infrastructure development: • A new Opencast Pit mine on Kipling; and • Expansion of the Hotazel and York Opencast Pits to allow for the mining of KMRs boundary pillar associated with each pit. Potential Impacts include: Potential poor planning and control mechanisms leading to excessive vegetation clearance within open pit areas	-	4	4	3	8	3	60	High	The footprint of the proposed infrastructure areas should be clearly demarcated to restrict vegetation clearing activities within the open pit footprint as far as practically possible.	3	2	2	4	2	24	Low	60
	Proposed Key Infrastructure (Attenuation Dams)																	
	Site preparation prior to construction activities related to the construction of the dam wall, including placement of contractor laydown areas and storage facilities.	-	4	4	3	6	3	52	Moderate	The footprint of the proposed two attenuation dams should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible	3	3	3	4	2	30	Low	42,3
	Removal of topsoil and vegetation from project footprint	-	4	4	3	6	3	52	Moderate	The footprint of the proposed two attenuation dams should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible	3	3	3	4	2	30	Low	42,3
	Secondary Infrastructure																	
	Potential poor planning leading to excessive placement of secondary infrastructure outside of the demarcated infrastructure areas leading to increased soil erosion	-	4	4	3	8	3	60	High	The footprint of the secondary infrastructure areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible.	3	2	2	6	1	30	Moderate	60
	Potential poor planning and control mechanisms leading to excessive vegetation clearance within the secondary infrastructure areas	-	4	4	3	8	3	60	High	The footprint of the secondary infrastructure areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible.	3	2	2	6	1	30	Moderate	60
Heritage	The unmitigated impact of the proposed development on site KLIP-004 has been assessed. The site is a medium-density Stone Age surface scatter and was assessed to have a Medium Significance. The site is located within the proposed development footprints.	-	5	5	2	4	4	55	Moderate	• Vegetation clearing of the site should be undertaken under close supervision of an archaeologist. • Once vegetation clearing is complete, the site must be assessed in the field by a suitably qualified Stone Age specialist long before construction commences. This is to allow this specialist report, and any mitigation measures recommended by the specialist, to be undertaken before construction commences. • The recommendations made by the Stone Age specialist must be adhered to. Such recommendations may include the archaeological recording of a surface layout plan, surface collection of lithics, etc. •	3	5	2	2	2	27	Low	
	The unmitigated impact of the proposed development on sites KLIP-001 and KLIP-003 will be assessed. The two sites are grouped together in this impact assessment as they are structures believed to be older than 60 years and both located within the proposed development footprints	-	3	5	2	2	2	27	Low	• Long before construction commences, an architectural historian must be appointed to undertake an assessment of the two buildings. • Although the architectural historian will provide recommendations, these are expected to inter alia comprise the recording of the two structures by way of photographic recording, recording of measured drawings of the facades and layout plans of the buildings. • The results from the above-mentioned mitigation measures (drawings, photographs and descriptions of the two buildings) must accompany the permit application that will be	3	5	2	2	2	27	Low	0

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										submitted to the relevant heritage authority to allow for the destruction of the two buildings. • The two structures may only be destroyed once the relevant destruction permit has been issued by the relevant heritage authority. •								
Traffic	Road capacity: Relevant Road sections and need for repairing and / or reconstructing of road	**+**	3	5	2	6	3	**39**	**Moderate**	• No mitigation measures required at this point. Roadways need to be monitored to determine when road surfaces require repairing.	3	5	2	6	3	**39**	**Moderate**	0,0
	Road capacity: Need for additional lanes	**+**	2	3	2	4	1	**18**	**Low**	• Road capacity calculations indicated that all relevant roads have sufficient road capacity • available.	2	3	2	4	1	**18**	**Low**	0,0
	Road safety: Intersection spacing	**+**	1	5	2	2	1	**9**	**Low**	• Existing intersections.	1	5	2	2	1	**9**	**Low**	0,0
	Road safety: Vertical Road alignment	**+**	1	5	2	2	1	**9**	**Low**	• Existing roads, vertical alignments acceptable.	1	5	2	2	1	**9**	**Low**	0,0
	Road safety: Available sight distance at intersections	**+**	1	5	2	2	1	**9**	**Low**	• Existing intersections.	1	5	2	2	1	**9**	**Low**	0,0
	Road safety: Need for dedicated left- and right-turn lanes	-	3	4	2	6	3	**36**	**Moderate**	• Dedicated right-turn lanes required at intersections B and E. Risk of vehicle accidents due to vehicles standing in roadway • waiting to turn right.	1	4	2	2	1	**8**	**Low**	77,8
	Road safety: Pedestrian movement within intersections	**+**	2	4	2	2	1	**16**	**Low**	• Pedestrian walkways and • crossings provided at key intersections.	2	4	2	2	1	**16**	**Low**	0,0
	Road safety: Public transport loading and off-loading at Intersections	**+**	2	4	2	2	1	**16**	**Low**	• Public transport lay-bys provided at key intersections.	2	4	2	2	1	**16**	**Low**	0,0
Visual	Visual Impacts during construction and operation of attenuation ponds	**-**	2	1	1	4	1	**12**	**Low**	• Retain natural vegetation where possible	2	1	1	4	1	**12**	**Low**	0.0
Surface Water	**Attenuation Dams** Impact on water quality due to an increase in runoff from cleared and stripped areas in close proximity to water courses	-	3	2	1	4	2	**21**	**Low**	• The footprint of the proposed infrastructure area must be clearly demarcated to restrict vegetation clearing activities as far as practically possible • Vegetation clearing activities will be restricted to demarcated infrastructure footprint area • Vegetation clearance will be undertaken in a phased manner. • Clean water diversion bunds will be constructed upstream of the construction site prior to clearing areas for new infrastructure • Areas disturbed by activities should be rehabilitated immediately on completion of each area. • Bunded containment and settlement facilities will be provided for hazardous materials, such as fuel and oil • Spill-sorb or a similar product will be kept on site and used to clean up hydrocarbon spills in the event that they will occur • The groundwater and surface water quality monitoring programme will continue in line with requirements of the Water Use License • Sufficient on-site ablution, sanitation and waste management facilities will be provided	2	2	1	4	1	**14**	**Low**	33.3
	Attenuation Dams	-	3	2	1	4	2	21	Low	• Where practical activities should be limited to months of low rainfall (dry season) to reduce probability of potential impact.	2	2	1	4	1	14	Low	33.3

Aspect	Nature of the impact	Significance of potential impact BEFORE mitigation								Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	Increased erosion from areas of exposed soils during site clearing resulting in potential increase in sedimentation of surface water resources.									• Areas disturbed by activities should be rehabilitated immediately on completion of each area. • Erosion control measures in the form of temporary erosion prevention berms should be implemented during construction.								
	Pollution Control Dams Increased erosion from areas of exposed soils during site clearing resulting in potential increase in sedimentation of surface water resources.	-	4	2	2	6	2	40	Moderate	• Where practical activities should be limited to months of low rainfall (dry season) to reduce probability of potential impact. • Areas disturbed by activities should be rehabilitated immediately on completion of each area. • Erosion control measures in the form of temporary erosion prevention berms should be implemented during construction.	2	2	2	4	2	16	Low	60.0
	Expansion and development of opencast Pits Impact on water quality due to an increase in runoff from cleared and stripped areas in close proximity to water courses	-	4	2	2	8	3	48	Moderate	• The footprint of the proposed infrastructure area must be clearly demarcated to restrict vegetation clearing activities as far as practically possible • Vegetation clearing activities will be restricted to demarcated infrastructure footprint area • Vegetation clearance will be undertaken in a phased manner • Clean water diversion bunds will be constructed upstream of the construction site prior to clearing areas for new infrastructure • Areas disturbed by pre-construction activities, which will not be required for construction, will be rehabilitated immediately on completion of construction area • Bunded containment and settlement facilities will be provided for hazardous materials, such as fuel and oil • Spill-sorb or a similar product will be kept on site and used to clean up hydrocarbon spills in the event that they will occur • The groundwater and surface water quality monitoring programme will continue in line with requirements of the Water Use License • Sufficient on-site ablution, sanitation and waste management facilities will be provided	3	2	2	4	2	24	Low	50.0
	Expansion and development of opencast Pits Increased erosion from areas of exposed soils during site clearing resulting in potential increase in sedimentation to surface water resources	-	4	2	2	8	3	48	Moderate	• Where practical activities should be limited to months of low rainfall (dry season) to reduce probability of potential impact • Areas disturbed by activities should be rehabilitated immediately on completion of each area • Erosion control measures in the form of temporary erosion prevention berms should be implemented during construction.	2	2	1	4	2	14	Low	70.8

16.4.2 Proposed impacts anticipated during construction

The tables below provides the potential impacts associated with the construction phase of the proposed project.

Table 16-5: Construction impacts applicable to all the proposed expansion activities

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
Freshwater	Kipling Pit Shell (partially encroaches on diverted reach of Ga-Mogara River) • Removal of topsoil from open pit footprint, and stockpiling thereof for rehabilitation. • Potential indiscriminate disposal of hazardous and non-hazardous materials waste in the Ga-Mogara River. • Surface impact during blasting and initial removal of overburden. Impacts include: • Damage to marginal and non-marginal vegetation, leading to exposure and compaction of soil, in turn leading to potentially increased runoff and erosion; • Exposure of soil, leading to increased runoff from cleared areas and potential erosion of affected reach of the river, and thus increased potential for further alteration of the sediment balance of the river particularly within the diverted reach thereof; • Altered sediment balance of the river may lead to changes in instream habitat, potentially altered surface water quality when present and smothering of vegetation and/or altered vegetation composition; • Decreased ecoservice provision; • Further decreased ability to support biodiversity, specifically downstream of the MRA; and • Increased proliferation of alien vegetation as a result of disturbances.	-	5	3	1	8	4	60	High	• The footprint provided to the specialist in August 2021 indicates that the Kipling pit shell will extend into a diverted reach of the Ga-Mogara River, within the Mokala Mine MRA (SLR, 2021). It is strongly recommended that the footprint be optimised to avoid encroaching on the river any further as this will contribute to the cumulative impacts to the river posed by the proposed expansion activities; • Notwithstanding the above, no unauthorised activity may be permitted within the Ga-Mogara River, including vehicular movement, indiscriminate disposal of waste material, or removal of vegetation; • During construction, the topsoil should be removed up to a depth of 150mm and be carefully stockpiled, for use during rehabilitation, outside of the freshwater resource and its 32m NEMA Zone of Regulation; • Excavated materials should not be contaminated and it should be ensured that the minimum surface area is taken up. The stockpiles may not exceed 2m in height or the height recommended by the Soil and Land Capability study (ZRC, 2021); • All exposed soils must be protected for the duration of the construction phase in order to prevent erosion and further sedimentation of the reach of the watercourse proximal to these stockpiles; and • Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential • Retain as much indigenous vegetation (riparian and terrestrial) as possible • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired and • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas	4	3	1	6	3	40	Moderate	33.3

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										in which no activities are proposed should be marked as a no-go areas								
	Kipling Waste Rock Dump within 20 m of diverted reach of Ga-Mogara River • Construction of clean and dirty water separation systems / stormwater management systems around the downgradient boundaries of the WRD that direct clean stormwater run-off around and away from the WRD. Potential impacts include: • Temporarily exposed soils, leading to increased risk of transportation of sediment to the watercourse. • Increased sedimentation of the watercourse may lead to altered water quality, smothering of vegetation and/or altered vegetation composition; • Exposed soils may result in increased stormwater runoff, leading to sheet erosion, as well as increased water inputs to the watercourse, in turn potentially leading to an altered	-	4	2	1	6	2	36	Moderate	• Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas. • The stockpiles may not exceed 2m in height or the height recommended by the Soil and Land Capability study (ZRC, 2021); • All exposed soils must be protected for the duration of the construction phase in order to prevent erosion and further sedimentation of the reach of the watercourse proximal to these stockpiles.	3	2	1	4	2	21	Low	41,7
	Expansion of open pits (Hotazel) • Surface impact during blasting and initial removal of overburden. • Potential indiscriminate disposal of hazardous and non-hazardous materials waste in the Ga-Mogara River. Potential impacts: as per pre-construction phase activities. Potential impacts include: • Damage to marginal and non-marginal vegetation, leading to exposure and compaction of soil, in turn leading to further increased runoff and erosion; • Exposure of soil, leading to increased runoff from cleared areas and further erosion of the river, and thus increased potential for further sedimentation of the river; • Changes to the sediment balance of the river may lead to changes in instream habitat, potentially altered surface water quality when present and smothering of vegetation and/or altered vegetation composition;	-	5	4	2	8	4	70	High	• Alternative options to avoid mining through the Ga-Mogara River should be sought, such as accessing the mineral resource from the western side of the river. • Notwithstanding the above, no unauthorised activity may be permitted within the Ga-Mogara River, including vehicular movement, indiscriminate disposal of waste material, or removal of vegetation; Notwithstanding the above, the following mitigation measures apply: • Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone (or diverted reach of the river) and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential;	4	4	2	6	4	48	Moderate	31.4

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	• Decreased ecoservice provision; • Further decreased ability to support biodiversity, specifically downstream of the MRA; and • Increased proliferation of alien vegetation as a result of disturbances.									• Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • The watercourse areas beyond the propose footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas.								
	<u>WRD North and South (Hotazel) within 120 m and 150m respectively of the Ga-Mogara River</u> Construction of stormwater trenches / berms around the downgradient boundaries of the respective WRDs to direct clean stormwater run-off around and away from the WRD. Potential impacts include: • Exposure of soil, leading to increased runoff, erosion and wind-blown sediment, and thus potential increased sedimentation of the river; • Alteration of sediment balance of the river leading to changes in riparian and/or instream habitat, leading to smothering of flora and benthic biota and potentially altering surface water quality when water is present; • Decreased ecoservice provision; and Proliferation of alien vegetation or encroacher species as a result of disturbances. Potential loss of catchment yield (*considered very low risk due to the semi-arid climate) and the extent of the catchment.	-	4	2	1	6	1	**36**	**Moderate**	• Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas. • The stockpiles may not exceed 2m in height or the height recommended by the Soil and Land Capability study (ZRC, 2021); • All exposed soils must be protected for the duration of the construction phase in order to prevent erosion and further sedimentation of the reach of the watercourse proximal to these stockpiles.	2	2	1	2	1	**10**	**Low**	72.2
	<u>The attenuation dam within the Ga-Mogara River</u> • Construction activities relating to the construction of the dam wall: • Ground breaking and earthworks; • Possible excavation activities leading to the stockpiling of soil; and	-	5	2	1	10	3	**65**	**High**	• Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation;	5	2	1	6	2	**45**	**Moderate**	30.8

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation: P	D	E	M	LoR	Significance		Mitigation Measures	Significance of potential impact AFTER mitigation: P	D	E	M	LoR	Significance		Degree of mitigation (%)
	• Removal and stockpiling of topsoil. Potential impacts include: • Loss of vegetation, leading to exposed/compacted soil, in turn leading to potential increased runoff and erosion; • Exposure of soil, leading to increased runoff from cleared areas and potential erosion of the river, and thus increased potential for further alteration to the sediment balance of the river; • Alteration of the sediment balance of the river may lead to further changes in instream habitat, potentially altered surface water quality particularly in the downstream reaches of the system, and smothering of vegetation and/or altered vegetation composition; • Potential impacts on water quality due to leaks and spills; • Further decreased ecoservice provision; •Further decreased ability to support biodiversity; and • Further proliferation of alien vegetation as a result of disturbances.									• All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas.								
Floral	All KMR Expansions Activities • Loss of floral SCC from the authorised KMR Expansion footprint, and potentially from the immediate surrounding areas (on a local scale). Potential Impacts Include: • Potential failure to have relocated or harvested all floral SCC within the footprint areas prior to the commencement of site clearing activities associated with the construction phase. • Potential failure to monitor the success of relocated floral SCC as well as propagation trials in plant nurseries from harvested propagules where SCC were not eligible for relocation. Potential overexploitation through the harvesting of floral SCC outside of the construction footprint by construction personnel.	-	4	2	3	8	3	52	Moderate	• It is recommended that all construction personnel be educated in environmental awareness, including the identification of SCC so to prevent accidental or unauthorised harvesting or clearance of SCC without permit application • No collection of indigenous floral species must be allowed by construction personnel, especially with regards to floral SCC (if encountered and not yet rescued/relocated) • Edge effect control needs to be implemented by fencing off or demarcating the expansion activities' footprint to prevent further degradation and potential loss of floral SCC and their habitat outside of the proposed expansion footprint. • Monitoring of any rescued and relocated floral SCC should commence during the construction phase and continue until it is evident that relocated species have successfully established. •	2	2	2	4	2	16	Low	69,2
	Nature of Impact per area Direct loss of floral diversity and habitat resulting from vegetation clearance and footprint development.																	
	Potential Impacts Include: Site clearing activities and expansion of Opencast Pits into natural vegetation and Ga-Mogara River.	-	5	4	3	8	4	75	High	• The disturbance footprint of proposed KMR Expansion Activities must be kept as small as possible, especially where it is - expanding into more sensitive habitat - to minimise impact on the surrounding environment (edge effect management also crucial). • The authorised expansion footprints must be demarcated, and it must be ensured that no unauthorised construction personnel move beyond these areas where natural (and more sensitive) vegetation would be adversely impacted. • Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint. Clearing of vegetation should take	5	4	1	6	2	55	Moderate	26,7
	Site clearing activities and construction of Attenuation Dams within the Ga-Mogara River and encroaching into adjacent natural habitat.	-	5	4	1	6	2	55	Moderate		4	2	1	4	2	28	Low	49,1
	Site clearing activities and development of the Secondary Infrastructure (WRDs and Stockpiles, Kipling Anomaly) within natural vegetation.	-	5	4	2	6	3	60	High		5	4	1	4	2	45	Moderate	25,0
	Site clearing activities and development of the Secondary Infrastructure (ancillary infrastructure such as offices, potable water tanks etc.) within natural vegetation.	-	5	4	1	6	2	55	Moderate		2	4	1	4	2	18	Low	67,3

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	Site clearing activities and development of the Secondary Infrastructure (Linear infrastructure, namely Haul Road, Pipeline) within natural vegetation.	-	5	4	3	6	4	65	High	place in a phased manner to keep bare soil areas as small as possible and to limit the erosion potential. Additionally, construction personnel and construction	4	4	1	4	2	36	Moderate	44,6
	Dumping of construction material within areas where no construction is planned, thereby increasing the extent of the authorised footprint.	-	3	2	2	4	2	24	Low	vehicles should be kept to the bare minimal per site in order to reduce the construction footprint and potential for soil compaction. • Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed expansion activities. • Planning of temporary roads and access routes should take the site sensitivity plan into consideration. If possible, such roads should be constructed outside of the sensitive rocky ridge habitat and planned in a manner that will not lead to habitat fragmentation •	2	1	1	4	1	12	Low	50,0
	All KMR Expansion Activities • Indirect loss of floral diversity and habitat due to potentially poorly managed edge effects Potential Impacts Include: • Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to ongoing proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas (altering the floral habitat). • Compaction of soils outside of the expansion footprint due to indiscriminate driving of construction vehicles through natural vegetation. Habitat fragmentation as a result of construction activities leading to loss of floral diversity and habitat.	-	3	2	2	6	3	30	Moderate	• To limit edge effect impacts to the surrounding natural habitat, the below guidelines must be followed: ○ Demarcating all footprint areas during construction activities; ○ No construction rubble to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility; ○ All soils compacted as a result of construction activities should be ripped, profiled and reseeded; ○ Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil; and ○ Manage the spread of AIP species and bush encroachers, which may affect remaining natural habitat within surrounding areas. ○ Ongoing AIP monitoring and clearing/control should take place throughout all phases of the project activities. The project perimeters should regularly be checked for AIP proliferation to prevent spread into surrounding natural areas; ○ Management of AIPs during the construction phase and operational-phase activities must be focused on limiting their introduction and preventing their spread. • Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal. • Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area	2	2	1	4	2	14	Low	53,3
	All KMR Expansion Activities: • Indirect loss of floral diversity and habitat due to potentially poorly managed edge effects Potential Impacts Include: Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions.	-	5	2	2	4	2	40	Moderate	• Suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities.	3	2	1	4	2	21	Low	47,5

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	All KMR Expansion Activities: • Indirect loss of floral diversity and habitat due to construction waste. Potential Impacts Include Waste from construction material leading to disturbance of natural vegetation.	-	4	2	2	4	2	32	**Moderate**	• No temporary dump sites should be allowed in areas with natural vegetation. Waste disposal containers and bins should be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility. • If any spills occur, they should be cleaned up immediately to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil.	2	2	1	4	2	14	**Low**	56,3
	All KMR Expansion Activities: • Indirect loss of floral diversity and habitat due to due to fires. Potential Impacts Include Destruction of vegetation due to unplanned fires	-	3	2	2	6	3	30	**Moderate**	• No unauthorised fires are to be allowed on the site, unless in areas demarcated and managed for this purpose. • Informal fires in the vicinity of the development areas should be prohibited. • Where a burning regime is implemented, this should be overseen by a qualified and experienced professional. • The mining and construction personnel should be informed about fire control and prevention measures to reduce the frequency of uncontrolled veld fires in areas surrounding and within the proposed KMR Expansion Activities. • A fire management plan should be in place in case of unplanned fires.	2	2	1	4	2	14	**Low**	53,3
Fauna	All proposed KMR Expansion Activities: • Loss of faunal habitat and diversity from the authorised KMR Expansion footprint, and potentially from the immediate surrounding areas (on a local scale). Potential Impacts Include: • Site clearing and the removal of vegetation leading to loss of faunal habitat, diversity and potentially occurring faunal SCC within the construction footprints and possibly in surrounding areas.	-	5	4	1	8	3	65	**High**	• Vegetation should be cleared in a phased manner to allow for any faunal species to vacate the footprint area naturally. • As far as possible vegetation clearance activities should be undertaken in the winter months, as faunal species will not be breeding and there is a lower risk to nesting avifauna. • Smaller arachnid and reptile species will be slower moving during the winter months, cool mornings and during the day when they seek refuge under dead wood and in burrows. As such, a walkdown of the footprint should be conducted prior to clearing and such species relocated to similar surrounding habitat outside of the footprint areas. Any species uncovered during earth works activities must be relocated in a similar fashion. Care must be taken not to harm individuals during such relocations. Such relocations must be undertaken by a competent individual.	5	4	1	6	3	55	**Moderate**	-18,2
	All proposed KMR Expansion Activities: • Unnecessary loss of valuable faunal habitat and faunal species reliant on specific habitats outside the construction footprint. Potential Impacts Include: • Uncontrolled and unplanned site clearing involving the removal of vegetation and destruction of faunal habitat outside of the footprint area	-	3	4	2	6	3	36	**Moderate**	• Faunal habitat beyond the demarcated areas should not be altered or disturbed and footprint creep is to be actively managed.	2	1	1	4	2	12	**Low**	66,7
	All proposed KMR Expansion Activities:	-	5	4	2	8	3	70	**High**	• Should any faunal SCC be found on site, a suitably qualified specialist must be consulted as to the best way forward;	4	3	1	6	2	40	**Moderate**	42,9

Aspect	Nature of the impact	P	D	E	M	LoR	Significance of potential impact BEFORE mitigation: Significance	Mitigation Measures	P	D	E	M	LoR	Significance of potential impact AFTER mitigation: Significance	Degree of mitigation (%)
	• Loss of SCC habitat and potentially occurring SCC from the direct footprint of the proposed KMR expansion activities. Potential Impacts Include: • Decreased habitat availability leading to a loss of faunal SCC abundance and SCC foraging grounds; • Persecution or trapping of faunal SCC.							• Smaller including SCC will be slower moving during the winter months, cool mornings and during the day when they seek refuge under dead wood and in burrows. As such, a walkdown of the footprint should be conducted prior to clearing and such species relocated to similar surrounding habitat outside of the footprint areas. Any species uncovered during earth works activities must be relocated in a similar fashion. Care must be taken not to harm individuals during such relocations. Such relocations must be undertaken by a competent individual; • Preserve the Savanna and Ga-Mogara Riverine Vegetation habitat units as far as possible to preserve foraging grounds and valuable nesting habitat for SCC and other fauna species; • No hunting or trapping of faunal SCC within the footprint sites or surrounding natural areas; • No vegetation outside of the demarcated footprint must be cleared.							
	All proposed KMR Expansion Activities: • Loss of faunal habitat and diversity, including potentially occurring SCC due to additional anthropogenic threats to the area as a result of the proposed KMR expansion activities. Potential Impacts Include: Increased personnel on site increases the risk of: • Hunting/trapping fauna and other human-wildlife conflict; • Uncontrolled fires; • Vehicle collisions with wildlife; • Indiscriminate driving of construction vehicles off road and through natural vegetation; • Waste from construction activities leading to disturbance of natural vegetation.	3	3	2	6	2	33 Moderate	• No hunting, trapping or setting of snares by construction personnel is to be allowed. Suitable fines / disciplinary actions for such must be made known and implemented; • Construction personnel are to be educated about the various faunal species in the area, particularly about venous spider, snake and scorpion species so that they are aware of them and realise that although dangerous they pose limited risk to staff provided they are not threatened or harmed. • Should any of these species be encountered, these species are to be safely and carefully relocated to the surrounding natural habitat adjacent the development site by a suitable qualified or competent staff member, should the not move off on their own • The contact details of a suitably qualified snake handler for the mine must be made available to operational teams should a venomous snake be encounter that needs removal and relocation to a suitable area. • No unauthorised fires are to be allowed on the site, unless in areas demarcated and managed for this purpose. Informal fires in the vicinity of the development areas should be prohibited. • Construction vehicles are to utilise only designated roads. No driving through the surrounding habitat is to be permitted. Construction vehicles must be limited to only travel 40km/h on designated roads; • No temporary dump sites should be allowed in areas with natural vegetation. Waste disposal containers and bins should be provided during the construction phase for all construction rubble and general waste. disturbed area; • If any spills occur, they should be cleaned up immediately to avoid soil contamination that can hinder vegetation rehabilitation later down the line. disturbed area. •	2	3	1	6	2	20 Low	39,4
	Various KMR activities Direct loss of faunal diversity, habitat and potentially occurring SCC resulting from vegetation clearance and footprint development.														

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	Potential Impacts Include: • Site clearing activities and expansion of Opencast Pits into areas of natural vegetation and the Ga-Mogara River.	-	5	4	3	8	4	75	High	• A walkdown of the footprint should be conducted prior to clearing to search for any arachnids or reptiles that need to be relocated. Any species uncovered during earth works activities must be relocated in a similar fashion. Care must be taken not to harm individuals during such relocations. Such relocations must be undertaken by a competent individual. • The disturbance footprint within each site associated with the proposed KMR Expansion Activities must be kept as small as possible to minimise impact on the surrounding environment (edge effect management is also crucial). Clearing of vegetation should take place in a phased manner to keep bare soil areas as small as possible, limiting erosion potential and the rate of habitat loss in the footprint areas; • The authorised expansion footprint sites must be demarcated, and it must be ensured that no unauthorised construction personnel or equipment move beyond these areas where natural faunal habitat would be adversely impacted; • Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed expansion activities. • Planning of temporary roads and access routes should take the site sensitivity plan into consideration. If possible, such roads should be constructed and planned in a manner that will not lead to unnecessary habitat fragmentation; • Excavated topsoil must be stored with associated native vegetation debris for subsequent use in rehabilitation; • Any railway infrastructure and mining related activities including stockpiles should be placed within transformed areas or where possible, existing infrastructure should be used • No dumping of general waste or construction material in non-designated dump sites is to be allowed. As such it is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste.	5	4	1	6	2	55	Moderate	22,6
	Potential Impacts Include: • Site clearing activities and construction of the Attenuation Dams within the Ga-Mogara River and encroaching into adjacent natural habitat.	-	5	4	1	6	2	55	Moderate		4	2	1	4	2	28	Low	49,1
	Potential Impacts Include: • Site clearing activities and development of the Secondary Infrastructure (WRDs and Stockpiles, Kipling Anomaly) within areas of natural vegetation.	-	5	4	2	6	3	60	High		5	4	1	4	2	45	Moderate	25,0
	Potential Impacts Include: • Site clearing activities and development of the Secondary Infrastructure (ancillary infrastructure such as offices, potable water tanks etc.) within areas of natural vegetation.	-	5	4	1	6	2	55	Moderate		2	4	1	4	2	18	Low	67,3
	Potential Impacts Include: • Site clearing activities and development of the Secondary Infrastructure (Linear infrastructure, namely Haul Road, Pipeline, Rail Loop options) within areas of natural vegetation.	-	5	4	3	6	4	65	High		4	4	1	4	2	36	Moderate	44,6
	Potential Impacts Include: • Dumping of construction material within areas where no construction is planned, thereby increasing footprint extent and loss of habitat	-	3	2	2	2	4	24	Low		2	1	1	4	1	12	Low	50,0
	All proposed KMR Expansion Activities: • Loss of faunal diversity and habitat due to potentially poorly managed edge effects. Potential Impacts Include: • Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to ongoing proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas (altering faunal habitat). • Habitat fragmentation as a result of construction activities; • Dust generated during construction activities accumulating on the surrounding vegetation may suppress photosynthetic ability of plants, and potentially hampering the viability of faunal habitat and forage resources.	-	3	2	2	6	3	30	Moderate	• Demarcating all footprint areas during construction activities; • No construction rubble should be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility; • All disturbed areas should be revegetated as soon as possible to reinstate habitat that was lost. Rehabilitation should be undertaken concurrently with mining activities; • Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil; • Manage the spread of AIP species and bush encroachers, which may affect remaining natural habitat within surrounding areas; • Ongoing AIP monitoring and clearing/control should take place throughout all phases of the project activities. The footprint perimeters should regularly be checked for AIP proliferation;	2	2	1	4	2	14	Low	53,3

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										• Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area; • Suppress dust in order to mitigate the impact of dust on vegetation (faunal habitat) within a close proximity of construction activities.								
Soil and Land capability	**Proposed Key Infrastructure (Open Cast Pits)**																	
	Vegetation clearance leading to soil erosion within footprint areas.	-	5	4	3	8	4	75	High	• The footprint of the proposed infrastructure areas should be clearly demarcated to restrict vegetation clearing activities within the open pit footprint as far as practically possible; • If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low; • Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast; • Restrict vegetation clearance to priority areas of development • All disturbed areas adjacent to the open pit areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	3	3	3	6	2	36	Moderate	52
	Movement of construction vehicle/equipment leading to soil compaction	-	5	5	3	8	4	80	High	• Laydown areas should be located within the already disturbed soils (Anthrosols) from the currently active pits to avoid compaction of natural soils; • If possible, vegetation clearance, can be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low to avoid surface crusting and sealing of exposed soils • Direct surface disturbance of soils should be limited within demarcated areas where possible to minimise the intensity of compaction due to the susceptibility of these soils to prolonged waterlogging conditions (inundation); • Compacted soils adjacent to the open pits footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation.	4	3	2	6	2	44	Moderate	45
	Spillage of hydrocarbons leading to soil contamination	-	4	4	3	8	3	60	High	• Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available and accessible at all times to the contractors and construction crew conducting the works on site for reference; • A spill prevention and emergency spill response plan should be compiled to guide the construction works; and • An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur.	3	3	2	6	2	33	Low	45
	Land degradation leading to loss of land capability	-	4	4	3	8	3	60	High	• Excavation and long-term stockpiling of soil should be limited within the demarcated areas as far as practically possible; • Ensure all stockpiles are clearly and permanently demarcated and located in defined no-go areas;	4	4	3	6	3	52	Moderate	13,3

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										• Stockpile's height should be restricted to that which can deposited without additional traversing by machinery. Maximum height of 2-3 m is proposed, and the stockpile should be treated with temporary soil stabilization;								
	Proposed Key Infrastructure (Attenuation Dams)																	
	Movement of construction vehicle/equipment during the construction of the dam leading to soil erosion	-	4	4	3	8	3	60	**High**	• The footprint of the proposed infrastructure areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible; • If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low; • Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast; • Restrict vegetation clearance to within the dam infrastructure • Keep speed limit below 40 km/h. • All disturbed areas adjacent to the attenuation dams can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission	3	3	3	6	3	36	**Moderate**	40
	Vegetation clearance leading to soil compaction within footprint areas.	-	5	4	3	8	3	75	**High**	• If possible, vegetation clearance, can be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low to avoid surface crusting and sealing of exposed soils • Direct surface disturbance of soils should be limited within demarcated areas where possible to minimise the intensity of compaction due to the susceptibility of these soils to prolonged waterlogging conditions (inundation); and • Compacted soils adjacent to the dam infrastructure footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation	4	3	3	6	3	48	**Moderate**	36
	Spillage of hydrocarbons leading to soil contamination	-	5	4	3	8	3	75	**High**	• Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available and accessible at all times to the contractors and construction crew conducting the works on site for reference; • A spill prevention and emergency spill response plan should be compiled to guide the construction works; and • An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur.	4	3	3	6	3	48	**Moderate**	36

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	Land degradation leading to loss of land capability	-	4	3	3	8	3	56	Moderate	• Earthworks and long-term stockpiling of soil should be limited within the demarcated areas as far as practically possible;	3	3	2	4	2	27	Low	51,8
	Secondary Infrastructure)																	
	Vegetation clearance leading to soil erosion within footprint areas.	-	5	4	3	8	4	75	High	• The footprint of the secondary infrastructure areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible; • If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low; • Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast; • Restrict vegetation clearance to priority areas of development; • Keep speed limit below 40 km/h. • All disturbed areas adjacent to the secondary infrastructural areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission	3	3	3	6	2	36	Moderate	52
	Movement of construction vehicle/equipment leading to soil compaction		5	5	3	8	4	80	High	• If possible, vegetation clearance, can be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low to avoid surface crusting and sealing of exposed soils • Direct surface disturbance of soils should be limited within demarcated areas where possible to minimise the intensity of compaction due to the susceptibility of these soils to prolonged waterlogging conditions (inundation); and • Compacted soils adjacent to the secondary infrastructure footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation. •	4	3	2	6	2	44	Moderate	45
	spillage of hydrocarbons leading to soil contamination	-	4	4	3	8	3	60	High	• Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available and accessible at all times to the contractors and construction crew conducting the works on site for reference; • A spill prevention and emergency spill response plan should be compiled to guide the construction works; and • An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur.	3	3	2	6	2	33	Low	45
	Land degradation leading to loss of land capability	-	4	4	3	8	3	60	High	• Earthworks related to construction of secondary infrastructure should be limited within the demarcated areas as far as practically possible; • Ensure all stockpiles are clearly and permanently demarcated and located in defined no-go areas;	4	4	3	6	3	52	Moderate	13,3

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
Heritage	Hotazel-001 is a confirmed grave and burial ground which is located outside of the proposed development footprint but within the 100m buffer area required around gravesites. Site Hotazel-001 is located 70m north of the proposed mining pit on the farm Hotazel.		3	5	3	8	4	48	Moderate	As cemeteries and graves have Medium to High Heritage Significance, the preferred option is to change the development footprint to allow for the in situ preservation of these sites. The following mitigation measures would be required for this option: • SAHRA's Burial Grounds and Graves Unit requires a buffer area of at least 100m between mining development and any burial grounds or graves that are to be preserved. As a result, and if at all possible, the proposed development footprints must be amended to allow for a 100m wide buffer area surrounding each of the two burial grounds that is kept clear of any construction or mining activities. • Fences around the two burial grounds should be maintained. • The two burial grounds should be cleaned on a yearly basis. • A heritage monitoring process would also be required during all the project phases. However, should it not be possible to preserve these sites in situ, the following mitigation measures are required: • A grave relocation process must be undertaken. • A detailed social consultation process, at least 60 days in length, comprising the attempted identification of the next-of-kin in order to obtain their consent for the relocation. • Bilingual site and newspaper notices indicating the intent of the relocation. • Permits from all the relevant and legally required authorities. • An exhumation process that keeps the dignity of the remains and family intact. • An exhumation process that safeguards the legal rights of the families as well as that of the mining company. • The process must be done by a reputable company well versed in the mitigation of graves.	2	5	3	6	2	28	Low	
Traffic	Road capacity: Relevant Road sections and need for repairing and / or reconstructing of road	+	3	5	2	6	3	39	Moderate	• No mitigation measures required at this point. Roadways need to be monitored to determine when road surfaces require repairing.	3	5	2	6	3	39	Moderate	0,0
	Road capacity: Need for additional lanes	+	2	3	2	4	1	18	Low	• Road capacity calculations indicated that all relevant roads have sufficient road capacity available.	2	3	2	4	1	18	Low	0,0
	Road safety: Intersection spacing	+	1	5	2	2	1	9	Low	• Existing intersections.	1	5	2	2	1	9	Low	0,0
	Road safety: Vertical Road alignment	+	1	5	2	2	1	9	Low	• Existing roads, vertical alignments acceptable.	1	5	2	2	1	9	Low	0,0
	Road safety: Available sight distance at intersections	+	1	5	2	2	1	9	Low	• Existing intersections.	1	5	2	2	1	9	Low	0,0
	Road safety: Need for dedicated left- and right-turn lanes	+	2	3	2	4	1	18	Low	• No additional mitigation measures, as long as mitigation implemented as indicated without Proposed KMR Expansion Project.	2	3	2	4	1	18	Low	0,0
	Road safety: Pedestrian movement within intersections	+	2	4	2	2	1	16	Low	• Pedestrian walkways and crossings provided at key intersections.	2	4	2	2	1	16	Low	0,0
	Road safety: Public transport loading and off-loading at intersections	+	2	4	2	2	1	16	Low	• Public transport lay-bys provided at key intersections.	2	4	2	2	1	16	Low	0,0
Visual	The development /expansion and operation of the WRDs occur simultaneously and visual impacts	-	4	5	3	6	3	56	Moderate	• Undertake gradual clearing of land/vegetation	4	5	3	6	3	56	Moderate	0.0

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	expected with this phase are evaluated in a similar manner.									• Ensure harvesting of plants from this area and preserve in the nursery for rehabilitation purposes, where practical. • Adhere to the management measures regarding dust provided by the air quality specialist.								
	Visual Impacts during construction and operation of attenuation ponds	-	2	2	1	4	1	14	**Low**	• Dust suppression • Adhere to the management measures regarding dust provided by the air quality specialist. • Retain natural vegetation where possible	2	2	1	4	3	14	**Low**	0.0
Surface Water	**Attenuation Dams** Contamination of surface water from potential hydrocarbon spills from construction machinery when constructing the dam walls resulting in a reduced water quality	-	3	2	1	4	2	21	Low	• Contaminated runoff should be contained and reused as necessary e.g. for dust suppression. • Hazardous substances and potentially polluting materials should be stored in appropriately bunded areas located outside of the riparian zone. • Contractors should be made aware of the WUL conditions that apply during construction and made liable for environmental damages caused by spillages. • Emergency action plans should be developed to deal with spillages	2	2	1	4	1	14	Low	33.3
	Attenuation Dams Increased erosion from areas of exposed soils during site clearing resulting in loose materials being washed into the surface water resources and reducing water quality	-	3	2	1	4	2	21	Low	• Vegetation clearing activities will be restricted to the demarcated infrastructure foot print area. • Activities should be limited to months of low rainfall (dry season) to reduce probability of potential impact • Erosion control measures in the form of temporary erosion prevention berms should be implemented during construction • Areas disturbed by construction activities should be rehabilitated immediately on completion of construction of each area	2	2	1	4	1	14	Low	33.3
	Construction of Pollution Control Dams Increased erosion from areas of exposed soils during site clearing resulting in loose materials being washed into the surface water resources and reducing water quality	-	4	2	2	6	2	40	Moderate	• Vegetation clearing activities will be restricted to the demarcated infrastructure footprint area • Activities should be limited to months of low rainfall (dry season) to reduce probability of potential impact • Erosion control measures in the form of temporary erosion prevention berms should be implemented during construction • Areas disturbed by construction activities should be rehabilitated immediately on completion of construction of each area	2	2	2	4	2	16	Low	-150
	Construction of Pollution Control Dams Contamination of surface water from potential hydrocarbon spills from construction machinery reducing water quality	-	2	2	1	4	2	14	Low	• Contaminated runoff should be contained and reused as necessary e.g. for dust suppression • Emergency action plans should be developed to deal with spillages • Contractors should be made aware of the WUL conditions that apply during construction and made liable for environmental damages caused by spillages	2	2	1	4	2	14	Low	0.0

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										• All machinery and substances used on the site will be checked for leaks and otherwise properly maintained. Where leaks are found immediate action must be taken to stop leaks. All contamination from leaks will be immediately removed and remediated								
	Construction of Pollution Control Dams Increased potential for damming and flooding and subsequent damage to property and infrastructure due to hardstanding.	-	4	4	2	8	2	**56**	Moderate	• Areas should be appropriately graded to prevent ponding. Stormwater measures should be appropriately designed to allow for free flow of water as per the Stormwater Management Plan • Paddocks should be constructed to minimise uncontrolled runoff from the site entering the clean water system	2	4	2	4	1	**20**	Low	-180.0
	Expansions of opencast pits Increased erosion from areas of exposed soils during site clearing resulting in loose materials being washed into the surface water resources and reducing water quality	-	4	2	2	8	3	**48**	Moderate	• Vegetation clearing activities will be restricted to the demarcated infrastructure footprint area • Activities should be limited to months of low rainfall (dry season) to reduce probability of potential impact • Erosion control measures in the form of temporary erosion prevention berms should be implemented during construction • Areas disturbed by construction activities should be rehabilitated immediately on completion of construction of each area	2	2	2	4	2	**16**	Low	-200.0
	Expansions of opencast pits Contamination of the Ga-Mogara River from potential hydrocarbon spills from construction machinery reducing surface water quality	-	3	2	3	6	2	**33**	Moderate	• Contaminated runoff should be contained and reused as necessary e.g. for dust suppression • Emergency action plans should be developed to deal with spillages • Contractors should be made aware of the WUL conditions that apply during construction and made liable for environmental damages caused by spillages	2	2	2	4	2	**16**	Low	106.3
Air Quality	Impaired human health from increased pollutant concentrations associated with all the construction activities (including vehicle movement)	-	3	2	1	4	3	**21**	**Low**	• Water bowsers on unpaved roads, water sprays at stockpiles and handling points and limiting construction activities to take place during day-light hours • Water bowsers on unpaved roads, water sprays at stockpiles, handling points, crushers, and screens and limiting construction activities to take place during day-light hours	3	2	1	2	3	**15**	**Low**	
	Increased nuisance dust fall rates associated with all construction activities (including vehicle movement).	-	3	2	1	2	1	**15**	**Low**	• Water bowsers on unpaved roads, water sprays at stockpiles and handling points and limiting construction activities to take place during day-light hours • Water bowsers on unpaved roads, water sprays at stockpiles, handling points, crushers, and screens and limiting construction activities to take place during day-light hours								
Socio-Economic	Mining expansion, including all construction activities (including infrastructural development) that involve additional land clearing	-	4	4	3	6		**52**	**Moderate**	• Investigate community or farmer-level agricultural projects to support self-employed farmers (especially with livestock) • Improve the farming productivity of the existing mine-owned farmland to ensure that such land is managed appropriately and not neglected. This could form part of an agricultural project(s)	2	4	3	6		**26**	**Low**	50.0

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										• Implement a rehabilitation plan concurrently with the current mining developments (and hence not just during the decommission phase), which focuses on restoring the land to its original potential for grazing cattle • Develop a farmer engagement strategy and incorporate such a strategy into an existing stakeholder engagement plan								
	<u>Reducing farm labour opportunities</u> Mining expansion, including all construction activities (including infrastructural development) that involve additional land clearing	-	2	4	3	2		**18**	**Low**	• The mitigation and management measures in the Surface Water Specialist Study (2021) should be reviewed and implemented • KMR should establish a water quality forum for its AoI, as well as the affected farmers and land users to discuss water issues and concerns which might arise as a result of the expansion project and KMR's ongoing mining activities • KMR should develop and communicate (if they have not already done so) a grievance management mechanism which should be made available to affected land users and doorstep communities to address concerns raised by affected parties • Regular water monitoring should be implemented at selected sites for longitudinal monitoring. This should be used to track any issues and/or concerns with the lowering of the water table over time, as well as the water quality and any mining-related impacts • KMR should consider including representatives from the local farmers association or the suggested water quality forum in water quality monitoring	1	4	3	2		**9**	**Low**	50.0
	<u>Reducing water availability for living and farming</u> • Mining expansion, including all construction activities and operational phase activities which require surface water • Water usage for the construction and operational phases of the waste rock dumps, Run of Mine (RoM) stockpiles and crushing facility • Additional water usage from additional boreholes to be sunk • Surface water run-off to the attenuation dam	-	3	4	3	4		**33**	**Moderate**	• The mitigation and management measures in the Surface Water Specialist Study (2021) should be reviewed and implemented • KMR should establish a water quality forum for its AoI, but also the affected farmers and land users to discuss water issues and concerns which might arise as a result of the expansion project and KMR's ongoing mining activities • KMR should develop and communicate (if they have not already done so) a grievance management mechanism which should be made available to affected land users and doorstep communities to address concerns raised by affected parties • Regular water monitoring should be implemented at selected sites for longitudinal monitoring. This should be used to track any issues and/or concerns with the lowering of the water table over time, but also the water quality and any mining-related impacts • KMR should consider including representatives from the local farmers association or the suggested water quality forum in water quality monitoring	3	4	3	4		**33**	**Moderate**	0
	<u>Increased exposure to environmental hazards and risks during construction and operational phases</u> • Mining expansion, including all construction activities, blasting and vibrations especially of the new mining pits • Relocation of admin offices and security building	-	5	4	2	8		**70**	**High**	• The mitigation and management measures in the Air Quality Impact Assessment, Noise Opinion Statement and Blasting and Vibrations Impact Assessment should be referred to and implemented • KMR could consider undertaking a Community Health and Safety Impact Assessment in line with GIIP • Implement the following key requirements of the OHS Act (Act 85 of 1993):	4	4	2	6		**48**	**Moderate**	31.4

Aspect	Nature of the impact	Significance of potential impact BEFORE mitigation						Mitigation Measures	Significance of potential impact AFTER mitigation						Degree of mitigation (%)
		P	D	E	M	LoR	Significance		P	D	E	M	LoR	Significance	
	• Waste rock dumps • Constructing a sewerage treatment facility • Crushing facility • RoM stockpiles • Earthworks for all infrastructure (including Ancillary infrastructure) provisions [this includes clearing vegetation, roadworks (haul roads) and sinking boreholes] Constructing the attenuation dam							• Identify potential hazards to the workforce • Provide preventative and protective measures such as removing substances that are considered dangerous or rectifying situations that may appear dangerous before incidence occurs • Record incidences • Prepare emergency response plans in advance and ensure that they are communicated to the workforce effectively • In alignment with GIIP, the following topics should be included in site inductions and other training: • Community health and injury profiles • Health risks relevant to the workforce and mitigation strategies • Health risks relevant to community members and mitigation strategies • Available health services • Inform affected communities about potential risks and impacts in a culturally appropriate manner, including collaborating with the community and government agencies in their efforts to respond effectively to emergency situations • Involve the doorstep communities and affected land users in discussing these concerns in forum settings, as well as identify mitigation measures • Prior to the commencement of any groundworks, the doorstep communities, affected land users and ward committee members should be consulted and prepared for the construction phase. This should include consultations about the possible nuisance impacts as discussed. Such discussions should inform further appropriate mitigation measures. As an example, particular construction-related activities could be scheduled for certain times of the day, using applications such as WhatsApp groups or local forums to disseminate working schedules • Relevant community forms, NGOs and/or the ward committee members should always be consulted prior to the construction or upgrading of access road(s) or project-related infrastructure changes which could affect nearby/adjacent houses • Incorporate project activities into a KMR Emergency Response Plan • Keep first aid supplies on site at all times • Undertake induction training as well as regular refresher training sessions on health and safety for employees • Include the respective contractors in the health and safety training • Inform the employees of the KMR Emergency Response Plan in conjunction with the training • Maintain the existing dust management/mitigation measures on-site. Should dust levels increase the management/mitigation measures should be reviewed to ensure dust levels remain below the respective standards • Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive							

Aspect	Nature of the impact		Significance of potential impact **BEFORE** mitigation							Mitigation Measures	Significance of potential impact **AFTER** mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										receptors, taking account of prevailing wind directions and seasonal variations in the prevailing wind • Using these recommendations, update KMR's existing contractor agreements concerning health and safety standards								
	Influx of job-seekers • All construction activities that require labour • General mining and other operational activities that require labour • Maintenance work that requires labour • SMMEs or other services required • Perception that mining provides an endless supply of employment opportunities • Mixed messaging regarding opportunities from KMR • Potential retrenchments, downscaling or closures at other mines in the region Large scale unemployment triggered by unfavourable economic development in JTGDM and JMLM		4	3	2	6		44	Moderate	• Review the proposed mitigation measures for socio-economic issues listed in JTGDM and JMLM's SDFs and ensure that KMR's SLP is aligned with these measures and /or other strategic programmes where relevant • Clearly and transparently communicate and implement employment and procurement policies • Subject all the project employees to a health, Covid19 and HIV/AIDS awareness educational programme. Contractors should also be required to provide such training to their staff • KMR could assist with initiating programmes aimed at encouraging voluntary workers to patrol particular areas (especially during the construction period). Supporting local structures in establishing a community policing forum could be considered • Local forums or the ward committee members could be tasked to keep record of any potential influx of job-seekers [this could also be the responsibility of a Community Liaison Officer (CLO)] • Develop a Recruitment and Influx Management Plan • Review HR policies and procedures in consultation with key stakeholders to ensure that these are relevant and transparent. Such procedures could include a Preferential Procurement Policy in favour of employing local labour • Extend the CLO's duties to cover the expansion project	3	3	2	4		27	Low	38.6
	Tension between security workers and local residents • General construction and operational activities where security workers are required (especially activities such as those associated with roadworks which might be close to the AoI) • General mining activities • Maintenance • Day-to-day securing of KMR property • Responding to security threats relating to KMR property Interaction with external parties on KMR property		3	3	2	6		33	Moderate	• Develop criteria for the recruitment of security personnel during the construction phase (or a security company's terms of agreement need to reflect such criteria) • When hiring security personnel, contractors must be required by KMR to undertake reasonable effort to inquire whether the personnel have not been part of past abuses • As far as possible, recruit security personnel from the doorstep communities. This should allow them to distinguish between the local population and outsiders • Properly train security personnel in the use of force and, most importantly, appropriate conduct towards nearby and affected communities and residents • Develop a code of conduct for the security personnel in consultation with the doorstep communities • Through a stakeholder engagement strategy, inform all the doorstep communities and most directly affected land users about the roles and responsibilities of the security personnel or the security company. This could be accomplished through community meetings, forum discussions, information dissemination, or media coverage.	2	3	2	6		22	Low	33.3
	Continued employment of local labour • All construction activities that require labour • General mining and other operational activities that require labour • Maintenance work that requires labour	+	5	4	3	6		65	High	• Update the SLP and any other related policies and plans to ensure a solid local procurement strategy • Update the SLP to ensure that KMR's Skills Development Programme include: ○ Core business training	4	4	3	6		52	Moderate	20.0

Aspect	Nature of the impact	Significance of potential impact BEFORE mitigation						Mitigation Measures	Significance of potential impact AFTER mitigation						Degree of mitigation (%)
		P	D	E	M	LoR	Significance		P	D	E	M	LoR	Significance	
	• SMMEs or other services required • KMR procurement policies and strategies Regulatory requirements (SLP, Mining Charter 3)							○ Learnerships ○ Portable skills training ○ One community bursary per year (ideally through a community trust) • Manage employment by selecting employees according to an electronic selection system supported by JMLM that ensures recruitment from local, impacted communities. This should ensure a fair recruitment process. Related to this, KMR should ensure clear expectations in all platforms of communication of the number of jobs available and in what categories or fields of the mine. This would allow a clear indication of what types of jobs would be available • Update the Employment Equity Plan in the SLP to provide equal job opportunities • Employment preference should be provided to the local residents • Use, as far as reasonably possible, local suppliers and SMMEs and invite them to list their businesses on a database managed by KMR • In addition to appropriate HR policies and procedures, establish a labour desk/employment committee to provide strategic guidance to the mine on labour recruitment policies (if this is not already established). This should ensure that recruitment is done in a fair and transparent way, and that job creation opportunities are maximised • Allow those labourers who were involved in the construction phase a fair opportunity to apply for work during the operational phase • Provide sufficient opportunities for women and disabled persons to become employable on the mine • Training and skills development focused on women should take place to increase their participation in the labour force • Develop and implement, as far as reasonably possible, a plan for the gradual replacement of migrant labour by local employees • Develop and implement a labour grievance mechanism as an HR function • Establish a community form to identify grievances and communicate these to the mine • The following International Labour Organisation (ILO) conventions must be adhered to: ○ ILO Convention 87 on freedom of association and protection of the right to organise ○ ILO Convention 98 on the right to organise and collective bargaining ○ ILO Convention 29 on forced labour ○ ILO Convention 105 on the abolition of forced labour ○ ILO Convention 138 on the minimum age of employment							

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										○ ILO Convention 100 on equal remuneration ○ ILO Convention 111 on discrimination •								
	Continued skills and further training opportunities • All construction activities that require labour • General mining and other operational activities that require labour • Maintenance work that requires labour SMMEs or other services required	+	5	4	3	6		65	High	• As legislated, disclose the SLP to the AoI, doorstep communities, but also the affected land users on a regular basis. Such communities should be given an opportunity to comment on any amendments of the SLP and provide input or grievances	5	4	3	6		65	High	0
	Contributing to the local and regional economy • All construction activities that require labour • General mining and other operational activities that require labour • Maintenance work that requires labour • SMMEs or other services required • Improved/updates SLP Improved/updated local procurement strategies	+	3	4	3	6		39	Moderate	• Promote the use of local business and creation of SMMES as far as possible by providing them with preferential treatment	4	4	3	6		52	Moderate	33.3
	<u>Potential increase in crime and substance abuse</u> In-migration	-	5	3	2	8		65	High	• Develop a Stakeholder Engagement Plan (SEP) and a grievance mechanism • Review the proposed mitigation measures for socio-economic issues listed in JTGDM and JMLM's SDFs and ensure that KMR's SLP is aligned with these measures and /or other strategic programmes where relevant • Clearly and transparently communicate and implement employment and procurement policies • Subject all the project employees to a health, Covid19 and HIV/AIDS awareness educational programme. Contractors should also be required to provide such training to their staff • KMR could assist with initiating programmes aimed at encouraging voluntary workers to patrol particular areas (especially during the construction period). Supporting local structures in establishing a community policing forum could be considered • Local forums or the ward committee members could be tasked to keep record of any potential influx of job-seekers [this could also be the responsibility of a Community Liaison Officer (CLO)] • Develop a Recruitment and Influx Management Plan • Review HR policies and procedures in consultation with key stakeholders to ensure that these are relevant and transparent. Such procedures could include a Preferential Procurement Policy in favour of employing local labour • Extend the CLO's duties to cover the expansion project	5	3	2	4		45	Moderate	30.8
	Loss of place attachment Blasting and vibrations especially of the new mining pits	-	5	4	3	10		85	High	• Refer to management measures in the HIA, such as guidance in terms of clearing and fencing off the graves, as well as related monitoring procedures • Develop a chance-find procedure for all new tangible cultural heritage which is discovered during the project's construction, operational, as well as decommissioning phases	4	4	3	4		44	Moderate	48.2

Aspect	Nature of the impact	Significance of potential impact BEFORE mitigation						Mitigation Measures	Significance of potential impact AFTER mitigation						Degree of mitigation (%)
		P	D	E	M	LoR	Significance		P	D	E	M	LoR	Significance	
								• Investigate the need for a grave management and/or relocation plan if the identified graves cannot be fenced off property. This should include detailed measures for the consultation of the Next-of-Kin (NoK).							

16.4.3 Proposed impacts anticipated during operations

The tables below provides the potential impacts associated with the operational phase of the proposed project.

Table 16-6: Operational impacts applicable to all the proposed expansion activities

Aspect	**Nature of the impact**		**Significance of potential impact BEFORE mitigation**							**Mitigation Measures**	**Significance of potential impact AFTER mitigation**							**Degree of mitigation (%)**
			P	**D**	**E**	**M**	**LoR**	**Significance**			**P**	**D**	**E**	**M**	**LoR**	**Significance**		
Freshwater	Kipling Pit Shell (partially encroaches on diverted reach of Ga-Mogara River) Operation of open pit on Kipling; encroaching on diverted portion of Ga-Mogara River including: • Removal of topsoil and overburden and stockpiling thereof, potentially within 32 m of the river; • Blasting/mining activities in order to remove overburden and to extract the manganese; • Removal of manganese and overburden from the open cast pits and subsequent transportation thereof. Potential impacts include: • Further loss of hydraulic and instream connectivity; • Increased risk of pollution of surface water when present, which may affect the downstream reaches of the river, leading to impaired water quality and salination of soil within the river; • Increased risk of sediment transport via wind and/or surface runoff from the overburden stockpile into the river, potentially leading to altered water quality, further altered channel competency and further altered vegetation community composition; • Increased risk of erosion, leading to further altered topography/geomorphological processes, in turn resulting in altered pattern, quantum of flow and timing of water in the landscape.	-	5	5	2	8	5	75	**High**	In applying the risk assessment, it was assumed that the mitigation hierarchy as advocated by the DEA et al. (2013) would be followed, i.e. impacts would first be avoided. As the proposed expansion of both the York and Hotazel pits are located within the Ga-Mogara river, causing irreversible localised impacts and contributing to the cumulative impacts on the downstream reach as a result, this is not feasible. Notwithstanding the above the following mitigation measures apply: • Pollution prevention through appropriate management and monitoring of pollution prevention systems, with specific mention of the management of clean and dirty water separation systems, in order to prevent, eliminate and/or control potential pollution of soil, groundwater and surface water must be implemented; • Implement a monitoring programme to detect and prevent the pollution of soil, surface water and groundwater; and • If possible, the overburden stockpiles should be located in an area where they will not impact on any hydrological features of increased importance within the greater MRA, and outside the 100m GN704 Zone of Regulation associated with either the Ga-Mogara River or Witleegte River within the MRA. • Reduce airborne dust during blasting activities through: - Damping dust generation areas with water (although not in sufficient quantities to generate runoff); and - Use of hessian or brush barrier fences. • Measures to contain and reuse as much water as possible within the mine process water system must be sought, and very strict control of water consumption must take place. Detailed monitoring must be implemented and maintained to ensure that all water usage is continuously optimised.	4	5	1	6	4	**48**	**Moderate**	36.0
	Kipling Waste Rock Dump within 20 m of diverted reach of Ga-Mogara River • Potential risk of failure if structure is not stable. • Seepage and runoff from WRD • Presence of clean and dirty separation infrastructure around downgradient areas of WRD, preventing stormwater runoff from reaching watercourse. Potential impacts include: • Loss of riparian habitat, leading to loss of biodiversity; • Risk of ponding should diverted portion of river become blocked as a result of failure; • Formation of preferential surface flow paths leading to potential for erosion of terrestrial habitat and sedimentation of downgradient river.	-	4	5	2	6	2	**52**	**Moderate**	• The structure must be stabilised to prevent failure, and must be regularly inspected to proactively manage any perceived risk of failure; • Should failure occur, any waste rock within the diverted reach of the river must be removed to another appropriate storage facility to ensure hydraulic connectivity is maintained. • Additional water inputs to watercourse via groundwater are anticipated to be highly unlikely due to depth of groundwater table (between 12 m to 37 m according to 2018/19 hydro census) and groundwater does not contribute to baseflow of river. • Notwithstanding the above, water to be collected by means of stormwater trenches/berms, and recycled and utilised within the KMR water circuit, or pumped to a Pollution Control facility for evaporation; • Pollution prevention through infrastructure design, in order to prevent, eliminate and/or control the potential	3	4	2	4	2	**30**	**Moderate**	42,3

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	• Possible contamination of surface and ground water, leading to impaired water quality and salination of soil within the watercourse; • Alteration of sediment balance of watercourse could lead to altered water quality, altered channel competency and altered vegetation community composition; • Altered flood peaks as a result of formalisation and concentration of surface runoff; • Potential for erosion of terrestrial areas as a result of the formation of preferential flow paths, leading to sedimentation of the river; • Further reduction in volume of water entering the river, leading to further loss of recharge (and thus increased desiccation) of downstream system; • Altered vegetation communities due to increased moisture stress.									groundwater pollution plume, as determined by a suitably qualified specialist; • Implement monitoring programme to detect and determine the formation and/or extent of any potential groundwater pollution plume as per the groundwater management plan, if one has been developed; • Loss of catchment yield to be determined by a suitably qualified specialist (although this is not perceived to be a significant risk due to the semi-arid climate); • Clean and dirty water systems must be kept separate in line with Regulation GN704;• • The clean water diversion structures must be designed to accommodate the peak flow expected for a minimum 1:50 year flood event; • Clean water may be discharged into the watercourse, however the discharge outlet must be constructed from energy dissipating structures (such as Armorflex or reno mattresses) to slow down the velocity of water inflow into the watercourse; • Runoff from areas within the dirty water channel should be captured in a sump and pumped to a PCD that is lined with an appropriate liner, before being re-used as process water of the mine.								
	Expansion of open pits (Hotazel) • Removal of topsoil and overburden and stockpiling thereof, potentially within 32 m of the river; • Blasting/mining activities in order to remove overburden and to extract the manganese; • Removal of manganese and overburden from the open cast pits and subsequent transportation thereof. Potential impacts include: • Loss of instream and riparian habitat (approximately 1,4 ha [Hotazel pit]); • Increased risk of pollution of surface water when present, which may affect the downstream reaches of the river, leading to impaired water quality and salination of soil within the river; • Increased risk of sediment transport via wind and/or surface runoff from the overburden stockpile into the river, potentially leading to altered water quality, further altered channel competency and further altered vegetation community composition; • Increased risk of erosion, leading to further altered topography/geomorphological processes, in turn resulting in changes to pattern, quantum of flow and timing of water in the landscape.	-	5	5	2	10	5	85	High	In applying the risk assessment, it was assumed that the mitigation hierarchy as advocated by the DEA et al. (2013) would be followed, i.e. impacts would first be avoided. As the proposed expansion of both the York and Hotazel pits are located within the Ga-Mogara river, causing irreversible localised impacts and contributing to the cumulative impacts on the downstream reach as a result, this is not feasible. Notwithstanding the above the following mitigation measures apply: • Pollution prevention through appropriate management and monitoring of pollution prevention systems, with specific mention of the management of clean and dirty water separation systems, in order to prevent, eliminate and/or control potential pollution of soil, groundwater and surface water must be implemented; • Implement a monitoring programme to detect and prevent the pollution of soil, surface water and groundwater; and • If possible, the overburden stockpiles should be located in an area where they will not impact on any hydrological features of increased importance within the greater MRA, and outside the 100m GN704 Zone of Regulation associated with either the Ga-Mogara River or Witleegte River within the MRA. • Reduce airborne dust during blasting activities through: - Damping dust generation areas with water (although not in sufficient quantities to generate runoff); and - Use of hessian or brush barrier fences. • Measures to contain and reuse as much water as possible within the mine process water system must be sought, and very strict control of water consumption must take place. Detailed monitoring must be implemented and maintained to ensure that all water usage is continuously optimised;.	5	4	2	8	5	70	High	17,6

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	WRD North and South (Hotazel) within 120 m and 150 m respectively of the Ga-Mogara River • Potential risk of failure if structure is not stable, • Seepage and runoff from WRD. Potential impacts include: • Loss of riparian habitat, leading to loss of biodiversity; • Formation of preferential surface flow paths leading to potential for erosion of terrestrial habitat and sedimentation of downgradient river; • Alteration to topography, leading to changes in pattern, quantum of flow and timing of water in the landscape; • Possible contamination of surface and ground water, leading to impaired water quality and salination of soil within the watercourse; • Alteration to the sediment balance of watercourse could lead to altered water quality, altered channel competency and altered vegetation community composition; and • Potential loss of catchment yield (considered very low risk due to the relatively small extent of the mine's dirty water management systems, size of the river's catchment and the semi-arid environment) and reduction in the size of the catchment.	-	4	2	2	6	3	40	Moderate	• The structure must be stabilised to prevent failure, and must be regularly inspected to proactively manage any perceived risk of failure; • Additional water inputs to watercourse via groundwater are anticipated to be highly unlikely due to depth of groundwater table (between 12 m to 37 m according to 2018/19 hydro census) and groundwater does not contribute to baseflow of river. • Notwithstanding the above, water to be collected by means of stormwater trenches/berms, and recycled and utilised within the KMR water circuit, or pumped to a Pollution Control facility for evaporation; • Pollution prevention through infrastructure design, in order to prevent, eliminate and/or control the potential groundwater pollution plume, as determined by a suitably qualified specialist; • Implement monitoring programme to detect and determine the formation and/or extent of any potential groundwater pollution plume as per the groundwater management plan, if one has been developed; • Loss of catchment yield to be determined by a suitably qualified specialist (although this is not perceived to be a significant risk due to the semi-arid climate); • Clean and dirty water systems must be kept separate in line with Regulation GN704;• • The clean water diversion structures must be designed to accommodate the peak flow expected for a minimum 1:50 year flood event; • Clean water may be discharged into the watercourse, however the discharge outlet must be constructed from energy dissipating structures (such as Armorflex or reno mattresses) to slow down the velocity of water inflow into the watercourse; • Runoff from areas within the dirty water channel should be captured in a sump and pumped to a PCD that is lined with an appropriate liner, before being re-used as process water of the mine.	2	2	1	2	1	10	Low	75,0
	The attenuation dam within the Ga-Mogara River • Inundation footprint will result in the direct loss of approximately 16 ha (dam on Telele) and approximately 18 ha (dam between York and Hotazel pits) of riparian habitat. Additional loss due to increased moisture stress as a result of loss of recharge is possible in the reaches downstream of the dams; • Loss of hydraulic connectivity and recharge to downstream reaches of the Ga-Mogara River. • Overflow of water over the spillway when the dam is at full capacity. Potential impacts include: • Prolonged inundation of the upstream reach of the dam wall, leading to potential changes to hydroperiod and associated alterations to biodiversity aspects including floral community composition and structure and increased faunal utilisation;	-	5	2	3	10	5	75	High	• The dams and any outlet structures should regularly be inspected for erosion, especially after heavy rainfall events when potential for erosion is greatest. If erosion is noted, this should be rectified, preferably through the reinstatement of vegetation in the eroded areas. If erosion is pronounced, erosion control devices such as reno mattresses should be considered, in consultation with a freshwater ecological specialist; • Outlet structures should be maintained free of any debris and silt/sediment; •Alien Invasive Plants (AIPs) must be managed, and annual removal/chemical treatment must be undertaken. An AIP control plan must consider clearing and management of AIPs for at least 7 years post construction of the dams; • The dams will need to be desilted intermittently to ensure the storage capacity is maintained. During desilting, all silt within the dam basin should immediately be removed from site in order to prevent sedimentation of the downstream areas. Additionally, during desilting a	5	2	2	8	5	60	High	20,0

Aspect	Nature of the impact		Significance of potential impact **BEFORE** mitigation							Mitigation Measures	Significance of potential impact **AFTER** mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	• Potential accumulation of sediment within the dams, leading to altered vegetation assemblages, and possible reduction in dam capacity.									temporary silt trap should be installed at the outlet structure. This should be emptied on a regular basis during the desilting process to prevent any excess silt being transported into the downstream areas; • Maintenance vehicles must be confined to designated roadways and the indiscriminate movement of vehicles across the dam wall, any remaining portions of the Ga-Mogara River and through the Witleegte River must be strictly prohibited.								
Floral	All KMR Expansion Activities: • Direct loss of floral habitat, SCC, as well as overall species diversity within the local area. Potential Impacts Include: • Stockpiles, discard dumps and PCD expansion as material is deposited. • Increased human presence due to mining expansion during operational phase, potentially leading to Illegal harvesting/ collection of SCC or an increased risk of fire frequency impacting on floral communities outside of the mining footprint.	-	3	4	2	6	3	36	Moderate	• It is recommended that all construction personnel be educated in environmental awareness, including the identification of SCC so to prevent accidental or unauthorised harvesting or clearance of SCC without permit application. • No collection of indigenous floral species must be allowed by personnel during the operational phase, especially with regards to floral SCC (if encountered and not rescued/relocated). • Edge effect control needs to be implemented by fencing off or demarcating the KMR Expansion footprint to prevent further degradation and potential loss of floral SCC and their habitat outside of the proposed expansion footprint. • Stockpiles, discard dumps and PCD positions, and their expansion as material is deposited, should be kept as small as possible. • Monitoring of any rescued and relocated floral SCC should commence during the construction phase and continue unit it is evident that relocated species have successfully established.	2	4	1	4	2	18	Low	50,0
	All KMR Expansion Activities: • Direct loss of floral habitat, SCC, as well as overall species diversity within the local area. Potential Impacts Include: • Increased introduction and proliferation of AIPs due to a lack of maintenance activities, or poorly implemented and monitored AIP Management programme, leading to ongoing displacement of natural vegetation outside of the approved expansion areas. • Ongoing intensification of bush encroachment resulting from increased disturbances or habitat fragmentation. • Overexploitation through the removal and/or collection of important or sensitive floral SCC beyond the direct footprint areas. • Fragmentation of the Ga-Mogara Habitat Unit by Opencast Pit Expansion. • On-going disturbance during operational phase may lead to erosion and sedimentation of surrounding floral habitat.	-	4	4	2	6	3	48	Moderate	• No additional habitat is to be disturbed during the operational phase of the project outside of the demarcated approved footprints (being applied for). Biweekly (recommended) to monthly (minimum requirement) monitoring and recording of the footprint areas must be done by the Environmental Control Officer (ECO) and photographic records kept – special attention should also be paid to potential increase and spread of AIPs (especially in the Ga-Mogara Habitat) and bush encroachment. • Where possible existing roads are to be used for access purposes. • No vehicles are allowed to indiscriminately drive through sensitive habitat and natural areas. • Proliferation of AIPs is expected within any disturbed areas. AIPs must be monitored and must be removed throughout the operational phase of the project to prevent their spread beyond the development footprint areas. Removal of the AIPs, with specific emphasis on Category 1b alien species, encountered within the mining footprint and immediate surrounds must take place to comply with existing legislation the existing AIP Management/Control Plan needs to be updated. The existing AIP Plan should be updated regularly.	3	4	2	4	2	30	Moderate	37,5

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil (where possible).								
	<u>All KMR Expansion Activities:</u> • Indirect loss of floral diversity and habitat resulting in the die-off of floral species. <u>Potential Impacts Include:</u> • Blasting and removal of material from opencast pits. • Dust generated during operational activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants and potentially further decreasing optimal growing/re-establishing conditions	-	4	4	2	4	2	**40**	**Moderate**	• Ecological footprint of open pit is to remain as small as possible whilst allowing for economical and optimal extraction of the material. Suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities	3	4	2	2	2	**24**	**Low**	40,0
	<u>All KMR Expansion Activities:</u> • Indirect loss of floral diversity and habitat due to fires. <u>Potential Impacts Include:</u> • Destruction of vegetation due to unplanned fires resulting from operational activities around the Opencast Pits.	-	3	2	2	6	4	**30**	**Moderate**	• No unauthorised fires are to be allowed on the site, unless in areas demarcated and managed for this purpose. • Informal fires in the vicinity of the development areas should be prohibited. • Where a burning regime is implemented, this should be overseen by a qualified and experienced professional. • The mining and construction personnel should be informed about fire control and prevention measures to reduce the frequency of uncontrolled veld fires in areas surrounding and within the proposed Opencast Pit Expansion. A fire management plan should be in place in case of unplanned fires.	1	1	1	4	3	**6**	**Low**	80,0
	<u>All KMR Expansion Activities:</u> • Alteration of floral communities from damming of the Ga-Mogara Habitat Unit and during potential flooding events. <u>Potential Impacts Include:</u> • Increased sediment loads concentrated in dammed-off sections. • Loss of sediment transport to downstream habitat. • Fragmentation of movement corridors and potential increase in abundance of AIPs within dammed-off sections with AIP propagules exported to adjacent terrestrial habitat during potential flooding events.	-	4	4	2	6	2	**48**	**Moderate**	• Implement stormwater management to reduce accumulation of sediment loads within dammed-off sections of the GaMogara Habitat Unit. • Reduce fragmentation of the Ga-Mogara Habitat through improving habitat connectivity along the river and between the river and adjacent terrestrial habitats. Implement AIP control to reduce the chances of propagules being spread to adjacent habitat during flooding events.	2	4	2	4	2	**20**	**Low**	58,3
Fauna	<u>All proposed KMR Expansion Activities:</u> • Loss of viable soils for rehabilitation, thus hampering the potential for faunal species to successfully recolonize during rehabilitation activities. Ultimately a loss of faunal diversity will result. <u>Potential Impacts Include:</u> Potential failure to correctly stockpile topsoil removed during construction activities leading to: • Potential contamination of topsoil stockpiles with AIP propagules; • Compaction of stockpiled topsoil leading to loss of viable soils for rehabilitation; and	-	3	.	2	8	3	**42**	**Moderate**	• Excavated topsoil must be stored with associated native vegetation debris for subsequent use in rehabilitation; Any stockpiles should be placed within transformed areas or where possible, existing infrastructure should be used. No additional natural areas should be impacted for stockpiling.	2	4	1	6	2	**22**	**Low**	47,6

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	Inefficient vegetating of stockpiled topsoil resulting in loss and degradation of soils																	
	All proposed KMR Expansion Activities: • Direct loss of faunal habitat, SCC, as well as overall species diversity within the mine footprint and adjacent areas. Potential Impacts Include: • Expansion of the stockpiles, discard dumps and PCD expansion as material is deposited during the course of mining activities; Increased human presence due to mining expansion during operational phase, potentially leading to illegal hunting/ collection of SCC or an increased risk of fire frequency impacting on faunal habitat and diversity outside of the mining footprint.	-	3	4	2	6	3	**36**	**Moderate**	• No collection or hunting of any fauna species is to be allowed by personnel during the operational phase, especially with regards to faunal SCC (if encountered and not rescued/relocated); • Edge effect control needs to be implemented by demarcating the KMR Expansion footprint areas in order to prevent further degradation and potential loss of faunal habitat outside of the proposed expansion footprint; • Stockpiles, discard dumps and PCD positions should not expand beyond the authorised footprint areas; • Should any faunal species protected under the NEMBA, 2004 (Act No. 10 of 2004: TOPS 2007 species list) or Schedule 1 of the Northern Cape Nature Conservation Act (NCNCA No 9 of 2009) be encountered, a suitably qualified specialist should be consulted. Should it be deemed necessary to move the taxa, authorisation to relocate such species must be obtained from DENC or the DFFE; and All faunal species rescued must be relocated to a suitable area, with similar habitat adjacent to the footprint area or within the mining property.	2	3	1	4	2	**16**	**Low**	55,6
	All proposed KMR Expansion Activities: • Direct loss of faunal habitat, SCC, as well as overall species diversity within the mine footprint and adjacent areas Potential Impacts Include: • Increased introduction and proliferation of AIPs due to potential lack of maintenance activities, or poorly implemented and monitored AIP Management programme, leading to ongoing alteration of natural faunal habitat outside of the approved expansion areas; • Ongoing intensification and degradation of faunal habitat by bush encroachment resulting from increased disturbances or habitat fragmentation; • Overexploitation through the hunting/trapping of faunal SCC beyond the direct footprint areas; Fragmentation of the GaMogara Riverine Vegetation Habitat Unit by Opencast Pit Expansion.	-	4	4	2	6	3	**48**	**Moderate**	• No additional habitat is to be disturbed outside of the approved footprints areas. Biweekly (recommended) to monthly (minimum requirement) monitoring and recording of the footprint areas must be done during the construction phase by the Environmental Control Officer (ECO) and photographic records kept – special attention should also be paid to potential increase and spread of AIPs (especially in the Ga-Mogara Riverine Vegetation Habitat) and bush encroachment. • Where possible existing roads are to be used for access purposes. • No vehicles are allowed to indiscriminately drive through sensitive habitat and natural areas. • Proliferation of AIPs must be monitored and controlled throughout the operational phase of the project to prevent further spread. • The existing AIP Plan should be updated regularly. No hunting/trapping on fauna is to be allowed.	3	4	2	4	2	**30**	**Moderate**	37,5
	All proposed KMR Expansion Activities: • Indirect loss of faunal diversity and habitat resulting in decline of faunal diversity in the local area. Potential Impacts Include: • Blasting and removal of material from opencast pits, along with increased traffic along linear developments will generate noise pollution which will likely lead to the decline of faunal diversity in the development footprint and in the immediate surrounds; Dust generated during operational activities accumulating on the surrounding vegetation may suppress plant growth and therefore deplete faunal	-	4	4	4	2	4	**40**	**Moderate**	• The ecological footprint of all open pits must remain as small as possible whilst allowing for economical and optimal extraction of the material; An effective dust management plan must be designed and implemented in order to mitigate the impact of dust on flora and therefore fauna habitat throughout the operational phase.	3	4	2	2	2	**24**	**Low**	40,0

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	habitat and forage resources as well as the ability of cleared vegetation to regrow																	
	All proposed KMR Expansion Activities: • Indirect loss of faunal diversity and habitat due to fires. Potential Impacts Include: Potential unfavourable alteration of faunal habitat due to unplanned fires resulting from operational activities around the open cast pits.	-	3	2	2	6	4	30	Moderate	• No unauthorised fires are to be allowed on the site, unless in areas demarcated and managed for this purpose; • Informal fires in the vicinity of the development areas should be prohibited; • Where a burning regime is implemented, this should be overseen by a qualified and experienced professional; • The operational personnel should be informed about fire control and prevention measures to reduce the frequency of uncontrolled veld fires in areas surrounding and within the footprint of the proposed KMR Expansion Activities; A fire management plan should be in place in case of unplanned fires.	1	1	1	4	3	6	Low	80,0
	All proposed KMR Expansion Activities: • Alteration of faunal habitat as a result of the proposed attenuation features in the Ga-Mogara Riverine Vegetation Habitat Unit. Potential Impacts Include: • Increased sediment loads concentrated in dammed-off sections which will result in the potential smothering of faunal habitat in the river bed; • Fragmentation of faunal movement corridors which may impede faunal species movement; Potential increase of AIPs and consequential habitat degradation in the adjacent terrestrial habitat sections of the attenuation structures during potential flooding events.	-	4	4	2	6	4	48	Moderate	• Implement stormwater management to reduce accumulation of sediment loads within attenuated sections of the Ga-Mogara Habitat Unit; • Reduce fragmentation of the Ga-Mogara Habitat by incorporating movement corridors for water, animals and plants; • Implement AIP control to reduce the chances of propagules being spread to adjacent habitat during flooding events.	2	4	2	4	2	20	Low	58,3
Soil and land capability	**Proposed Key Infrastructure (Open Cast Pits)**																	
	Movement of construction vehicle/equipment leading to soils compaction	-	5	4	3	8	4	75	High	• Laydown areas should be located within the already disturbed soils (Anthrosols) from the currently active pits to avoid compaction of natural soils; • If possible, vegetation clearance, can be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low to avoid surface crusting and sealing of exposed soils • Direct surface disturbance of soils should be limited within demarcated areas where possible to minimise the intensity of compaction due to the susceptibility of these soils to prolonged waterlogging conditions (inundation); and • Compacted soils adjacent to the open pits footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation	4	3	2	6	3	44	Moderate	41,3
	spillage of hydrocarbons leading to soil contamination	-	4	4	3	8	3	60	High	• No vegetation clearance is allowed outside of the demarcated footprint areas. Disturbed areas beyond the footprint are to be suitably rehabilitated in accordance with the rehabilitation plan.	4	3	3	6	3	48	Moderate	20
	Land degradation leading to loss of land capability	-	4	4	3	8	3	60	High	• Operational vehicles are to utilise only designated roads. No driving through the surrounding habitat is to be permitted. • At decommissioning and rehabilitation phase, replace soil to appropriate soil depths in the correct order, and cover areas to mimic a natural topographic aspect so as to	4	3	3	6	3	48	Moderate	20

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR		Significance		P	D	E	M	LoR		Significance	
										achieve a free draining landscape that is as close as possible the pre-mining land capability rating.								
	Various key infrastructure (Attenuation Dam)																	
	Movement of construction vehicle/equipment leading to soils compaction	-	4	4	3	6	3	**54**	**Moderate**	• Laydown areas should be located within disturbed soils (Anthrosols) to avoid compaction of natural soils; • If possible, vegetation clearance, can be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low to avoid surface crusting and sealing of exposed soils • Direct surface disturbance of soils should be limited within demarcated areas where possible to minimise the intensity of compaction due to the susceptibility of these soils to prolonged waterlogging conditions (inundation); and • Compacted soils adjacent to the attenuation dams and associated infrastructure footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation	3	3	3	4	3	**30**	**Low**	44,4
	spillage of hydrocarbons leading to soil contamination	-	5	4	3	6	3	**65**	**High**	• No vegetation clearance is allowed outside of the demarcated footprint areas. Disturbed areas beyond the footprint are to be suitably rehabilitated in accordance with the rehabilitation plan.	4	3	3	4	3	**40**	**Moderate**	38,5
	Land degradation leading to loss of land capability	-	4	3	3	6	3	**48**	**Low**	• Operational vehicles are to utilise only designated roads. No driving through the surrounding habitat is to be permitted.	3	3	2	4	2	**27**	**Low**	43,8
	Secondary Infrastructure																	
	Movement of construction vehicle/equipment leading to soils compaction	-	5	5	3	8	4	**80**	**High**	• If possible, vegetation clearance, can be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low to avoid surface crusting and sealing of exposed soils • Direct surface disturbance of soils should be limited within demarcated areas where possible to minimise the intensity of compaction due to the susceptibility of these soils to prolonged waterlogging conditions (inundation);and • Compacted soils adjacent to the open pits footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation.	4	3	2	6	2	**44**	**Moderate**	45
	Spillage of hydrocarbons leading to soil contamination	-	4	4	3	8	3	**60**	**High**	• No vegetation clearance is allowed outside of the demarcated footprint areas. Disturbed areas beyond the footprint are to be suitably rehabilitated in accordance with the rehabilitation plan.	4	3	3	6	3	**48**	**Moderate**	20
	Land degradation leading to loss of land capability	-	4	4	3	8	3	**60**	**High**	• Operational vehicles are to utilise only designated roads. No driving through the surrounding habitat is to be permitted.	4	3	3	6	3	**48**	**Moderate**	20
Heritage	Hotazel-001 is a confirmed grave and burial ground which is located outside of the proposed development footprint but within the 100m buffer area required around gravesites. Site Hotazel-001 is located 70m north of the proposed mining pit on the farm Hotazel.		3	5	3	8	4	48	**Moderate**	As cemeteries and graves have Medium to High Heritage Significance, the preferred option is to change the development footprint to allow for the in situ preservation of these sites. The following mitigation measures would be required for this option: • SAHRA's Burial Grounds and Graves Unit requires a buffer area of at least 100m between mining development and any burial grounds or graves that are to be preserved. As a result, and if at all possible, the proposed development footprints must be amended to allow for a 100m wide buffer area surrounding each of the two burial	2	5	3	6	2	**28**	**Low**	

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										grounds that is kept clear of any construction or mining activities. • Fences around the two burial grounds should be maintained. • The two burial grounds should be cleaned on a yearly basis. • A heritage monitoring process would also be required during all the project phases. However, should it not be possible to preserve these sites in situ, the following mitigation measures are required: • A grave relocation process must be undertaken. • A detailed social consultation process, at least 60 days in length, comprising the attempted identification of the next-of-kin in order to obtain their consent for the relocation. • Bilingual site and newspaper notices indicating the intent of the relocation. • Permits from all the relevant and legally required authorities. • An exhumation process that keeps the dignity of the remains and family intact. • An exhumation process that safeguards the legal rights of the families as well as that of the mining company. • The process must be done by a reputable company well versed in the mitigation of graves.								
Blasting	Potential impact on ground vibration due to blasting in the following area:																	
	• Hydrocensus Borehole	-	4	4	2	8	4	56	Moderate	Specific blast design to be done, shorter blast holes, smaller diameter blast hole, using electronic initiation instead of shock tube systems to obtain single hole firing.	3	4	2	2	1	24	Low	57.1
	• Heritage (KMR 001 - Historical Site - Abandoned Cottage)	-	4	4	2	8	4	56	Moderate		3	4	2	2	1	24	Low	57.1
	• Railway Line	-	5	4	2	8	4	70	High		3	4	2	4	1	30	Moderate	57.1
	• Diversion R380 Road (Planned)	-	5	4	2	8	4	70	High		3	4	2	4	1	30	Moderate	57.1
	Potential impact on various locations due to the air blast created as part of the blasting activities:																	
	• Farm Buildings/Structures	-	3	4	2	4	4	30	Moderate	Specific blast design to be done, shorter blast holes, smaller diameter blast hole, use of specific stemming materials to manage air blast, increased stemming lengths to reduce air blast effect. Used of specific stemming to manage fly rock - crushed aggregate of specific size. Re-design with increased stemming lengths.	3	4	2	2	1	24	Low	20.0
	• Houses	-	3	4	2	4	4	30	Moderate		3	4	2	2	1	24	Low	20.0
	• Hotazel Municipal Clinic	-	3	4	2	4	4	30	Moderate		3	4	2	2	1	24	Low	20.0
	• School	-	3	4	2	4	4	30	Moderate		3	4	2	2	1	24	Low	20.0
	Potential impact on various location due to fly rock due to blasting activities																	
	• Rail Loading Bay	-	4	4	2	6	4	48	Moderate	• Specific blast design to be done, shorter blast holes, smaller diameter blast hole, use of specific stemming materials to manage air blast, increased stemming lengths to reduce air blast effect. Used of specific stemming to manage fly rock - crushed aggregate of specific size. Re-design with increased stemming lengths.	3	4	2	2	1	24	Low	50.0
	• Return Water Dam	-	4	4	2	6	4	48	Moderate		3	4	2	2	1	24	Low	50.0
	• Attenuation Dam (Planned)	-	4	4	2	6	4	48	Moderate		3	4	2	2	1	24	Low	50.0
	• Railway Line	-	4	4	2	8	4	56	Moderate		3	4	2	2	1	24	Low	57.1
	• Heritage (KMR 001 - Historical Site - Abandoned Cottage)	-	4	4	2	4	4	40	Moderate		3	4	2	2	1	24	Low	40.0
	• Diversion R380 Road (Planned)	-	4	4	2	8	4	56	Moderate		3	4	2	2	1	24	Low	57.1
Traffic	Road capacity: Relevant Road sections and need for repairing and / or reconstructing of road	+	3	5	2	6	3	39	Moderate	• No mitigation measures required at this point. Roadways need to be monitored to determine when road surfaces require repairing.	3	5	2	6	3	39	Moderate	0,0
	Road capacity: Need for additional lanes	+	2	3	2	4	1	18	Low	• Road capacity calculations indicated that all relevant roads have sufficient road capacity available.	2	3	2	4	1	18	Low	0,0

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	Road safety: Intersection spacing	+	1	5	2	2	1	9	Low	• Existing intersections.	1	5	2	2	1	9	Low	0,0
	Road safety: Vertical Road alignment	+	1	5	2	2	1	9	Low	• Existing roads, vertical alignments acceptable.	1	5	2	2	1	9	Low	0,0
	Road safety: Available sight distance at intersections	+	1	5	2	2	1	9	Low	• Existing intersections.	1	5	2	2	1	9	Low	0,0
	Road safety: Need for dedicated left- and right-turn lanes	+	2	3	2	4	1	18	Low	• No additional mitigation measures, as long as mitigation implemented as indicated without Proposed KMR Expansion Project.	2	3	2	4	1	18	Low	0,0
	Road safety: Pedestrian movement within intersections	+	2	4	2	2	1	16	Low	• Pedestrian walkways and crossings provided at key intersections.	2	4	2	2	1	16	Low	0,0
	Road safety: Public transport loading and off-loading at intersections	+	2	4	2	2	1	16	Low	• Public transport lay-bys provided at key intersections.	2	4	2	2	1	16	Low	0,0
Groundwater	Lowering of groundwater levels due to dewatering (results in a potential loss to groundwater in storage and may impact on existing groundwater users	-	3	4	1	4	1	27	Low	• Limited extent of the cone of dewatering • Monitoring of the groundwater drawdown	3	4	2	2	2	24	Low	11.1
	Change in ambient water quality due to open pit	-	4	4	1	2	2	28	Low	• Geochemical results indicate that the material to be exposed is non-acid generating • Dewatering qualities must be measured at the transfer sumps • Pits act as sink (groundwater flows/ plume migration towards and not away from the pits)	3	4	1	4	2	27	Low	3.6
	Diffuse pollution (seepage) from WRDs	-	4	4	2	2	2	32	Moderate	• Waste rock lithologies tested are non-acid generating • Monitoring of pollution plume migration • Where monitoring results indicate that 3rd party water supply has been polluted (or yield) have been reduced an alternative equivalent water supply will be provided	3	4	2	2	2	24	Love	3.6
Visual	The development /expansion and operation of the WRDs occur simultaneously and visual impacts expected with this phase are evaluated in a similar manner.	-	5	5	3	6	3	70	High	• Undertake gradual clearing of land/vegetation • Ensure harvesting of plants from this area and preserve in the nursery for rehabilitation purposes, where practical. • Adhere to the management measures regarding dust provided by the air quality specialist. • Undertake progressive rehabilitation of the WRDs, if practically possible. • Plant or retain vegetation such as trees and shrubs on periphery of the town to provide a screen/buffer of direct views towards these structures. Point lighting inwards and not to villages to avoid nocturnal impacts. Natural vegetation, wherever possible, should be retained on and around the mine property as well as along the boundary of the mine.	5	4	2	4	3	50	Moderate	28.6
	Visual Impacts during construction and operation of future Telele Underground Mine	-	4	4	2	6	2	48	Moderate	• Dust suppression • Keep nocturnal lighting towards the operational areas and avoid lighting pointing toward roads or the town • Adhere to the management measures regarding dust provided by the air quality specialist. • Retain natural vegetation where possible	4	4	2	6	3	48	Moderate	0.0
	Visual Impacts during construction and operation of attenuation ponds	-	3	4	1	4	2	27	Low	• Dust suppression • Adhere to the management measures regarding dust provided by the air quality specialist. • Retain natural vegetation where possible • Revegetate sides	2	4	1	2	3	14	Low	48.1

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
Surface Water	**All proposed activities/infrastructure at KMR mine** Flooding risk of upstream areas, especially private land upstream of the 1st attenuation dam, and potential flooding of the York open-pit by the 2nd attenuation dam	**-**	4	1	2	8	4	44	Moderate	• Early warning system installed upstream to identify the potential for a flood behind attenuation dam where private land is located allowing for prewarning and evacuation. • Design dam and select location to reduce flooding of private land as far as possible.	2	4	2	4	2	20	Low	54.5
	All proposed activities/infrastructure at KMR mine Potential flooding of the nearby open-pits through increasing the water head upstream of the pit during a flood event promoting an increase in seepage into the nearby open-pit	**-**	3	1	1	6	3	24	Low	• Early warning systems installed upstream to identify the potential for a flood which would exceed the attenuation dam volume allowing for pit evacuation. • Design the attenuation dams to hold a 1:50 year event.	2	4	2	4	2	20	Low	16.7
	All proposed activities/infrastructure at KMR mine Reduction in downstream streamflow and available water to downstream water users	**-**	5	4	3	8	4	75	High	Allow for water to spill over or be released following the filling of the dam.	2	4	3	4	2	22	Low	70.7
	Pollution Control Dams Potential of flooding following an extreme rainfall event which could exceed the storage capacity of the PCD	**-**	4	4	2	8	2	56	Moderate	The PCD should be designed to hold a 1:50 year event with a minimum freeboard of 0.8 metres above the fill supply level.	2	4	2	4	2	20	Low	64.3
	Pollution Control Dams Reduced availability of water to downstream water users due to dirty runoff from site	**-**	3	4	3	6	2	39	Moderate	• During normal operations dirty water should be contained in (pollution control dams) PCDs designed to handle the 1:50 year event and enable settlement of solids in the contained water prior to reuse • Clean water diversions, designed to handle the 1:50 year storm event, should be constructed to divert water away from PCD and return it to the natural environment	2	4	2	4	2	20	Low	48.7
	Expansion and operation of opencast pits Reduced availability of water to downstream water users due to changes in MAR and potential decreased water quality	**-**	4	4	3	8	4	60	High	• During the operational phase of the mine, implement a storm water management plan which adheres to GN 704 requirements in terms of separation of clean and dirty water is required so as to ensure no mixing of clean and dirty water occurs. Maintain all channels to prevent any obstruction of flow.	3	4	3	6	3	39	Moderate	35.0
	Expansion and operation of opencast pits Potential flooding of the open-pit due to surface runoff, exposure to rainfall, and increased expansion across the water course exposing the open-pit to a higher groundwater table	**-**	4	4	2	8	3	56	Moderate	• Construction of attenuation dams to prevent the flooding of the pit following an extreme rainfall event. • Design and implementation of storm water management plan to divert all water away from the open-pit • Design and implement a pumping strategy of sufficient capacity to pump out the intruding ground water, surface water and direct rainfall out of the pit.	3	4	2	4	2	30	Moderate	46.4
Air Quality	Impaired human health from increased pollutant concentrations associated with the project operations	**-**	4	4	3	8	4	52	Moderate	• Water bowsers on unpaved roads; water sprays at stockpiles, handling points, crushers, and screens	4	4	3	6	4	40	Moderate	
	Increased nuisance dust fall rates associated with the project operations	**-**	4	4	2	6	3	48	Moderate	• Water bowsers on unpaved roads; water sprays at stockpiles, handling points, crushers, and screens	4	4	2	4	3	40	Moderate	
	Impaired vegetation health from dust fall rates associated with the project operations	**-**	3	4	3	6	4	39	Moderate	• Water bowsers on unpaved roads; water sprays at stockpiles, handling points, crushers, and screens	3	4	3	6	4	39	Moderate	
Socio-Economic	Mining expansion, including all construction activities (including infrastructural development) that involve additional land clearing	-	4	4	3	6		**52**	**Moderate**	• Investigate community or farmer-level agricultural projects to support self-employed farmers (especially with livestock) • Improve the farming productivity of the existing mine-owned farmland to ensure that such land is managed appropriately and not neglected. This could form part of an agricultural project(s) • Implement a rehabilitation plan concurrently with the current mining developments (and hence not just during	2	4	3	6		**26**	**Low**	50.0

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			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										the decommission phase), which focuses on restoring the land to its original potential for grazing cattle • Develop a farmer engagement strategy and incorporate such a strategy into an existing stakeholder engagement plan								
	Reducing farm labour opportunities Mining expansion, including all construction activities (including infrastructural development) that involve additional land clearing	-	2	4	3	2		18	Low	• The mitigation and management measures in the Surface Water Specialist Study (2021) should be reviewed and implemented • KMR should establish a water quality forum for its AoI, as well as the affected farmers and land users to discuss water issues and concerns which might arise as a result of the expansion project and KMR's ongoing mining activities • KMR should develop and communicate (if they have not already done so) a grievance management mechanism which should be made available to affected land users and doorstep communities to address concerns raised by affected parties • Regular water monitoring should be implemented at selected sites for longitudinal monitoring. This should be used to track any issues and/or concerns with the lowering of the water table over time, as well as the water quality and any mining-related impacts • KMR should consider including representatives from the local farmers association or the suggested water quality forum in water quality monitoring	1	4	3	2		9	Low	50.0
	Reducing water availability for living and farming • Mining expansion, including all construction activities and operational phase activities which require surface water • Water usage for the construction and operational phases of the waste rock dumps, Run of Mine (RoM) stockpiles and crushing facility • Additional water usage from additional boreholes to be sunk • Surface water run-off to the attenuation dam	-	3	4	3	4		33	Moderate	• The mitigation and management measures in the Surface Water Specialist Study (2021) should be reviewed and implemented • KMR should establish a water quality forum for its AoI, but also the affected farmers and land users to discuss water issues and concerns which might arise as a result of the expansion project and KMR's ongoing mining activities • KMR should develop and communicate (if they have not already done so) a grievance management mechanism which should be made available to affected land users and doorstep communities to address concerns raised by affected parties • Regular water monitoring should be implemented at selected sites for longitudinal monitoring. This should be used to track any issues and/or concerns with the lowering of the water table over time, but also the water quality and any mining-related impacts • KMR should consider including representatives from the local farmers association or the suggested water quality forum in water quality monitoring	3	4	3	4		33	Moderate	0
	Increased exposure to environmental hazards and risks during construction and operational phases • Mining expansion, including all construction activities, blasting and vibrations especially of the new mining pits • Relocation of admin offices and security building • Waste rock dumps	-	5	4	2	8		70	High	• The mitigation and management measures in the Air Quality Impact Assessment, Noise Opinion Statement and Blasting and Vibrations Impact Assessment should be referred to and implemented • KMR could consider undertaking a Community Health and Safety Impact Assessment in line with GIIP • Implement the following key requirements of the OHS Act (Act 85 of 1993):	4	4	2	6		48	Moderate	31.4

Aspect	Nature of the impact	Significance of potential impact BEFORE mitigation						Mitigation Measures	Significance of potential impact AFTER mitigation						Degree of mitigation (%)
		P	D	E	M	LoR	Significance		P	D	E	M	LoR	Significance	
	• Constructing a sewerage treatment facility • Crushing facility • RoM stockpiles • Earthworks for all infrastructure (including Ancillary infrastructure) provisions [this includes clearing vegetation, roadworks (haul roads) and sinking boreholes] Constructing the attenuation dam							• Identify potential hazards to the workforce • Provide preventative and protective measures such as removing substances that are considered dangerous or rectifying situations that may appear dangerous before incidence occurs • Record incidences • Prepare emergency response plans in advance and ensure that they are communicated to the workforce effectively • In alignment with GIIP, the following topics should be included in site inductions and other training: • Community health and injury profiles • Health risks relevant to the workforce and mitigation strategies • Health risks relevant to community members and mitigation strategies • Available health services • Inform affected communities about potential risks and impacts in a culturally appropriate manner, including collaborating with the community and government agencies in their efforts to respond effectively to emergency situations • Involve the doorstep communities and affected land users in discussing these concerns in forum settings, as well as identify mitigation measures • Prior to the commencement of any groundworks, the doorstep communities, affected land users and ward committee members should be consulted and prepared for the construction phase. This should include consultations about the possible nuisance impacts as discussed. Such discussions should inform further appropriate mitigation measures. As an example, particular construction-related activities could be scheduled for certain times of the day, using applications such as WhatsApp groups or local forums to disseminate working schedules • Relevant community forms, NGOs and/or the ward committee members should always be consulted prior to the construction or upgrading of access road(s) or project-related infrastructure changes which could affect nearby/adjacent houses • Incorporate project activities into a KMR Emergency Response Plan • Keep first aid supplies on site at all times • Undertake induction training as well as regular refresher training sessions on health and safety for employees • Include the respective contractors in the health and safety training • Inform the employees of the KMR Emergency Response Plan in conjunction with the training • Maintain the existing dust management/mitigation measures on-site. Should dust levels increase the management/mitigation measures should be reviewed to ensure dust levels remain below the respective standards • Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive							

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										receptors, taking account of prevailing wind directions and seasonal variations in the prevailing wind • Using these recommendations, update KMR's existing contractor agreements concerning health and safety standards								
	Influx of job-seekers • All construction activities that require labour • General mining and other operational activities that require labour • Maintenance work that requires labour • SMMEs or other services required • Perception that mining provides an endless supply of employment opportunities • Mixed messaging regarding opportunities from KMR • Potential retrenchments, downscaling or closures at other mines in the region Large scale unemployment triggered by unfavourable economic development in JTGDM and JMLM		4	3	2	6		44	Moderate	• Review the proposed mitigation measures for socio-economic issues listed in JTGDM and JMLM's SDFs and ensure that KMR's SLP is aligned with these measures and /or other strategic programmes where relevant • Clearly and transparently communicate and implement employment and procurement policies • Subject all the project employees to a health, Covid19 and HIV/AIDS awareness educational programme. Contractors should also be required to provide such training to their staff • KMR could assist with initiating programmes aimed at encouraging voluntary workers to patrol particular areas (especially during the construction period). Supporting local structures in establishing a community policing forum could be considered • Local forums or the ward committee members could be tasked to keep record of any potential influx of job-seekers [this could also be the responsibility of a Community Liaison Officer (CLO)] • Develop a Recruitment and Influx Management Plan • Review HR policies and procedures in consultation with key stakeholders to ensure that these are relevant and transparent. Such procedures could include a Preferential Procurement Policy in favour of employing local labour • Extend the CLO's duties to cover the expansion project	3	3	2	4		27	Low	38.6
	Tension between security workers and local residents • General construction and operational activities where security workers are required (especially activities such as those associated with roadworks which might be close to the AoI) • General mining activities • Maintenance • Day-to-day securing of KMR property • Responding to security threats relating to KMR property Interaction with external parties on KMR property		3	3	2	6		33	Moderate	• Develop criteria for the recruitment of security personnel during the construction phase (or a security company's terms of agreement need to reflect such criteria) • When hiring security personnel, contractors must be required by KMR to undertake reasonable effort to inquire whether the personnel have not been part of past abuses • As far as possible, recruit security personnel from the doorstep communities. This should allow them to distinguish between the local population and outsiders • Properly train security personnel in the use of force and, most importantly, appropriate conduct towards nearby and affected communities and residents • Develop a code of conduct for the security personnel in consultation with the doorstep communities • Through a stakeholder engagement strategy, inform all the doorstep communities and most directly affected land users about the roles and responsibilities of the security personnel or the security company. This could be accomplished through community meetings, forum discussions, information dissemination, or media coverage.	2	3	2	6		22	Low	33.3
	Continued employment of local labour • All construction activities that require labour	+	5	4	3	6		65	High	• Update the SLP and any other related policies and plans to ensure a solid local procurement strategy	4	4	3	6		52	Moderate	20.0

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation						Mitigation Measures	Significance of potential impact AFTER mitigation						Degree of mitigation (%)
			P	D	E	M	LoR	Significance		P	D	E	M	LoR	Significance	
	• General mining and other operational activities that require labour • Maintenance work that requires labour • SMMEs or other services required • KMR procurement policies and strategies Regulatory requirements (SLP, Mining Charter 3)								• Update the SLP to ensure that KMR's Skills Development Programme include: ○ Core business training ○ Learnerships ○ Portable skills training ○ One community bursary per year (ideally through a community trust) • Manage employment by selecting employees according to an electronic selection system supported by JMLM that ensures recruitment from local, impacted communities. This should ensure a fair recruitment process. Related to this, KMR should ensure clear expectations in all platforms of communication of the number of jobs available and in what categories or fields of the mine. This would allow a clear indication of what types of jobs would be available • Update the Employment Equity Plan in the SLP to provide equal job opportunities • Employment preference should be provided to the local residents • Use, as far as reasonably possible, local suppliers and SMMEs and invite them to list their businesses on a database managed by KMR • In addition to appropriate HR policies and procedures, establish a labour desk/employment committee to provide strategic guidance to the mine on labour recruitment policies (if this is not already established). This should ensure that recruitment is done in a fair and transparent way, and that job creation opportunities are maximised • Allow those labourers who were involved in the construction phase a fair opportunity to apply for work during the operational phase • Provide sufficient opportunities for women and disabled persons to become employable on the mine • Training and skills development focused on women should take place to increase their participation in the labour force • Develop and implement, as far as reasonably possible, a plan for the gradual replacement of migrant labour by local employees • Develop and implement a labour grievance mechanism as an HR function • Establish a community form to identify grievances and communicate these to the mine • The following International Labour Organisation (ILO) conventions must be adhered to: ○ ILO Convention 87 on freedom of association and protection of the right to organise ○ ILO Convention 98 on the right to organise and collective bargaining ○ ILO Convention 29 on forced labour ○ ILO Convention 105 on the abolition of forced labour							

Aspect	Nature of the impact		Significance of potential impact **BEFORE** mitigation: P	D	E	M	LoR	Significance		Mitigation Measures	Significance of potential impact **AFTER** mitigation: P	D	E	M	LoR	Significance		Degree of mitigation (%)
										○ ILO Convention 138 on the minimum age of employment ○ ILO Convention 100 on equal remuneration ○ ILO Convention 111 on discrimination •								
	Continued skills and further training opportunities • All construction activities that require labour • General mining and other operational activities that require labour • Maintenance work that requires labour SMMEs or other services required	+	5	4	3	6		65	High	• As legislated, disclose the SLP to the AoI, doorstep communities, but also the affected land users on a regular basis. Such communities should be given an opportunity to comment on any amendments of the SLP and provide input or grievances	5	4	3	6		65	High	0
	Contributing to the local and regional economy • All construction activities that require labour • General mining and other operational activities that require labour • Maintenance work that requires labour • SMMEs or other services required • Improved/updates SLP Improved/updated local procurement strategies	+	3	4	3	6		39	Moderate	• Promote the use of local business and creation of SMMES as far as possible by providing them with preferential treatment	4	4	3	6		52	Moderate	33.3
	<u>Potential increase in crime and substance abuse</u> In-migration	-	5	3	2	8		65	High	• Develop a Stakeholder Engagement Plan (SEP) and a grievance mechanism • Review the proposed mitigation measures for socio-economic issues listed in JTGDM and JMLM's SDFs and ensure that KMR's SLP is aligned with these measures and /or other strategic programmes where relevant • Clearly and transparently communicate and implement employment and procurement policies • Subject all the project employees to a health, Covid19 and HIV/AIDS awareness educational programme. Contractors should also be required to provide such training to their staff • KMR could assist with initiating programmes aimed at encouraging voluntary workers to patrol particular areas (especially during the construction period). Supporting local structures in establishing a community policing forum could be considered • Local forums or the ward committee members could be tasked to keep record of any potential influx of job-seekers [this could also be the responsibility of a Community Liaison Officer (CLO)] • Develop a Recruitment and Influx Management Plan • Review HR policies and procedures in consultation with key stakeholders to ensure that these are relevant and transparent. Such procedures could include a Preferential Procurement Policy in favour of employing local labour • Extend the CLO's duties to cover the expansion project	5	3	2	4		45	Moderate	30.8
	Loss of place attachment Blasting and vibrations especially of the new mining pits	-	5	4	3	10		85	High	• Refer to management measures in the HIA, such as guidance in terms of clearing and fencing off the graves, as well as related monitoring procedures • Develop a chance-find procedure for all new tangible cultural heritage which is discovered during the project's	4	4	3	4		44	Moderate	48.2

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation						Mitigation Measures	Significance of potential impact AFTER mitigation						Degree of mitigation (%)
			P	D	E	M	LoR	Significance		P	D	E	M	LoR	Significance	
									construction, operational, as well as decommissioning phases • Investigate the need for a grave management and/or relocation plan if the identified graves cannot be fenced off property. This should include detailed measures for the consultation of the Next-of-Kin (NoK).							

16.4.4 Proposed impacts anticipated during closure/ rehabilitation

The tables below provides the potential impacts associated with the closure, rehabilitation and post closure phase of the proposed project. Refer to Section 28.4 for the closure actions and post closure monitoring.

Table 16-7: Closure/rehabilitation phase impacts applicable to all the proposed expansion activities

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
Freshwater	Kipling Pit Shell (partially encroaches on diverted reach of Ga-Mogara River) • Demolition of related surface infrastructure; • Backfilling of pit.	-	5	2	1	4	1	35	Moderate	• The footprint provided to the specialist in August 2021 indicates that the Kipling pit shell will extend into a diverted reach of the Ga-Mogara River, within the Mokala Mine MRA (SLR, 2021). It is strongly recommended that the footprint be optimised to avoid encroaching on the river any further as this will contribute to the cumulative impacts to the river posed by the proposed expansion activities; Notwithstanding the above, the following mitigation measures apply: •Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone (or diverted reach of the river) and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas. • The topography of the backfilled pit must be levelled and tie-in with the surrounding landscape to ensure that there is no formation of preferential flow paths which may lead to erosion over time, or unnatural accumulation of surface water when present, which could over time lead to changes in vegetation profiles.	3	2	1	2	1	15	Low	57,1
	Kipling Waste Rock Dump within 20 m of diverted reach of Ga-Mogara River • Capping, sloping and revegetation of WRD. Potential impacts include: • Increased risk of transportation of sediment from exposed soil in stormwater runoff, leading to increased turbidity of surface water, sedimentation of watercourse, smothering of vegetation and/or altered vegetation composition.	-	4	5	2	6	2	52	Moderate	• Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential;	3	5	2	4	2	33	Moderate	36,5

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										• Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas. • The stockpiles may not exceed 2m in height or the height recommended by the Soil and Land Capability study (ZRC, 2021); • All exposed soils must be protected for the duration of the construction phase in order to prevent erosion and further sedimentation of the reach of the watercourse proximal to these stockpiles.								
	Expansion of open pits (York and Hotazel) • Backfilling of pits and reinstatement of pre-mining topography. Presumed no re-creation of riverine habitat. Impacts to Ga-Mogara River will have occurred during construction and operational phase. Backfilling of pits will not reverse construction / operational phase impacts thus extent, magnitude and loss of resource deemed relatively low.	-	5	5	1	4	1	50	**Moderate**	• Alternative options to avoid mining through the Ga-Mogara River should be sought, such as accessing the mineral resource from the western side of the river. • Notwithstanding the above, no unauthorised activity may be permitted within the Ga-Mogara River, including vehicular movement, indiscriminate disposal of waste material, or removal of vegetation; Notwithstanding the above, the following mitigation measures apply: • Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone (or diverted reach of the river) and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas. • The topography of the backfilled pit must be levelled and tie-in with the surrounding landscape to ensure that there is no formation of preferential flow paths which may lead to erosion over time, or unnatural accumulation of surface water when	3	5	1	2	1	24	**Low**	52,0

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										present, which could over time lead to changes in vegetation profiles. •								
	WRD North and South (Hotazel) within 120 m and 150 m respectively of the Ga-Mogara River • Capping, sloping and revegetation of WRD. Potential impacts include: • Increased risk of transportation of sediment from exposed soil in stormwater runoff, leading to increased turbidity of surface water, sedimentation of watercourse, smothering of vegetation and/or altered vegetation composition.	-	4	5	2	6	2	52	Moderate	• Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas. • The stockpiles may not exceed 2m in height or the height recommended by the Soil and Land Capability study (ZRC, 2021); • All exposed soils must be protected for the duration of the construction phase in order to prevent erosion and further sedimentation of the reach of the watercourse proximal to these stockpiles.	3	5	2	4	2	33	Moderate	36,5
	The attenuation dam within the Ga-Mogara River. • •Demolition of dam walls. • Potential impacts as per pre-construction and construction phases.	-	5	2	1	4	1	35	Moderate	• Contractor laydown areas, and material storage facilities to remain outside of the delineated riparian zone and associated 32m NEMA zone of regulation; • All vehicle re-fuelling is to take place outside of the delineated riparian zone and associated 32m NEMA zone of regulation or 100m NWA zone of regulation; • All Clean and Dirty Water separation areas are to be developed first prior to any other major earthworks to reduce risk of erosion and sedimentation; • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • Retain as much indigenous vegetation (riparian and terrestrial) as possible; • It should be feasible to utilise existing roads to gain access to the site, and crossing the river in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles; • Areas where bank failure is observed as a result of such watercourse crossings should be immediately repaired; and • The watercourse areas beyond the proposed footprint of development and the NEMA zone of regulation (32m) should be	3	2	1	2	1	15	Low	57,1

Aspect	**Nature of the impact**		**Significance of potential impact BEFORE mitigation**							**Mitigation Measures**	**Significance of potential impact AFTER mitigation**							**Degree of mitigation (%)**
			P	**D**	**E**	**M**	**LoR**	**Significance**			**P**	**D**	**E**	**M**	**LoR**	**Significance**		
										clearly demarcated with danger tape and areas in which no activities are proposed should be marked as a no-go areas.								
Floral	All KMR Expansion Activities: • Rehabilitation of the test pit on Devon. Potential Impacts Include: • Sloping and stabilising of the Test Pit and reinstatement of indigenous floral vegetation to the pre-mined state (preferred).	+	2	3	2	6	2	22	Low	• Rehabilitation must proceed in accordance with the approved rehabilitation plan and must aim to achieve the post-closure land-use, i.e., grazing and wildlife. Indigenous floral species representative of the surrounding vegetation type must be used for rehabilitation.	4	5	2	6	2	52	Moderate	-136
	All KMR Expansion Activities: • Loss of floral diversity and habitat due to ineffective implementation of rehabilitation activities. Permanent loss of habitat due to permanent WRDs. Potential Impacts Include: • Permanent loss of floral habitat, floral diversity, and floral SCC due to loss of favourable habitat to reinstate floral SCC. • Higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	-	4	4	3	8	4	60	High	• All infrastructure and footprint areas should be rehabilitated in accordance with the rehabilitation plan. • All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated. • The post-closure rehabilitation land use must be determined and agreed upon for the rehabilitation plan to be drafted. It is recommended that the post-closure land use be to natural vegetation that represents, as far as possible, the pre-mined vegetation communities, with ecological function prioritised. The rehabilitated areas must be able to sustain floral SCC, especially if such species are relocated into rehabilitated sites. Edge effects such as erosion and AIP proliferation, which may affect adjacent or sensitive habitat, need to be strictly managed adjacent to the footprint areas and as part of the rehabilitation phase	3	4	2	6	2	36	Moderate	40,0
	All KMR Expansion Activities: • Loss of floral SCC. Potential Impacts Include: • Potential poor monitoring of relocated SCC resulting in the loss of SCC from the local area and poorly reinstated and represented floral SCC within rehabilitated areas.	-	3	3	2	6	3	33	Moderate	Monitoring of rescued and relocated floral SCC should continue during the Closure & Rehabilitation Phase until it is evident that the species have successfully established. Where possible, these species should be reintroduced into rehabilitation sites.	2	2	2	4	2	16	Low	51,5
	All KMR Expansion Activities: • Ongoing loss of floral diversity and habitat, including recued/relocated SCC. Potential Impacts Include: • Potentially poorly implemented and monitored AIP Management programme, leading to the reintroduction and proliferation of AIP species within the area • Potential failure to monitor rehabilitation as per the Biodiversity Action Plan set out for the mine.	-	4	4	3	6	4	52	Moderate	Ongoing alien and invasive vegetation and bush encroachment monitoring and control should take place throughout the rehabilitation phase of the project.	3	2	2	4	2	24	Low	53,8
	All KMR Expansion Activities: • Cumulative Impacts Potential Impacts Include: • Ongoing mining development and ineffective rehabilitation leading to cumulative loss of natural vegetation in the region	-	4	4	3	8	4	60	High	Minimise loss of indigenous vegetation where possible post closure and ensure that rehabilitation is effectively implemented.	4	4	2	6	2	48	Moderate	20,0
Faunal	All proposed KMR Expansion Activities: • Rehabilitation of the test pit on Devon. Potential Impacts Include: • Sloping and stabilising of the Test Pit and reinstatement of indigenous vegetation to the pre	+	2	3	2	6	2	22	Low	• Rehabilitation must proceed in accordance with the approved rehabilitation plan and must aim to achieve the post-closure land-use, i.e., grazing and wildlife. Indigenous floral species representative of the surrounding vegetation type must be used for rehabilitation as this will ensure	4	5	2	6	2	52	Moderate	-136

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	mined state (preferred) thereby allowing re-colonisation of this area by faunal communities									suitable habitat and food resources for fauna in the region are reinstated.								
	<u>All proposed KMR Expansion Activities:</u> • Loss of faunal habitat, diversity and potentially occurring SCC due to ineffective implementation of rehabilitation activities.. <u>Potential Impacts Include:</u> • Potential permanent loss of faunal habitat, faunal diversity and faunal SCC due to loss of favourable habitat and the failure to suitably rehabilitate disturbed areas and the remaining WRDs; • Increased likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity during the closure and rehabilitation phase.	-	4	4	3	8	4	60	**High**	• All infrastructure and footprint areas should be rehabilitated in accordance with the rehabilitation plan. The rehabilitation plan should be regularly updated. • All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated. • Edge effects such as erosion and AIP proliferation, which may affect adjacent or sensitive habitat, need to be strictly managed adjacent to the footprint areas and as part of the rehabilitation phase. The post-closure rehabilitation land use must be determined and agreed upon for the rehabilitation plan to be drafted. It is recommended that the post-closure land use be to natural vegetation that represents, as far as possible, the pre-mined vegetation communities, with ecological function prioritised	3	4	2	6	2	36	**Moderate**	40,0
	<u>All proposed KMR Expansion Activities:</u> • Ongoing loss of faunal diversity and habitat, including SCC. <u>Potential Impacts Include:</u> • Potentially poorly implemented and monitored AIP Management programme post closure, leading to the reintroduction and proliferation of AIP species within the area; • Potential failure to monitor rehabilitation as per the Biodiversity Action Plan and post closure plan set out for the mine.	-	4	4	3	6	4	52	**Moderate**	Ongoing alien and invasive vegetation and bush encroachment monitoring and control should take place throughout the rehabilitation phase of the project.	3	2	2	4	2	24	**Low**	53,8
	<u>All proposed KMR Expansion Activities:</u> • Cumulative Impacts <u>Potential Impacts Include:</u> • Ongoing mining activities and expansion with ineffective concurrent rehabilitation leading to cumulative loss of natural faunal habitat, food resources and movement corridors in the mining areas and adjacent habitats within the mines zone of influence.	-	4	4	3	8	4	60	**High**	• Minimise loss of indigenous vegetation where possible post-closure and ensure that rehabilitation is effectively implemented; • Preserve, enhance, or offset faunal movement corridors wherever possible; • Ensure that rehabilitation takes place concurrently with mining activities; Implement all executable tasks as stipulated in the existing Biodiversity Action Plan (BAP) and AIP control plan, ensuring that these plans are regularly updated in accordance with their achievable targets and the mines expansion	4	4	2	6	2	48	**Moderate**	20,0
Soil and Land Capability	**Proposed Key Infrastructure (Open Cast Pits)**																	
	• Disturbance of soils as part of demolition activities leading to Sedimentation and erosion.	-	4	4	2	6	3	48	**Moderate**	• All disturbed areas should be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion; • Temporary erosion control measures may be used to protect the disturbed soils during the rehabilitation until adequate vegetation has established; • A site-specific drainage system design should be implemented to reduce the volume and velocity of flows crossing disturbed areas and to prevent the mixing of clean and dirty flows; and *Runoff attenuation, which function as wetlands can potentially be placed at strategic points in the bottom of the landscape to assist with the assimilation of contaminants and to trap sediments.	3	3	2	4	2	27	**Low**	43,7
	• Disturbance of soils as part of demolition activities leading to soil compaction.	-	4	4	2	6	3	48	**Moderate**	• All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible;	3	4	2	4	1	30	**Low**	37,5

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
										• Laydown areas should be located within disturbed soils (Witbank Soil forms) to avoid compaction of natural soils; • Avoid placement of material in the soil associated with wetland which has high clay content, where possible; • Decommissioning activities should be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low, such that the soils are less prone to compaction; and • Compacted soils within the mine footprint should be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation.								
	• Spillage of hydrocarbons resulting from leakages in demolition equipment/machinery, leading to Soil Contamination.	-	4	4	2	6	3	48	**Moderate**	• Regular monitoring of machinery must be undertaken to identify spills or leaks; • An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur; • The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly; • Spread absorbent sand on areas where oil spills are likely to occur, such as the refuelling areas.	3	3	2	4	2	27	**Low**	43,7
	Proposed Key Infrastructure (Attenuation Dams)																	
	• Disturbance of soils as part of demolition activities leading to Sedimentation and erosion.	-	3	4	2	6	3	36	**Moderate**	• All disturbed areas should be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion; • A site-specific drainage system design should be implemented to reduce the volume and velocity of flows crossing disturbed areas and to prevent the mixing of clean and dirty flows; and • Runoff attenuation, which function as wetlands can potentially be placed at strategic points in the bottom of the landscape to assist with the assimilation of contaminants and to trap sediments.	3	3	2	4	2	27	**Low**	#DIV/0!
	• Disturbance of soils as part of demolition activities leading to soil compaction.	-	3	4	2	6	3	36	**Moderate**	• Avoid placement of material in the soil associated with wetland which has high clay content, where possible; • Decommissioning activities should be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low, such that the soils are less prone to compaction; and • Compacted soils within the dam footprint should be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation.	3	4	2	4	1	30	**Low**	16,7
	• Spillage of hydrocarbons resulting from leakages in demolition equipment/machinery, leading to Soil Contamination.	-	3	4	2	6	3	36	**Moderate**	• Regular monitoring of machinery must be undertaken to identify spills or leaks; • An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur; • The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly; • Spread absorbent sand on areas where oil spills are likely to occur, such as the refuelling areas.	3	3	2	4	2	27	**Low**	16,7
	Secondary Infrastructure																	
	• Disturbance of soils as part of demolition activities leading to Sedimentation and erosion.	-	4	4	2	6	3	48	**Moderate**	• All disturbed areas should be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion;	3	3	2	4	2	27	**Low**	43,8

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR		Significance		P	D	E	M	LoR		Significance	
										• Temporary erosion control measures may be used to protect the disturbed soils during the rehabilitation until adequate vegetation has established; • A site-specific drainage system design should be implemented to reduce the volume and velocity of flows crossing disturbed areas and to prevent the mixing of clean and dirty flows; and • Runoff attenuation, which function as wetlands can potentially be placed at strategic points in the bottom of the landscape to assist with the assimilation of contaminants and to trap sediments.								
	• Disturbance of soils as part of demolition activities leading to soil compaction.	-	4	4	2	6	3	48	Moderate	• All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible; • Laydown areas should be located within disturbed soils (Witbank Soil forms) to avoid compaction of natural soils; • Avoid placement of material in the soil associated with wetland which has high clay content, where possible; • Decommissioning activities should be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low, such that the soils are less prone to compaction; and • Compacted soils within the mine footprint should be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation.	3	4	2	4	1	30	Low	37,1
	• Spillage of hydrocarbons resulting from leakages in demolition equipment/machinery, leading to Soil Contamination.	-	4	4	2	6	3	48	Moderate	• Regular monitoring of machinery must be undertaken to identify spills or leaks; • An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur; • The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly; • Spread absorbent sand on areas where oil spills are likely to occur, such as the refuelling areas.	3	3	2	4	2	27	Low	43,8
Traffic	• Road capacity: Relevant Road sections and need for repairing and / or reconstructing of road	+	1	1	2	2	1	5	Low	• None. Mine will close down and no vehicle traffic generated.	1	1	2	2	1	5	Low	0,0
	• Road capacity: Need for additional lanes	+	1	1	2	2	1	5	Low	• None. Mine will close down and no vehicle traffic generated.	1	1	2	2	1	5	Low	0,0
	• Road safety: Intersection spacing	+	1	5	2	2	1	9	Low	• Existing intersections.	1	5	2	2	1	9	Low	0,0
	• Road safety: Vertical Road alignment	+	1	5	2	2	1	9	Low	• Existing roads, vertical alignments acceptable.	1	5	2	2	1	9	Low	0,0
	• Road safety: Available sight distance at intersections	+	1	5	2	2		9	Low	• Existing intersections.	1	5	2	2	1	9	Low	0,0
	• Road safety: Need for dedicated left- and right-turn lanes	+	1	1	2	2	1	5	Low	• None. Mine will close and no vehicle traffic generated.	1	1	2	2	1	5	Low	0,0
	• Road safety: Pedestrian • movement within intersections	+	1	1	2	2	1	5	Low	• None. Mine will close and have no staff moving within intersections.	1	1	2	2	1	5	Low	0,0
	• Road safety: Public transport loading and off-loading at intersections	+	1	1	2	2	1	5	Low	• None. Mine will close and no public transport will be required.	1	1	2	2	1	5	Low	0,0
Groundwater	Re-establishment of groundwater levels, flow directions and flow gradient to near pre-mining levels	-	3	3	2	4	1	27	Low	• Monitoring of water qualities and water levels (quarterly for 5 years), thereafter annually until stabilised	3	3	2	2	2	21	low	22.2
	Diffuse seepage of groundwater potentially contaminated	-	3	4	2	4	2	30	Moderate	• Pits will remain a local groundwater sink (where dewatering and evaporation exceeds inflows) and groundwater flow/plume migration in towards the pit	3	4	2	2	2	24	Low	20.0
Visual	The development /expansion and operation of the WRDs occur simultaneously and visual impacts	-	3	2	2	4	3	24	Low	• Reshaping of the WRD to blend into environment • Revegetate side slopes • Implement closure plan	3	2	2	2	1	18	Low	25.0

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
	expected with this phase are evaluated in a similar manner.																	
	Visual Impacts during construction and operation of future Telele Underground Mine	-	1	1	1	2	1	4	Low	• Dust suppression Closure plan and keep plan up to date	1	1	1	2	1	4	Low	0.0
	Visual Impacts during construction and operation of attenuation ponds	-	1	1	1	2	1	4	Low	• Implement closure plan	1	1	1	2	1	4	Low	0.0
Surface Water	**Attenuation Dam** Infrastructure not required after closure should be removed and the footprint areas rehabilitated. All rehabilitation activities should be monitored until vegetation is well established	-	3	4	2	6	3	36	Moderate	All rehabilitation activities should be monitored until vegetation is well established and no further surface water quality impacts are deemed likely.	2	1	2	6	2	18	Low	50.0
	Pollution Control Dam Infrastructure not required after closure should be removed and the footprint areas rehabilitated. All rehabilitation activities should be monitored until vegetation is well established	-	3	4	2	6	2	36	Moderate	All rehabilitation activities should be monitored until vegetation is well established and no further surface water quality impacts are deemed likely.	2	1	2	4	1	14	Low	61.1
	Expansion of opencast pit Infrastructure not required after closure should be removed and the footprint areas rehabilitated. All rehabilitation activities should be monitored until vegetation is well established	-	3	4	2	6	2	36	Moderate	All rehabilitation activities should be monitored until vegetation is well established and no further surface water quality impacts are deemed likely.	2	1	2	4	1	14	Low	61.1
Air Quality	Potential impact on human health from pollutant concentrations associated with decommissioning activities	-	2	2	2	2	1	12	Low	None	2	2	2	2	1	12	Low	0
	Nuisance dust fall rates associated with decommissioning activities	-	2	2	1	2	1	10	Low	None	2	2	1	2	1	10	Low	0
	Potential impact on human health from pollutant concentrations associated with closure activities	-	1	2	1	2	1	5	Low	None	1	2	1	2	1	5	Low	0
	Nuisance dust fall rates associated with closure activities	-	1	2	1	2	1	5	Low	None	1	2	1	2	1	5	Low	0
Socio-Economic	**Reduced exposure to environmental hazards and risks during closure and decommissioning** Closure of the mine and decommissioning of facilities which created environmental hazards. These include: • Mining • Blasting and vibrations activities • Waste rock dumps • Sewerage treatment facility • Crushing facility • RoM stockpiles Use of haul roads	+	2	5	2	4		22	Low	• Appoint a rehabilitation specialist to implement the requirements of the Closure and Rehabilitation Plan • Consider surrounding land uses and design post-mining land use options to support and enhance long-term development options. This should form part of the mine's closure plan, and needs to be informed by the surrounding farmers	3	5	2	4		33	Moderate	50
	Loss of local employment and LED support during mine decommissioning • Retrenchments • Cancellation of procurement contracts • Reduction in government income and taxes • Reduction in economic activity in the region • Increased unemployment and dependence on social grants		5	4	3	10		85	High	• Update the SLP and any other related policies and plans to ensure a solid local procurement strategy • Update the SLP to ensure that KMR's Skills Development Programme include: ○ Core business training ○ Learnerships ○ Portable skills training ○ One community bursary per year (ideally through a community trust) • Update the Employment Equity Plan in the SLP to provide equal job opportunities • Employment preference should be provided to the local residents. Manage employment by selecting employees according to an electronic selection system supported by JMLM	4	4	3	8		33	Moderate	48.2

Aspect	Nature of the impact		Significance of potential impact BEFORE mitigation						Mitigation Measures	Significance of potential impact AFTER mitigation						Degree of mitigation (%)
			P	D	E	M	LoR	Significance		P	D	E	M	LoR	Significance	
									that ensures recruitment from local, impacted communities. This should ensure a fair recruitment process. Related to this, KMR should ensure clear expectations in all platforms of communication of the number of jobs available and in what categories or fields of the mine. This would allow a clear indication of what types of jobs would be available. • Recruitment of labour should be guided by KMR's recruitment policies which should be transparent and communicated to stakeholders to limit opportunities for conflict situations • KMR must improve its local procurement strategies to ensure improved alignment with the Broad-Based Socio-Economic Empowerment Charter for the Mining and Minerals Industry (Mining Charter) (2018); • Use, as far as reasonably possible, local suppliers and SMMEs and invite them to list their businesses on a database managed by KMR • In addition to appropriate HR policies and procedures, establish a labour desk/employment committee to provide strategic guidance to the mine on labour recruitment policies (if this is not already established). This should ensure that recruitment is done in a fair and transparent way, and that job creation opportunities are maximised. • Allow those labourers who were involved in the construction phase a fair opportunity to apply for work during the operational phase • Provide sufficient opportunities for women and disabled persons to become employable on the mine • Training and skills development focused on women should take place to increase their participation in the labour force • Develop and implement, as far as reasonably possible, a plan for the gradual replacement of migrant labour by local employees • Target emerging employment opportunities at local residents, as well as people from the surrounding communities in cases where the skills cannot be obtained from immediately adjacent communities • KMR's Contractor Management Plan needs to be implemented to ensure that appointed contractors also employ locally as far as practically possible. • Encourage continued participation of labour unions in workplace skills plans, whilst the drafting of annual training reports should be encouraged, and feedback provided to employees at large meetings • Develop and implement a labour grievance mechanism as an HR function • Establish a community form to identify grievances and communicate these to the mine • The following International Labour Organisation (ILO) conventions must be adhered to: ○ ILO Convention 87 on freedom of association and protection of the right to organise ○ ILO Convention 98 on the right to organise and collective bargaining ○ ILO Convention 29 on forced labour							

Aspect	Nature of the impact	Significance of potential impact **BEFORE** mitigation						Mitigation Measures	Significance of potential impact **AFTER** mitigation						Degree of mitigation (%)
		P	D	E	M	LoR	Significance		P	D	E	M	LoR	Significance	
								○ ILO Convention 105 on the abolition of forced labour ○ ILO Convention 138 on the minimum age of employment ○ ILO Convention 100 on equal remuneration • ILO Convention 111 on discrimination							

16.5 Cumulative impacts

The following sections outline the cumulative impact as indicated by the specialists.

16.5.1 Freshwater

Cumulative impacts are activities and their associated impacts on the past, present and foreseeable future, both spatially and temporally, considered together with the impacts identified above.

The assessed reach of the Ga-Mogara River associated with KMR has already been influenced by impacts which have occurred upstream of the mine, including the formation of swallets, upstream river diversion structures and encroachment of various mining activities on portions of the river. These impacts have most likely had an effect on the ecological functioning of downstream reaches, and the proposed and existing activities at KMR are likely to contribute to further impacts downstream of the mine. In particular, the proposed attenuation dams will result in further loss of hydraulic connectivity within the system thus further reducing the possibility of flow reaching the downstream Kuruman River. It is likely that the downstream reaches of the river (between KMR and the Kuruman River) will undergo further transformation from a freshwater ecosystem to a more episodic ecosystem as a result of the cumulative impacts of the various flow-impeding structures within the Ga-Mogara River.

16.5.2 Floral

The proposed project could further impact on the floral habitat and diversity as well as floral SCC through fragmentation of habitat of increased biodiversity importance and sensitivity (specific reference is made to ingoing disturbance and transformation of the ESA).

AIP spread can potentially become severe if these species are not monitored and managed, especially along linear developments that typically serve as a corridor for spread. These species can spread to adjacent natural areas, thus impacting on the indigenous biodiversity of the region. The abundance of *Prosopis glandulosa* within the Ga-Mogara Habitat unit, if not cleared and controlled, will continue to spread downstream and displace floral communities outside of the mining footprint.

Ongoing mining expansion within the area surrounding Hotazel will contribute to regional scale loss of vegetation types associated with the KMR Expansion Activities, as well as the Kalahari endemic *Vachellia haematoxylon.*

16.5.3 Faunal

The local area has already been subjected to significant impacts as a result of historic and current mining activities and livestock farming. Over time, the mining activities will lead to the declined in faunal diversity within and potentially adjacent to the mining footprints as a result of many species being forced out of these areas into adjacent habitats. This may lead to increased competition for space and food resources, however, given the moderate abundance and faunal diversity in the footprint areas, this impact is not expected to be significant. Edge effects and AIP proliferation are more concerning over the long-term. AIP proliferation will ultimately lead to loss of viable habitat, on a potentially increased scale, in the surrounding areas, displacing faunal species further as indigenous floral species (faunal habitat and food resources) are displaced and lost.

16.5.4 Soil and Land Capability

The proposed expansion activities will lead to a permanent change of land use if not properly mitigated. The cumulative loss from a soil and land capability point of view is anticipated to be Medium pre-mitigation and Low after mitigation. This is due to the significant portion (65.05%) of the footprint area having soils classified as suitable for agricultural cultivation according to the land capability classification. However, the suitability for successful dry land agriculture is low due to the climatic conditions of the area and thus renders the soils to a restricted potential based on the land potential classification. This area experiences erratic and very low rainfall which is necessary for successful dryland agriculture. In addition, no large dams or irrigation schemes are available in the area thus limiting the soils in the area to grazing and wildlife land uses. The high evaporation rate of the hot, dry climate will result in regular irrigation needed should crops be produced in this manner. Lastly, the loss of agricultural soils and the permanent change in land use will be limited to the footprint areas. The integrated mitigation measures must be implemented accordingly, with the aim of minimising the potential loss of these valuable soils considering the need for sustainable development.

17 Specialist Recommendations

This section presents the recommendations that were proposed by specialists. Management measures were recommended to address and mitigate potential impacts arising from on project activities. Section 16.4 provides the specific recommendations relevant to impacts identified as part of the impact assessment.

17.1 Fresh water recommendations

17.1.1 Development and operational footprint

The following actions are recommended:

- Sensitivity maps have been developed for the focus area, indicating the watercourse, and relevant regulatory zones in accordance with NEMA, Regulation GN509 and Regulation GN704. It is recommended that this sensitivity map be considered during all phases of the development and with special mention of the planning of any future infrastructure layout, to aid in the conservation of the watercourse habitat within the MRA;
- All future prospecting or development footprint areas should remain as small as possible and should not encroach onto surrounding, more sensitive areas. Prospecting must only take place in the demarcated areas. If prospecting or development is to occur within the watercourse, strict regulation of activities therein must take place, and non-prospecting areas are to be considered off-limits to personnel and vehicles;
- The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas;
- Planning of temporary roads and access routes should take the site sensitivity plan into consideration, and wherever possible, existing roads should be utilised. If additional roads are required, then wherever feasible such roads should be constructed a distance from the watercourse areas and not directly adjacent thereto. If crossings are required they should cross the system at right angles, as far as possible to minimise impacts in the receiving environment, and any areas where bank failure is observed due to the effects of such crossings should be immediately repaired by reducing the gradient of the banks to a 1:3 slope and where needed necessary, installing support structures. This should only be necessary if existing access roads are not utilised;
- All areas of increased ecological sensitivity should be marked as such and be off limits to all unauthorised construction and maintenance vehicles and personnel;
- Appropriate sanitary facilities must be provided for the life of the proposed project and all waste removed to an appropriate waste facility;
- All hazardous chemicals should be stored on bunded surfaces and no storage of such chemicals should be permitted within the freshwater buffer zones;
- No informal fires should be permitted in or near the construction areas;
- Ensuring that an adequate number of rubbish and “spill” bins are provided will also prevent litter and ensure the proper disposal of waste and spills; and

- Edge effects of activities, particularly erosion and alien/weed control need to be strictly managed.

17.1.2 Vehicle access

The following actions are recommended:

- All areas of increased ecological sensitivity should be marked as such and kept off limits to all unauthorised construction and maintenance vehicles as well as personnel;
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil; and
- All spills, should they occur, should be immediately cleaned up and treated accordingly.

17.1.3 Alien plant species

The following actions are recommended:

- Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the project footprint. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled;
- Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction, operational, closure/decommissioning and rehabilitation/ maintenance phases; and
- Species specific and area specific eradication recommendations:
- Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used;
- Footprint areas should be kept as small as possible when removing alien plant species;
- No vehicles should be allowed to drive through designated sensitive watercourse areas during the eradication of alien and weed species.

17.1.4 Freshwater habitat

The following actions are recommended:

- Ensure that as far as possible all infrastructure is placed outside of watercourse areas and applicable regulatory zones. A minimum buffer of 100m around all watercourse/freshwater systems should be maintained in line with the requirements of regulation GN704 of the NWA for all non-resource dependent infrastructure. If these measures cannot be adhered to, strict mitigation measures will be required to minimize the impact on the receiving watercourses. Such measures include those stipulated in Section 5 of this report, in addition to the following:
- Ensuring that measures are implemented to prevent dirty runoff water entering the watercourse habitat; and
- Ensuring that where necessary, exposed soils in the vicinity of watercourse habitat are protected from erosion by means of reinstating natural vegetation following construction,
- Permit only essential personnel within 100m of the watercourse habitat, if absolutely necessary that they enter the regulatory zone;
- Limit the footprint area of the construction activities to what is absolutely essential in order to minimise environmental damage;
- During prospecting, no vehicles should be allowed to indiscriminately drive through the freshwater areas;
- All waste materials generated during any phase of the proposed activities must be prevented from entering the watercourses; and

- Implement effective waste management in order to prevent construction related waste from entering the watercourse environments.

17.1.5 Soils

The following actions are recommended:

- To prevent the erosion of soils, management measures may be determined by the site engineer at their discretion and may include mechanisms such as temporary silt traps or hessian curtains. Revegetation with indigenous graminoid species is however recommended for long-term protection of soils and it is suggested that such revegetation of disturbed areas is undertaken concurrently with prospecting;
- Maintain topsoil stockpiles below 5 meters in height;
- As far as possible, all construction activities should occur in the low flow season, during the drier winter months;
- All soils compacted as a result of construction activities falling outside of project footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas; and
- Monitor all areas for erosion and incision. Any areas where erosion is occurring excessively quickly should be rehabilitated as quickly as possible.

17.1.6 Rehabilitation

The following actions are recommended:

- All soils compacted as a result of construction activities falling outside of project footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout all construction and rehabilitation phases to prevent loss of floral habitat;
- Edge effects of activities including erosion and alien/ weed control need to be strictly managed in these areas;
- As far as possible, all rehabilitation activities should occur in the low flow season, during the drier winter months.
- As much vegetation growth (of indigenous/endemic floral species) as possible should be promoted within the proposed development area in order to protect soils;
- All alien vegetation in the watercourse areas should be removed from rehabilitated areas and reseeded with indigenous grasses as specified by a suitably qualified specialist (ecologist);
- All areas affected by prospecting activities should be rehabilitated upon completion of the activities.

17.2 Flora

The following recommendations have been suggested for the Ga-Mogara Habitat Unit and Savannah Habitat Unit.

17.2.1 Ga-Mogara Habitat Unit Recommendations

- Given the existing impacts to the greater Ga-Mogara River system, it is highly advised that no further impact to the system take place and that as per the recommendations of the BAPs, the improvement of current vegetation condition and ecosystem functioning be strived for. If authorised, the River and Buffer Zone Revegetation Plan (Eco-Pulse & EMS, 2019a) must be updated to reflect additional impacts to the system. Based on the data that was made available to the specialists at the time of writing this report, no rehabilitation has been recommended for the Ga-Mogara Habitat that will be impacted by the proposed pit expansions. As such, a rehabilitation plan must be drawn up, and approved, if the proposed activities in the Ga-Mogara Habitat receives authorisation.

- If the proposed KMR Expansion Activities are authorised, it is recommended that stormwater management and erosion control measures must be implemented to limit sediment runoff into the Ga-Mogara Habitat. Refer also to the Freshwater Ecological assessment (SAS 202196, 2021) with regards to mitigation measures for the proposed activities in the Ga-Mogara Habitat, as well as important recommendations regarding the zones of regulation.
- AIP control within any watercourse is essential, particularly that of Prosopis glandulosa. If the proposed project is authorised, the Alien Invasive Plant Eradication and Control Programme as proposed by Eco-Pulse & EMS (2019) must be revised and should include the proposed expansion activities. To minimise the rehabilitation and alien control costs post decommissioning, it is recommended that ongoing alien control be implemented throughout the mining process as this will limit the spread of such species to the surrounding areas, especially regarding downstream habitat of the Ga-Mogara Habitat. Engagement with neighbouring landowners should be considered for an integrated AIP management plan to ensure long-term success of AIP control along the Ga-Mogara River.
- The vegetation surrounding the proposed mine layout should be maintained and rehabilitated where it is degraded to allow these stretches of vegetation to serve as a buffer against potential edge effect impacts from the proposed mining activities. This will also allow for less fragmented habitat and thus improve movement corridors.

17.2.2 Savannah Habitat Unit Recommendations

- Sections on Kipling are associated with numerous, older specimens of Vachellia erioloba trees. These trees are protected under the NFA and cannot be “rescued” during construction or mining activities. The very hard wood and deep tap root system makes translocation of adult specimens unsuitable (Root/shoot ratio about 40%. Roots extend about 1.2 times further than the crown area). Due to the wide extent and morphology of the tree’s root system, transplanting of trees usually involves substantial removal of roots. The whole transplanting process in particular for large trees is an engineering feat and requires substantial involvement of resources and time. The taproot of Vachellia erioloba species can descend to 60 m, providing access to deep ground water. The excavation of individuals will undoubtably result in damage to the root and will result in unsuccessful translocation. As such, it is highly recommended that clearance to these species be avoided at all costs. If this is not possible, their numbers should be offset with at minimal a 1:3 ratio and the areas where these species will be planted cannot be in an area earmarked for future mining.
- Similar to the above, the loss of Vachellia haematoxylon individuals is highly undesirable due to the restricted distribution range of this Kalahari endemic. Offsetting loss of these individuals must be pursued where avoidance or rescue and relocation is not possible. The old mine workings to be rehabilitated on Devon is within an area where Vachellia haematoxylon is abundant. The rehabilitation of this area must incorporate the planting of these species.
- As per the recommendation of the Closure and Rehabilitation plans for Kudumane Manganese Mine, rehabilitation of available areas should occur concurrently and must aim to achieve the pre-mined state (where feasible). As such, the mining footprint must be kept to a minimal and as close to existing infrastructure as possible. This will prevent further habitat fragmentation and thus reduce the chances or rate of habitat loss due to edge effect impacts, thereby lowering rehabilitation requirements.
- Poor vegetation management has resulted in bush encroachment and the presence of AIPs. These must be managed across the KMR MRAs with a particular focus on areas surrounding anthropogenic activities. The ongoing spread and intensification of AIPs and bush encroachment must be prevented and managed. The AIP management plan set up by Eco-Pulse & EMS (2019b) is adequate but will need an amendment to include new expansion activities and should reflect the updated NEMBA Legislation of alien and invasive species.

17.3 Faunal

Various recommendations have been suggested in Section 16.4 with regards to impacts which were identified as part of the impact assessment conducted.

17.4 Soils and Land Capability

Various recommendations have been suggested in Section 16.4 with regards to impacts which were identified as part of the impact assessment conducted.

17.5 Heritage

The following actions are recommended:

17.5.1 Pre-Construction and Construction Phases

The project will encompass a range of activities during the Pre-Construction and Construction Phases, including disturbance to the soil surface and development activities associated with the project.

It is always possible that cultural material may be exposed during construction and may be recoverable, keeping in mind delays can be costly during construction and as such must be minimised. Development surrounding mining and construction results in significant disturbance; however, any excavation work offers a window into the past, and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project, and these must be catered for. Temporary infrastructure developments, such as construction camps and laydown areas, are often changed or added to the project as required. In general, these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the Pre-Construction and Construction Phases, it is important to recognize any significant material being unearthed, making the correct judgment on which actions should be taken. It is recommended that the following chance find procedure should be implemented.

17.5.2 Chance Find Procedure

The recommended chance procedure as followed:

- A heritage practitioner / archaeologist should be appointed to develop a heritage induction program and conduct training for the ECO as well as team leaders in the identification of heritage resources and artefacts.
- An appropriately qualified heritage practitioner / archaeologist must be identified to be called upon if any possible heritage resources or artefacts are identified.
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated, and construction activities halted.
- The qualified heritage practitioner / archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and the impact on the heritage resource.
- The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the materials and data are recovered.
- Construction can commence as soon as the site has been cleared and signed off by the heritage practitioner / archaeologist.

17.5.3 Possible finds during Pre-Construction and Construction Phases

The study area occurs within a greater historical and archaeological context as identified during the desktop and fieldwork phase. Soil clearance may uncover the following:

- High density concentrations of stone tools.
- Unmarked graves.
- Archaeological middens associated with very old farmsteads and structures.

17.6 Traffic Recommendations

The following recommendations are made in terms of the detailed design phase of roads as part of the existing KMR mine and the proposed KMR Expansion Project:

- Detailed investigations should be conducted in conjunction with the relevant road's authority in terms of the existing quality and potential life span of the existing road surface layers of the roads where consumables, ROM ore and workers will be transported; and
- A road maintenance plan should be prepared in conjunction with the relevant road authority on public roads where trucks will operate as soon as the project has been approved to ensure that the consumables, ROM ore and workers can be transported at all times.

18 Environmental Impact Statement

The impact assessment as detailed in Section 16 assessed the types of impact, duration of impacts, likelihood of potential impacts occurring and the significance of impacts.

Assuming all phases of the project adhere to the conditions stated in the EMPr (Section 16 the EAP is of the opinion that the potential impacts associated with the proposed KMR Expansion Project activities can be appropriately managed.

18.1 Final site map

A map which superimposes the proposed infrastructure associated with the proposed KMR Expansion Project on the environmental sensitivities of the proposed location of the infrastructure, including buffers is provided in Appendix J.

18.2 Positive and negative associated with the proposed activity and alternatives

Refer to Section 16 for positive and negative impacts identified for the proposed project.

19 Proposed Impact Management Objectives

Impact management objectives are provided in in Table 19-1. The impacts associated with the proposed KMR Expansion Project and the identified management measures are provided in Section 16. The significance rating of each impact has been re-evaluated post-implementation of management commitments to provide an indication of the effectiveness of the management measures. Through the implementation of the management measures, KMR will aim to achieve the management objectives associated with the proposed KMR Expansion Project. The closure objectives is detailed in Section 28.1.

Table 19-1: Impact management objectives

Aspect	Objective
Socio – Economic	• To enhance benefits from the development of the project activities • To maximise opportunities for local residents • To facilitate employment of local labour on the Mine • To avoid creating unrealistic expectations • To prevent or minimise negative impacts resulting from the construction and operation of the project activities

Aspect	Objective
Surface and Ground Water	• Limit erosion and the consequent degradation of soil and pollution of air and water • Manage clean and dirty water systems effectively • Locate, design and construct mine infrastructure to minimise the risk of flooding both to the mine and to any other riparian users • Monitor surface water and groundwater quality during the life of the mine and post closure
Air Quality	• Manage mine residue deposits to minimise risk of injury to humans and animals; damage to infrastructure; and contamination of the environment • Minimise the risk of pollution associated with the road transport of material • Minimise the risk of pollution arising from mine residue deposits post closure • To minimise the amount of dry material susceptible to wind erosion • To minimise the entrainment potential of dust • To respond with corrective action to public complaints about dust related health and nuisance impacts • To reduce the emissions from the vehicles
Cultural Heritage	• To respect the culture and heritage of the people in the area • To avoid disturbance of graves and where not possible to undertake relocating of graves according to legal requirements and to determine mitigation in consultation with local communities
Biodiversity	• To demonstrate active stewardship of land and biodiversity • To avoid the damage or loss of plants and where not possible to ensure the conservation of representative habitats • To avoid the loss or disturbance of fauna populations and migration paths and where not possible to ensure the conservation of representative habitats
Soils and Land Capability	• To remove and store soil to enable its reuse for rehabilitation • To prevent and minimise soil erosion and contamination
Noise	• To minimise adverse noise impacts from construction and operation • To respond with corrective action to public complaints about noise

19.1 Final proposed alternatives

There are no additional alternatives to those identified and assessed through the impact assessment process are proposed for the mine development.

19.2 Aspects for inclusion as conditions of authorisation

Over and above the management measures detailed Section 16. The following conditions should be included in the authorisation:

- KMR should continue to reassess the risks and impacts of the development throughout its operational life. Should any change in the risk and impact profile of the development be determined, additional management controls and mitigation measures must be implemented and the EMPr amended to reflect these changes;
- Any substantial change to the infrastructure site layout as represented in the heritage report must be subjected to a field survey;
- The process for the relocation of graves must be followed;
- Monitoring of surface and groundwater will be undertaken in line with the monitoring programmes as detailed in the WULA associated with the proposed KMR Expansion Project.

19.3 Description of any assumptions, uncertainties and gaps in knowledge

The following assumptions, limitations and constraints highlighted and considered as part of the EIA for the proposed KMR Expansion Project:

Table 19-2: Assumptions, limitations and constraints

Study	Assumptions, limitations and constraints
General assumptions	The impact assessment was conducted based on the information provided by the client at the time of compiling this report and it is assumed that the proposed expansion activities will be constructed in line with this information.
Freshwater	The watercourse assessment is confined to the MRA and does not include the neighbouring and surrounding properties outside of the focus area. The general surroundings and important catchment characteristics were, however, considered in the desktop assessment of the focus area: • During the site assessment undertaken in July 2021, a single watercourse, identified as the Ga-Mogara River, was identified along the western boundary of the MRA. The Witleegte River, a small tributary of the Ga-Mogara River, was identified via desktop methods entering the south-eastern corner of York, where it confluences with the Ga-Mogara River. The Witleegte River and the reach of the Ga-Mogara River located within 500m of the MRA was delineated on a desktop basis using topographic maps and digital satellite imagery, in line with Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998). Only the reach of the Ga-Mogara River located within the MRA was assessed as part of this investigation • The MRA is situated within a semi-arid region, receiving an average annual rainfall of approximately 380mm per annum (SRK, 2020). The assessment was conducted during the dry winter season, and therefore identification of some floral species was not feasible due to the absence of inflorescences. However, due to the semi-arid climate in combination with the episodic characteristics of the Ga-Mogara River, it is not anticipated that the results of the assessment would greatly vary if the assessment was undertaken during the summer rainfall period • The application of aquatic assessment indices (such as the South African Scoring System version 5 [SASS5]) was not undertaken as conditions at the time assessment conducive to the application of such indices. Thus, instream conditions were inferred based on available databases, a visual assessment and professional experience of conditions in other reaches of the same watercourse. Therefore, although the instream Index of Habitat Integrity (IHI) (Kleynhans et al, 2008) was applied, it was undertaken with caution and a moderate degree of confidence, with the aim of providing a 'snapshot' of instream habitat conditions at the time of assessment • SAS previously undertook an ecological assessment of this reach of the Ga-Mogara River for SLR Consulting (Africa) (Pty) Ltd in 2017. The method of assessment utilised in 2017 to ascertain the PES of the river differs from that used during this assessment with the latter method being developed specifically for riverine and instream habitats. Additionally, the method for ascertaining ecological and socio-cultural service provision has been refined by the authors with the updated tool being made available in late 2020. Thus, some discrepancy in the PES category and Ecoservices provision has occurred, however this is due to differences in the methodologies and not the result of inconsistencies in the application of the assessment methods • The watercourse delineation as presented in the Freshwater report (Appendix I) was regarded as the best estimate of the watercourse boundaries based on the site conditions present at the time of assessment and based on the level of field verification possible. However, some limitations in the accuracy of the delineation due to historical and ongoing anthropogenic disturbances, in particular the alteration of the vegetation community composition and topography as a result of historical and current mining practices with specific mention of the authorised encroachment of the open pits within the 1:100 year floodline of the river, is deemed possible, although every effort has been made to ensure accuracy of the delineation

Study	Assumptions, limitations and constraints
	• Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. If more accurate assessments are required, the watercourse zones will need to be surveyed and pegged according to surveying principles • Aquatic, riparian and terrestrial areas form transitional areas where an ecotone is formed as vegetation species change from terrestrial species to facultative/riparian zone species. Additionally, due to the naturally arid characteristics of the MRA, many species found in the riparian zone occur in terrestrial areas, albeit in diminished abundance and/or structure (e.g. height of individual plants may be greater in the riparian zone than in the adjacent terrestrial areas). Within the transition zone some variation of opinion on the riparian zone boundary may occur, however if the DWAF 2008 method is followed, all assessors should get largely similar results • Both the DWS Risk Assessment Matrix (2016) and the impact assessment method supplied by SRK Consulting (South Africa) (Pty) Ltd were applied to the proposed activities and in relation to the identified watercourse. However, it is crucial to note that although these two methods may present different scores and impact significance ratings for the same activity, this is due to differences in their methodologies and not due to inconsistencies in their application. Each should be judged individually for their specified purpose; i.e. the use of the SRK Consulting (South Africa) (Pty) Ltd Impact Assessment method for the purposes of applying for amendment to the Environmental Authorisation in terms of NEMA, and the use of the DWS Risk Assessment Matrix to inform the Water Use Licence Application (WULA) • Although numerous proposed activities are included in the project description, those which are situated within or to the west of existing disturbances (for example, the proposed York haul road expansion and upgrade, relocation of the York PCD and rail loop expansion on York) were excluded from the impact and risk assessments as the quantum of risk posed by these activities is deemed very low to negligible. This is attributed to the distance of those activities from the watercourse, the relatively uniform topography of the MRA, and the barrier formed by existing activities between the watercourse and the proposed expansion activities • At the time of the assessment, details pertaining to the proposed or intended activities within the area labelled “Kipling Anomaly” were not available. Therefore it was not possible to assess potential risk / impact significance in that area beyond the possibility of vegetation clearing and site preparation and • A construction method statement for the proposed attenuation dams within the Ga-Mogara River was not available at the time of undertaking this study. Therefore, certain assumptions have been made when assessing the potential risk / impact significance of these, in particular during the construction phase. Should a detailed method statement be made available at a later stage the risk / impact assessments may need to be revised accordingly.
Heritage	The following assumptions and limitations regarding this study and report exist: • Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is important to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. In fact, due to the dense vegetation cover and access constraints within the study area, it is highly likely that the presently identified heritage sites are not a complete record of all the archaeological and heritage resources located within the study area. Areas not assessed during the fieldwork comprise disturbed areas and the project’s affected properties which do not fall within KMR’s mining right which meant that access was not allowed. These last-mentioned areas include all the proposed development footprints located on the farms Umtu 281, Olive Pan 282 and Gama 283. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted. Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will

<table>
<tr><th>Study</th><th>Assumptions, limitations and constraints</th></tr>
<tr><td></td><td>apply as set out below. Additionally, once access to the farms Umtu 281, Olive Pan 282 and Gama 283 is possible, additional field assessment of those footprints is required. This must be undertaken long before construction activities start.
The study area boundaries and development footprints depicted in this report were provided by the client. As a result, these were the areas assessed during the fieldwork. Should any additional development footprints located outside of these study area boundaries be required, such additional areas will have to be assessed in the field by an experienced archaeologist/heritage specialist long before construction starts.</td></tr>
<tr><td>Soils and land capability</td><td>For the purpose of the soil and land capability assessment, the following assumptions are applicable:
This study was undertaken as a desktop assessment only., the information gathered during the analyses of available databases must be considered with caution, as inaccuracies and data capturing errors are often present within these databases;
No site visit was conducted by the author of this report and thus relied on the soil information report compiled by Paterson (2014) for soil classification and other information;
The land type data (Eloff et al., 1986) was used to gather the soil information on the MRA;
The soil information compiled by Paterson (2014) was confined to the MRA and does not include adjacent areas, however for the purpose of this study it was limited to the footprint areas;
This soil information was used to infer the land capability classes of the area; and
The soil, land use and land capability desktop assessment are confined to the MRA and does not include the neighbouring and adjacent properties.</td></tr>
<tr><td>Surface water</td><td>The following assumptions were accepted:
All the mining facility areas accepted as fully developed and does not change through the time.
Rainfall and evaporation will occur from the biggest area from open pits. Therefore, pit lake direct rainfall and pit wall runoff flow conditions were not separated since there is no final design and depth-storage-area relationships.
Groundwater inflow into pits and water abstraction volumes from the pit considered stable for each month.
External catchment areas addressing into mine facilities are constant and surface developments and changes did not consider.
Based on the site observation, York SW PCD is out of use. Therefore, only rainfall and evaporation mechanism were evaluated in the model.</td></tr>
<tr><td>Visual</td><td>The following assumptions and limitations are relevant to the visual study:
No infrastructure heights were provided and no viewshed modelling could be undertaken. The extent of the impact is therefore subjective based on existing landscape and topography.
No site visit was undertaken.
A VIA, by nature, is not a purely objective or a quantitative process, but is dependent on the subjectivity of the judgments made. Where required, appropriate criteria and motivations have been clearly stated.</td></tr>
<tr><td>Floral</td><td>The following assumptions and limitations are applicable to this report:
The floral assessment is confined to the proposed KMR Expansion Activities and does not include the full extent of the MRAs nor the neighbouring and adjacent properties. The proposed KMR Expansion Activities and immediate surroundings were, however, included in the desktop analysis of which the results are presented in Part A: Section 3;
Sampling by its nature means that not all individuals are assessed and identified. With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. The field assessment took place during winter (20th – 23rd of July 2021) and thus falls outside of the flowering season of several species within the region, particularly graminoids and geophytes which either go dormant during</td></tr>
</table>

Study	Assumptions, limitations and constraints
	winter or lack the diagnostic characteristics to make confident identification to species level. A more comprehensive assessment would require that assessments take place in all seasons of the year. To account for seasonal limitations, on-site data was significantly augmented with all available desktop data and background research of previous studies conducted for the KMR: o NCC Environmental Services (Pty) Ltd. 2019a. Annual Biodiversity Assessment for Kudumane Manganese Resources Farm York 279 and Farm Hotazel 280. Northern Cape Province. Prepared for: Kudumane Manganese Resources. July 2018. o NCC Environmental Services (Pty) Ltd. 2019b. Annual Biodiversity Assessment and Biodiversity Action Plan Kudumane Manganese Resources Farm York 279 and Farm Hotazel 280 Northern Cape Province. Prepared for: Kudumane Manganese Resources. November 2019. o Eco-Pulse & EMS. 2019a. River and Buffer Zone Revegetation Plan for the Kudumane Manganese Resources Mine in Hotazel, Northern Cape. Final Report. Unpublished specialist Report prepared by Eco-Pulse Consulting cc and Ecological Management Services cc for Kudumane Manganese Resources (Pty) Ltd. September 2019. o Eco-Pulse & EMS. 2019b. Kudumane Manganese Resources Mine near Hotazel, Northern Cape: Alien Invasive Plant Eradication and Control Programme. Final Report. Specialist Report prepared by Eco-Pulse Consulting cc and Ecological Management Services cc for Kudumane Manganese Resources (Pty) Ltd. Report No. EP460-02. October 2019. o Phillips, R. and Mshengu, T., 2018. Kalagadi Manganese Mining Right Amendment, Hotazel, Northern Cape. J38048. Ecological Assessment. September 2018. o Ecological Management Services (EMS). 2015. Draft Biodiversity Offset investigation for the Kudumane Manganese Mine, Hotazel Northern Cape. April 2015. o Ecological Management Services (EMS). 2014. Biodiversity Assessment for the Proposed Kudumane Manganese Mine, Hotazel, Northern Cape. May 2014. o Ecological Management Services (EMS). 2012. Biodiversity Action Plan for the proposed Kudumane Manganese Mine near Hotazel in the Northern Cape. October 2012. o Ecological Management Services (EMS). 2009. Ecological survey for the proposed Manganese Mine, near Hotazel, Northern Cape. • The Department of Forestry, Fisheries, and the Environment's (DFFE) Screening Tool provides names of sensitive species likely to be present within the study area and its surrounds. Within the screening tool outcome, the names of some species are not provided. These species are rather assigned a number keeping them unidentifiable (e.g., Sensitive species 1). This procedure is followed because of the vulnerability of the species to threats such as illegal harvesting and overexploitation. According to the best practise guidelines provided by South African National Biodiversity Institute (SANBI), the identity of sensitive species may not appear in the final EIA report nor any of the specialist reports released into the public domain. However, the conservation threat status of such species has been provided.
Faunal	• The following assumptions and limitations are applicable to the Faunal Report: • The faunal assessment is confined to the area wherein the proposed KMR expansion activities will occur (henceforth interchangeably referred to as "the sites") and does not include the neighbouring and adjacent properties, nor does it include the entire extent of the MRAs. These were however considered as part of the desktop assessment • With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most faunal communities have been accurately assessed and as such the information provided herein is considered sufficient to allow informed decision making to take place and facilitate integrated environmental management • ➢ As part of the assessment, a field investigation was undertaken during winter (20th – 23rd of July 2021) to determine the ecological status of the proposed KMR expansion

<table>
<tr><th>Study</th><th>Assumptions, limitations and constraints</th></tr>
<tr><td></td><td>activities and to “ground-truth” the results of the desktop assessment. A more accurate assessment would require that assessments take place in all seasons of the year, especially in summer after the rainy season. The dry conditions experienced during this winter field assessment, would have had a significant role in limiting faunal diversity data. However, on-site data was significantly augmented with all available desktop data, previous specialist studies undertaken by the mine and specialist experience in the area. The findings of this assessment are considered to be an accurate reflection of the ecological characteristics associated with the locality of the proposed KMR expansion activities
Due to the nature of sampling and the secretive habits of most faunal taxa, it is unlikely that all species would have been observed during a field assessment of limited duration during the winter season when many species are inactive. Some species and taxa within the footprint area may therefore have been missed during the assessment. The survey was also undertaken during winter when a large component of the faunal assemblage, notably insects, reptiles and birds, would be in metamorphosis, hibernating or may have migrated. Thus, for a more accurate and complete data collection, summer assessments are considered more reliable. To limit these seasonal and time constraints, site observations were compared with desktop literature and previous specialist studies undertaken by the mine where necessary
On the farm York, there is a private nature reserve that was sampled along with all other areas associated with the proposed KMR expansion activities. This reserve has been artificially stocked with game, that will not be sustained in the area naturally and they require anthropogenic intervention (such as watering holes and additional feed) to survive in the ecosystem on site. As such, the presence of many of the large game species confirmed in this reserve, are considered unnatural and not a true reflection of the faunal diversity and ecology on site. Nonetheless, the contribution that this nature reserve may have on faunal ecology and diversity on the rest of the site and how it connects to the remaining site portions, was considered in this faunal assessment and
Faunal surveys are most successful when undertaken during summer when faunal activity is considered to be highest. To confirm the absence or presence of many of these species within the site an additional summer survey may be necessary.</td></tr>
<tr><td>Blasting</td><td>The following assumptions were made as part of the blasting assessment:
The project consists of extension of existing pit areas and new pit area where no mining is currently being conducted. Existing operations were visited.
The anticipated levels of influence estimated in this report are calculated using standard accepted methodology according to international and local regulations.
The assumption is made that the predictions are a good estimate with significant safety factors to ensure that expected levels are based on worst case scenarios. These will have to be confirmed with actual measurements once the operation is active.
The limitation is that limited data was available from this operation for a confirmation of the predicted values.
Drilling and blast designs from the existing York pit was applied in this report. Similar operations are expected for the Hotazel and Kipling pit areas.
The work done is based on the author’s knowledge and information provided by the project applicant.</td></tr>
<tr><td>Closure</td><td>The following knowledge gaps were identified and could have an effect on the closure liability quantum:
It is important to note that the DMRE opencast rehabilitation closure component (including final voids and ramps) does not allow for backfilling of the void, but only makes provision for the sloping of the pit walls to 1V:3H i.e., making the voids safe for humans and domestic animals. This is contradictory to the KMR EIA/ EMP report which states that “Once the open pit reaches steady state, ongoing backfilling and rehabilitation of the mined-out areas will occur as mining advances. Upon completion of opencast mining operations, the remaining opencast voids will be backfilled and rehabilitated” (Metago, 2010). The implementation of the NEMA financial provision regulations may lead to an increase in liability since the actual cost of backfilling will have to be estimated.</td></tr>
</table>

Study	Assumptions, limitations and constraints
	• The anticipated liability related to the activities associated with the proposed KMR expansion project was calculated based on the available information that was provided. Assumptions were made to calculate the relevant quantities where no information was available. • No closure-specific specialist studies were conducted to determine the probability of potential residual and latent risks; therefore, the residual and latent risk liability cannot be determined at this stage.
Traffic	For the purpose of this traffic impact assessment, it is assumed that: • The vehicle traffic absorption rate (rate at which existing developments attract vehicular traffic) by all other types of completed developments will maintain the same status for the next five years. • That the average rate of growth of vehicle traffic in the area under investigation that is not relevant to the Proposed KMR Expansion Project (background traffic) between the 2021 to 2026 scenarios were anticipated at 3% per annum.

20 Reasoned opinion as to whether the proposed activity should or should not be authorised

The environmental authorisation process associated with the proposed KMR Expansion Project for KMR was undertaken in terms of the relevant environmental authorisation requirements as detailed in Section 5. The environmental authorisation process was underpinned by an extensive stakeholder engagement process with in-depth consultation undertaken through various forms of engagement as detailed in Section 11. As part of this engagement, additional pre-application meetings with the leadership structures were conducted prior to the commencement of the environmental authorisation process.

The specialists' studies as detailed in Section 12 were undertaken. The specialist findings have been taken into account and addressed (as far as practically possible) as well as the project-specific issues which were raised.

In terms of the locality of the proposed project related infrastructure, areas of sensitivity were taken into consideration during the design phase and were avoided as far as practically possible. Where avoidance could not be achieved in terms of the design requirements of the proposed infrastructure, appropriate mitigation measures were developed to be implemented to reduce the impacts on the environment, as detailed in Section 16. The proposed mitigation measures were developed based on the nature, duration, severity and probability of the impact and based on the recommendations made by the specialists, as presented in Section 17.

In addition, since KMR is an existing operational mine, mine personnel are presently managing impacts in line with exiting environmental management requirement. These impacts are of a similar nature to the proposed KMR Expansion Project.

It is SRK's reasoned opinion that this project should be authorised based on the following:

- The impacts which have been identified can be mitigated through the implementation of the identified management measures in Section 16;
- Should the proposed KMR Expansion Project not be implemented, KMR will have to close the Hotazel operations as the majority of the resources have already been mined. This will result in job losses as the Hotazel pit expansion is intended to maintain the existing personnel employed at KMR. Any additional local economic development opportunities as well as procurement of local goods and services to support the mine activities will not be realised. The projected temporary employment opportunities during the construction phase will not be fulfilled.

20.1 Period for which the environmental authorisation is required

The EA is required for the duration of the LoM which is currently estimated to be beyond 2043

21 Financial Provision

The combined closure liability for all three mining operations associated with the Mining Right (NC 30/5/1/2/2/10053 MR), as calculated in September 2021, is R38 321 323,95 (including P&G and contingency, excluding VAT). The liability (including P&Gs, contingencies and excluding VAT) per operation is:

- Hotazel – R19 036 266,44;
- Devon – R302 818,36; and
- Kipling – R18 982 239,16.

The financial provision guarantee that is currently available for rehabilitation is R44 518 776.00 as issued by Lombard Insurance (validation document dated 8 September 2020). The liability update completed in April 2021 for Hotazel and Devon indicates a shortfall of R1 105 939.14 between the 2020 guarantee and the 2021 liability estimate. The guarantee will be adjusted in line with the closure liability for the proposed activities after Environmental Authorisation is received.

KMR is in the process of compiling the Final Rehabilitation, Decommissioning and Mine Closure plan, with the associated Risk Assessment as required by the Financial Provision Regulations for all the activities associated with the KMR expansions project.

Refer to Appendix I for the closure report compiled by Shangoni (2021)

21.1 Explain how aforesaid amount was derived

The following steps were taken to compile the environmental closure liability:

- The structures/disturbances were measured using designs, surveyor maps, aerial photos and other documents necessary to calculate the closure liability obtained from the mine and information was incorporated in the calculation spreadsheet;
- The assumptions were defined based on existing EIA/EMPr commitments; and
- Existing liabilities associated with the closure liability report compiled in April 2021 (Shangoni) were considered to avoid double costing.

The closure liability calculation consists of the following main categories:

- Physical - Demolition of infrastructure where infrastructure does not form part of end-land use;
- Biophysical - Actions to safeguard (making safe and stable) and re-establish the biophysical to ensure a sustainable landform and mitigate identified risks. This includes ripping disturbed areas and seeding some of the ripped areas (where vegetation could not establish naturally); and
- Post-closure management – Actions required as part of aftercare after the mine has been closed.

The following information (Table 21-1) serves as input into explaining the process followed to calculate the financial provision required.

Table 21-1: DMRE criteria applied in calculating the liability

Aspect	DMRE Guideline Reference	Input
Minerals mined / processed	Table B12	Manganese ore (oxide)
Primary risk class	-	Class B, medium risk
Environmental sensitivity	Table B4	Medium
Specialist studies required	Table B9	Screening level risk assessment

Preliminary and General	-	12% of sub-total 1 because sub-total 1 < R 100 000 000.00.
Contingency	-	10%
Weighing factor 1 – Nature of terrain	Table B7	Flat – 1.00
Weighing factor 2 – Proximity to urban area	Table B8	Peri-urban – 1.05 (Peri-urban: less than 150 km from a developed urban area)

21.1.1 Demolition and rehabilitation rates

The personnel within the DMRE Regional Offices are required to review and approve the quantum, that is, the monetary value of the financial provision that has been computed by the holder of a prospecting right, mining right or mining permit during the annual review as being sufficient to cover the environmental liability at that time and at closure of the mine.

A guideline document titled Guideline document for the evaluation of financial provision made by the mining industry has been developed to address this need and is for use by the DMRE personnel in the Regional Offices.

The guideline for the calculation of closure cost issued by DMRE in 2005 was used to support the calculation of the closure cost quanta. The tariffs used in the liability calculation were obtained from the DMRE on the 10th of May 2021. Table 5 contains the rates used for the 2021 closure liability calculation.

Table 21-2: Applicable DMRE rates used for quantum determination

	Description	Unit	Rate
2a	Demolition of steel buildings and structures	m^2	R 238,71
2b	Demolition of reinforced concrete buildings and structures	m^2	R 351,79
3	Rehabilitation of access roads	m^2	R 42,72
5	Demolition of housing and/or administration facilities	m^2	R 477,42
6	Opencast rehabilitation including final voids and ramps	ha	R 242 984,15
8a	Rehabilitation of overburden and spoils	ha	R 166 847,44
8b	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha	R 207 805,47
10	General surface rehabilitation	ha	R 132 171,31
11	River diversions	ha	R 132 171,31
12	Fencing	m	R 150,77
13	Water management	ha	R 50 255,25
14	2 to 3 years of maintenance and aftercare	ha	R 17 589,34

21.1.2 Closure liability update 2021

The combined closure liability for all three mining operations associated with the Mining Right (NC 30/5/1/2/2/10053 MR), as calculated in September 2021, amounts to R38 321 323,95 (including P&Gs,

contingencies and excluding VAT). This liability is associated with the activities planned as part of the KMR expansion project.

Table 6 provides the liability calculation summary combined for the proposed activities at Hotazel, Devon and Kipling.

Table 21-3: Closure liability calculation 2021 – All operations combined (Shangoni, 2021)

No	Description	Unit	Quantity	Master Rate	Multiplication factor	Weighing factor 1	Amount (Rand)
2a	Demolition of steel buildings and structures	m²	403,98	R238,71	1,00	1,00	R96 434,10
2b	Demolition of reinforced concrete buildings and structures	m²	789	R351,79	1,00	1,00	R277 559,76
3	Rehabilitation of access roads	m²	82681	R42,72	1,00	1,00	R3 531 881,37
5	Demolition of housing and/or administration facilities	m²	108	R477,42	1,00	1,00	R51 561,89
6	Opencast rehabilitation including final voids and ramps	ha	24,86	R242 984,15	0,52	1,00	R3 141 104,67
8a	Rehabilitation of overburden and spoils	ha	63,49	R166 847,44	1,00	1,00	R10 593 143,92
8b	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha	1,5	R207 805,47	1,00	1,00	R311 708,21
10	General surface rehabilitation	ha	67,12	R132 171,31	1,00	1,00	R8 870 783,53
11	River diversions	ha	20	R132 171,31	1,00	1,00	R-
12	Fencing	m	4752	R150,77	1,00	1,00	R716 438,88
13	Water management	ha	24,86	R50 255,25	0,60	1,00	R749 607,35
14	2 to 3 years of maintenance and aftercare	ha	165,8376	R17 589,34	1,00	1,00	R2 916 973,68
					Sub-total 1		*R31 257 197,35*
			Preliminary and General (12%)	R3 750 863,68	WeighingFactor 2	1,05	R3 938 406,87
						Contingencies (10%)	R3 125 719,74
						Sub-total 2	*R38 321 323,95*
						VAT (15%)	R5 748 198,59
						Grand Total	**R44 069 522,55**

22 Deviations from the Approved Scoping Report and Plan of Study.

Currently, there are no deviations from the approved Scoping Report and Plan of study

23 Other Information Required by the Competent Authority

No additional information has been required by the CA

24 Impact on the Socio-economic Conditions of any Directly Affected Person

Based on the review of the potential environmental, social and economic impacts associated with the proposed project, the overall social benefit outweighs the potential negative impacts. The social impacts can be mitigated where negative, but by enhancing the positive impacts, the mine will have a far greater positive impact, especially if they implement the KMR Policies and mitigation measures of the SIA and EMPr.

Since most of the new mining and construction activities will take place within the mine's existing boundary, it is not anticipated that significant impacts on the social environment, due to construction and operation of the mine, will occur. However, despite this, all of the project phases will result in some socio-economic impact that will need to be addressed based on the mitigation measures recommended in this report. It is anticipated that proactive and sustainable mitigation measures will mitigate most of the negative impacts and enhance the positive to an extent that the mine becomes an asset to the local community and enhances their current standard of living

25 Impact on Heritage Sites

The recent fieldwork undertaken resulted in the identification of a total of eleven (11) sites. These sites comprised the following:

- Five Stone Age sites: sites KLIP-002, KLIP-004, KLIP-005, YORK-002 and YORK-003.
- Three historic structures: sites KLIP-001, KLIP-003 and YORK-001.
- Three sites containing burial grounds:
    - One grave site, DEVON-001, is located approximately 130m outside of the proposed development footprint. Therefore, no direct impacts are foreseen on this site.
    - Grave sites TELELE-001 and HOTAZEL-001, are located less than 100m outside of the development footprint areas. The impact assessment of the proposed development on the sites is rated as Moderate.

As cemeteries and graves have Medium to High Heritage Significance, the preferred option is to change the development footprint to allow for the in situ preservation of these sites. The following mitigation measures would be required for this option:

- SAHRA's Burial Grounds and Graves Unit requires a buffer area of at least 100m between mining development and any burial grounds or graves that are to be preserved. As a result, and if at all possible, the proposed development footprints must be amended to allow for a 100m wide buffer area surrounding each of the two burial grounds that is kept clear of any construction or mining activities.
- Fences around the two burial grounds should be maintained.
- The two burial grounds should be cleaned on a yearly basis.

- A heritage monitoring process would also be required during all the project phases.
- A Grave Management Plan should be developed for the burial grounds that will be preserved in situ. This management plan must be approved by the SAHRA BGGU.

However, should it not be possible to preserve these sites in situ, the following mitigation measures are required:

- A grave relocation process must be undertaken.
- A detailed social consultation process, at least 60 days in length, comprising the attempted identification of the next-of-kin in order to obtain their consent for the relocation.
- Bilingual site and newspaper notices indicating the intent of the relocation.
- Permits from all the relevant and legally required authorities.
- An exhumation process that keeps the dignity of the remains and family intact.
- An exhumation process that safeguards the legal rights of the families as well as that of the mining company.
- The process must be done by a reputable company well versed in the mitigation of graves.

26 Other Matters Required in terms of Sections 24(4)(a) and (b) of the Act

Not Applicable

27 Part B: Environmental Management Programme Report

The structure of the EMPr in terms of Appendix 4 of the 2014 NEMA Regulations, as amended is provided in Table 27-1.

Table 27-1: Structure of the EMPr report in terms of Legislation Requirements as detailed in Appendix 4 (contents of an EMPr of GNR 982)

Appendix 4	Legislated requirements as per the NEMA GNR 982 in Appendix 4	Relevant Report Section
(1)(a)	details of-	
	(i) the EAP who prepared the EMPr	Section 2.1
	(ii) the expertise of the EAP, including a curriculum vitae;	Section 2.2
(1)(b)	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description	Section 6
(1)(c)	a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;	Figure 1-2 and Figure 6-1
(1)(d)	A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-	Section 16
	(i) planning and design;	
	(ii) pre-construction activities;	
	(iii) construction activities;	
	(iv) rehabilitation of the environment after construction and where applicable post closure; and	
	(v) where relevant, operation activities;	
(1)(e)	*Removed from Appendix 4 during 2017 NEMA Regulations Amendment and included in 1 (f) below*	
(1)(f)	a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to -	Sections 16 and Section 21
	(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	
	(ii) comply with any prescribed environmental management standards or practices;	
	(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and	
	iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable	
(1)(g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 29
(1)(h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	
(1)(i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	
(1)(j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	

Appendix 4	Legislated requirements as per the NEMA GNR 982 in Appendix 4	Relevant Report Section
(1)(k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	
(1)(l)	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations	
(1)(m)	an environmental awareness plan describing the manner in which-	
	(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and	Section 29.6
	(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	
(1)(n)	any specific information that may be required by the competent authority	Section 29.7
(2)	Where a government notice gazette by the minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	Not Applicable

27.1 Final environmental management programme

27.1.1 Details of EAP

Refer to Section 2.1 for the details of the EAP.

27.1.2 Description of the aspects of the activity

Refer to Section 6 of the report that detailed the aspects related to this activity.

27.1.3 Composite map highlighting sensitive areas

The broad placement of the surface infrastructure was informed by mapping the environmental sensitivities which considered the location of all known sensitive physical, social and environmental features within the mining rights and surface lease areas (Figure 27-1). The environmental sensitivities that were taken into account have been included in Table 27-2.

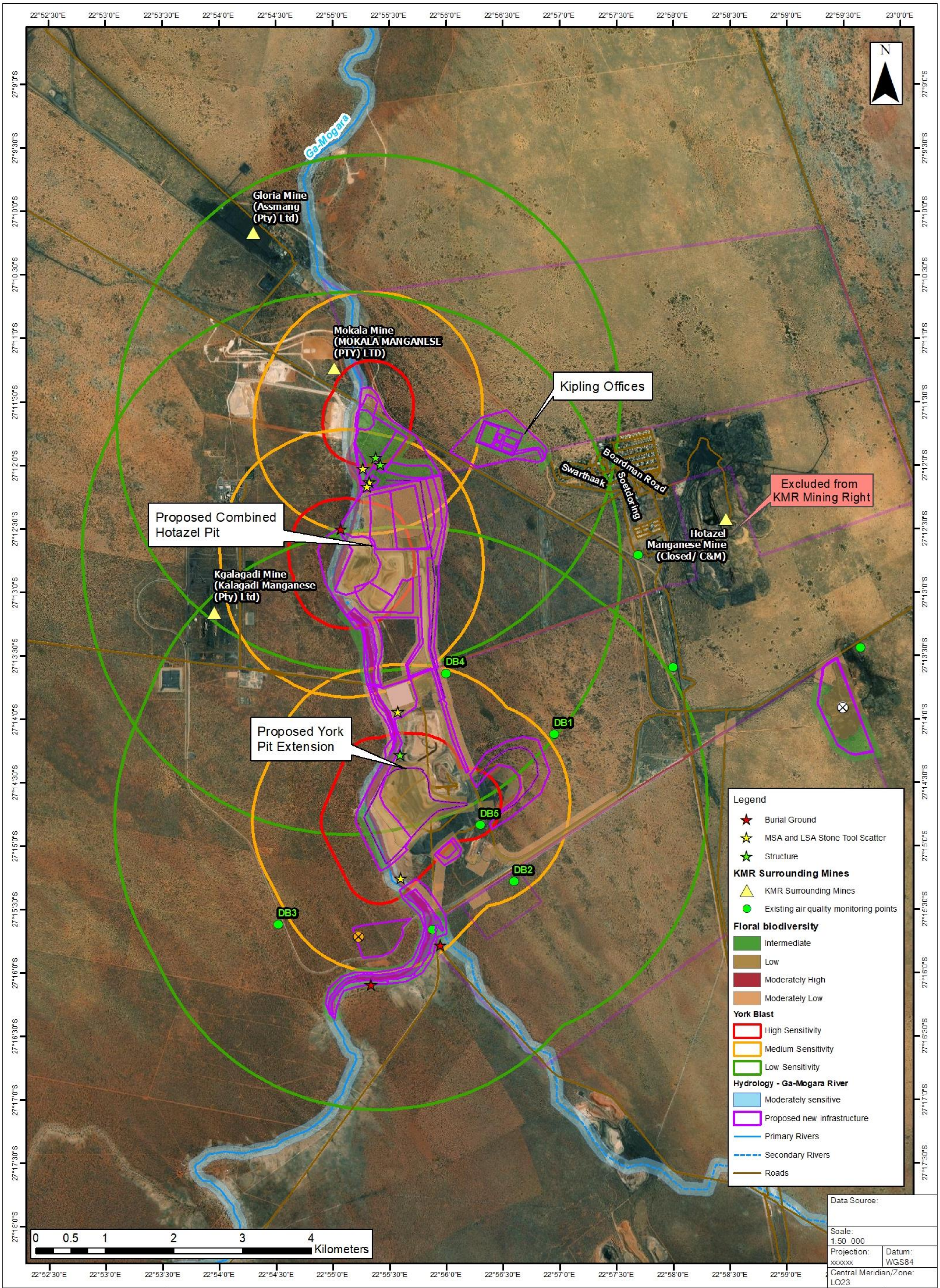
Table 27-2: Environmental sensitivities

Sensitive feature	Description
Cultural heritage sites	Heritage sites have been found located within the proposed project area.
Noise sensitive receptors	Sensitive noise receptor areas during the construction and operational phases have been identified and include the receptors in close proximity to the proposed KMR Expansion activities
Hydrology - Ga-Mogara River	The Ga-Mogara river is the main sensitive feature surrounding KMR especially as the attenuation dam will be constructed within the river.
Floral biodiversity	Based on the floral sensitivity mapping conducted by the specialist it was identified that areas along the Ga-Mogara River were classified as moderately sensitive
Air quality (dust sensitive receptors)	Various sensitive receptors have been identified.

Buffer distances (minimum safe distances), determined primarily from legislation, including GN704 and the MHSA (Table 27-3), were then overlain on the mapped sensitive areas. The placement of proposed site infrastructure options in relation to the identified sensitive areas is shown in Appendix J. Following the completion of the scoping phase, input from I&APs and the findings of the specialist studies were used to refine the preferred development footprint. The current activities and infrastructure at KMR are given in Section 4.2 and shown Appendix J.

Table 27-3: Buffer distances associated with the KMR Expansion Project

Infrastructure	Buffer (m)	Legislation/comment
Buildings Roads WRD Structures	100	MHSA and Regulations
Watercourses	100	NWA GN704
Wetlands	500	NWA GN704 GN1199
Potential sensitive receptors	500	A buffer has been suggested for noise, dust and air quality impacts
Explosives magazine	500	A proposed buffer for safety and avoidance of damage to new infrastructure (in the event of an explosion)



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KMR INTEGRATED ENVIRONMENTAL AUTHORISATION

SENSITIVITY MAP

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11/10/2021	SCHB
Project No.	Fig No.
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27.2 Description of impact management objectives including management statements

27.2.1 Determination of closure objectives

The closure objectives detailed in Section 28.1 are based on previous environmental databases and baseline information gathered through the LoM, as well as the baseline studies undertaken as part of the specialist investigations, as detailed in Section 12.

A baseline closure risk assessment was undertaken in early 2021 by Shangoni. This assessment was conducted for the existing infrastructure and activities currently being undertaken by KMR. Currently, Shangoni is updating the closure risk assessment to include the KMR Expansion Project activities.

27.2.2 Process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity

Through the implementation of the management measures by the relevant responsible persons, any potential environmental impact related with undertaking listed activities associated with the proposed project will be managed accordingly.

27.2.3 Potential risk of acid mine drainage

Geochemical tests and analyses provided by SLR (2014) indicate that the waste rock lithologies tested are non-acid generating, however some metals are leachable including aluminium (Al), iron (Fe) and manganese (Mn). SLR (2014b) simulated potential WRD seepage using the PHREEQC equilibrium geochemical modelling code and results suggest that seepage may have the following general characteristics:

- Neutral pH (controlled by calcite dissolution);
- High alkalinity;
- High salinity (in the form of elevated calcium, sodium, magnesium, chloride, nitrate and sulphate concentrations);
- Low or non-detect concentrations of most trace elements; and
- Chemicals of concern indicated by the modelling include fluoride, manganese, phosphorous, strontium and vanadium with the modelled concentrations as presented in Table 27-4.

Table 27-4: Waste rock seepage concentrations (Adapted from SLR, 2014).

Parameter	Low estimate (mg/L)	High estimate (mg/L)	SANS (241: 2011) (mg/l)
F	3.68	12	1.5*
Mn	0.52	3.4	0.1**
P	0.52	6.55	-
Sr	0.52	3.85	-
V	0.52	1.31	0.2*
Ca	68	632	-
Na	40	397	200**
Mg	40	239	-
Cl	23	340	300**
NO3 as N	3.97	556	11*
SO4 as S	42	289	250**

*Chronic health, ** Aesthetic

27.2.4 Water use licence requirements

The KMR mining operation operates under two Environmental Management Programmes (EMPrs) as approved by the Northern Cape Province Department of Environment and Nature Conservation (DENC) in June 2013 and October 2015 respectively. KMR also has a Water Use Licence (WUL) that was issued in 2016 by the Department of Water and Sanitation (DWS) and an amended WUL authorised in 2018 (Figure 27-2).

A WUL is being applied for as part of the integrated environmental authorisation process for the KMR Expansion Project.

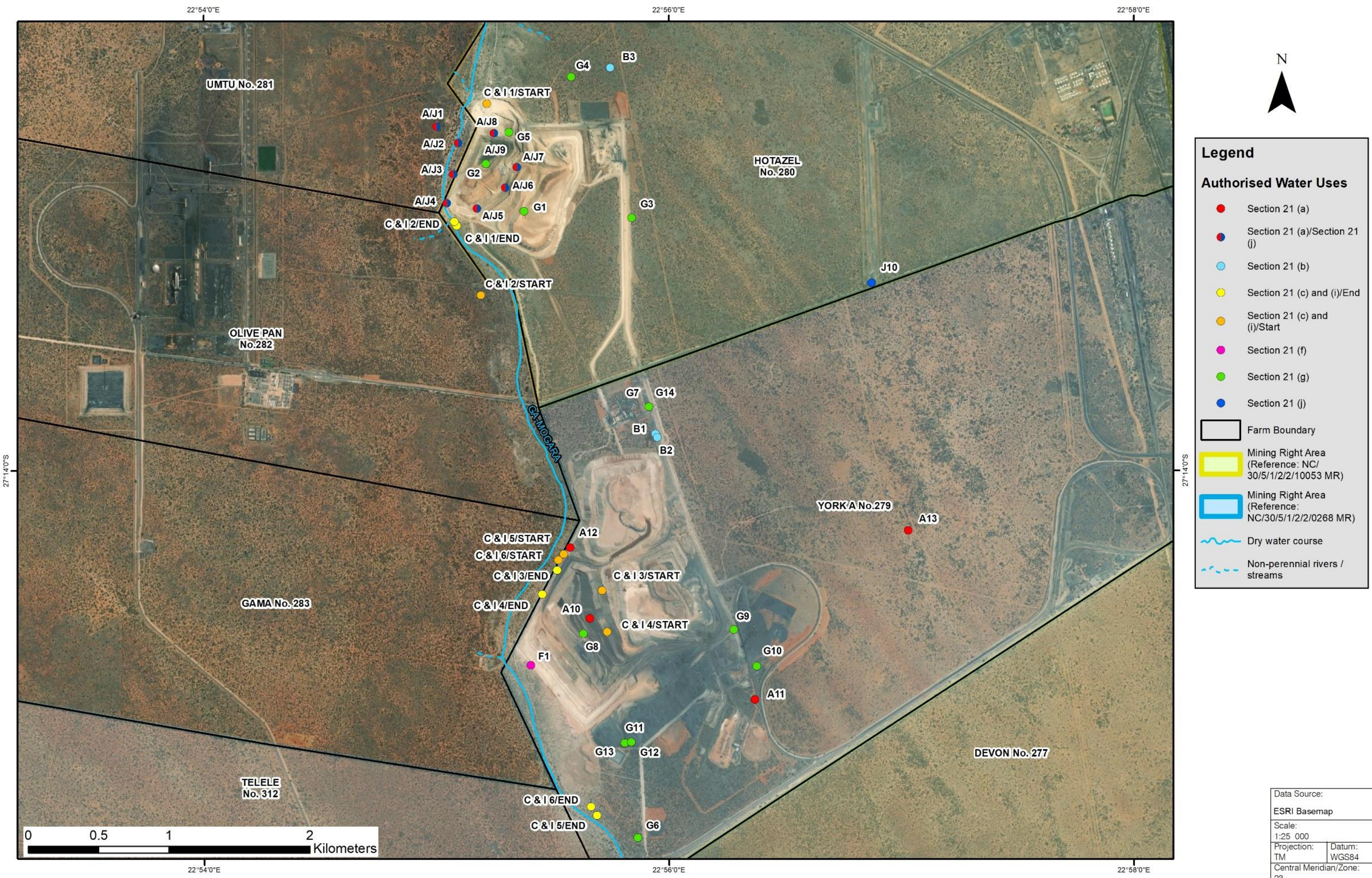
Table 27-5 provides a summary of the infrastructure units and associated existing water uses at KMR with the proposed new water uses associated with the KMR Expansion Project in grey text. The new water uses associated with the proposed KMR Expansion Project are shown in Figure 27-3 and Figure 27-2. Further details on the proposed KMR Expansion Project infrastructure and details relating to the existing infrastructure are provided in Section 6.

Table 27-5: Existing water uses and proposed new water uses associated with the whole KMR Expansion Project

Farm	Section 21 Water Uses		Infrastructure
	Description		
Portion 0 of farm Hotazel 280	a	Abstraction of groundwater	• Dewatering borehole curtain o Borehole HDW01 o Borehole HDW02 Borehole HDW03 o Borehole HDW04 o Borehole HDW05 o Borehole HDW06 o Borehole HDW07 o Borehole HDW08
			• Taking of water from Hotazel open pit (dewatering)
	j	Removing water found underground	• Borehole HDW01 • Borehole HDW02 • Borehole HDW03 • Borehole HDW04 • Borehole HDW05 • Borehole HDW06 • Borehole HDW07 • Borehole HDW08 • Dewatering of Hotazel open pit
	b	Storing water	• Hotazel attenuation dam

Farm	Section 21 Water Uses		Infrastructure
	Description		
	c&i	Impeding or diverting the flow of water in a water course; and Altering the bed, banks, course or characteristics of watercourse	• Flood defence berm to be located within 1:100 year floodline of the Ga-Mogara drainage channel • Encroachment of the Hotazel Pit into the 100m regulated zone of Ga-Mogara River • Expansion of Hotazel Pit across the Ga-Mogara River
	g	Disposing of water containing waste	• Storage of waste rock material in waste rock dump • Use of waste rock material to backfill Hotazel open pit • Dust suppression using excess mine water (dewatering water) along haul road at Hotazel • Storing RoM ore from Hotazel into stockpiles • Storing Water collected during dewatering of the pit and from dewatering boreholes in a steel tank • Hotazel PCD • Hotazel North WRD • Hotazel South WRD • Hotazel East WRD • Hotazel RoM Stockpile
Farm Kipling 217	a	Abstraction of groundwater	• Taking water from the Kipling open pit 1 (dewatering) for re-use in the process • Taking water from the Kipling open pit 2 (dewatering) for re-use in the process
	j	Removing water found underground	• Dewatering of water from the Kipling open pit 1 • Dewatering of water from the Kipling open pit 2
	c&i	Impeding or diverting the flow of water in a water course; and Altering the bed, banks, course or characteristics of watercourse	• Encroachment of Kipling Open cast pit 1 into the 100 m regulated zone of the Ga-Mogara River • Encroachment of Kipling Open cast pit 2 into the 100 m regulated zone of the Ga-Mogara River • Encroachment of Kipling WRD into the 100 m

Farm	Section 21 Water Uses		Infrastructure
	Description		
			regulated zone of the Ga-Mogara River
	g	Disposing of water containing waste	• Kipling PCD • Kipling WRD • Kipling RoM Stockpile
Farm Devon	g	Disposing of water containing waste	• Backfilling of Devon Open Pit



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Central Meridian/Zone: 23	
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Revision:	Date:

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KUDUMANE WULA

AUTHORISED WATER USES

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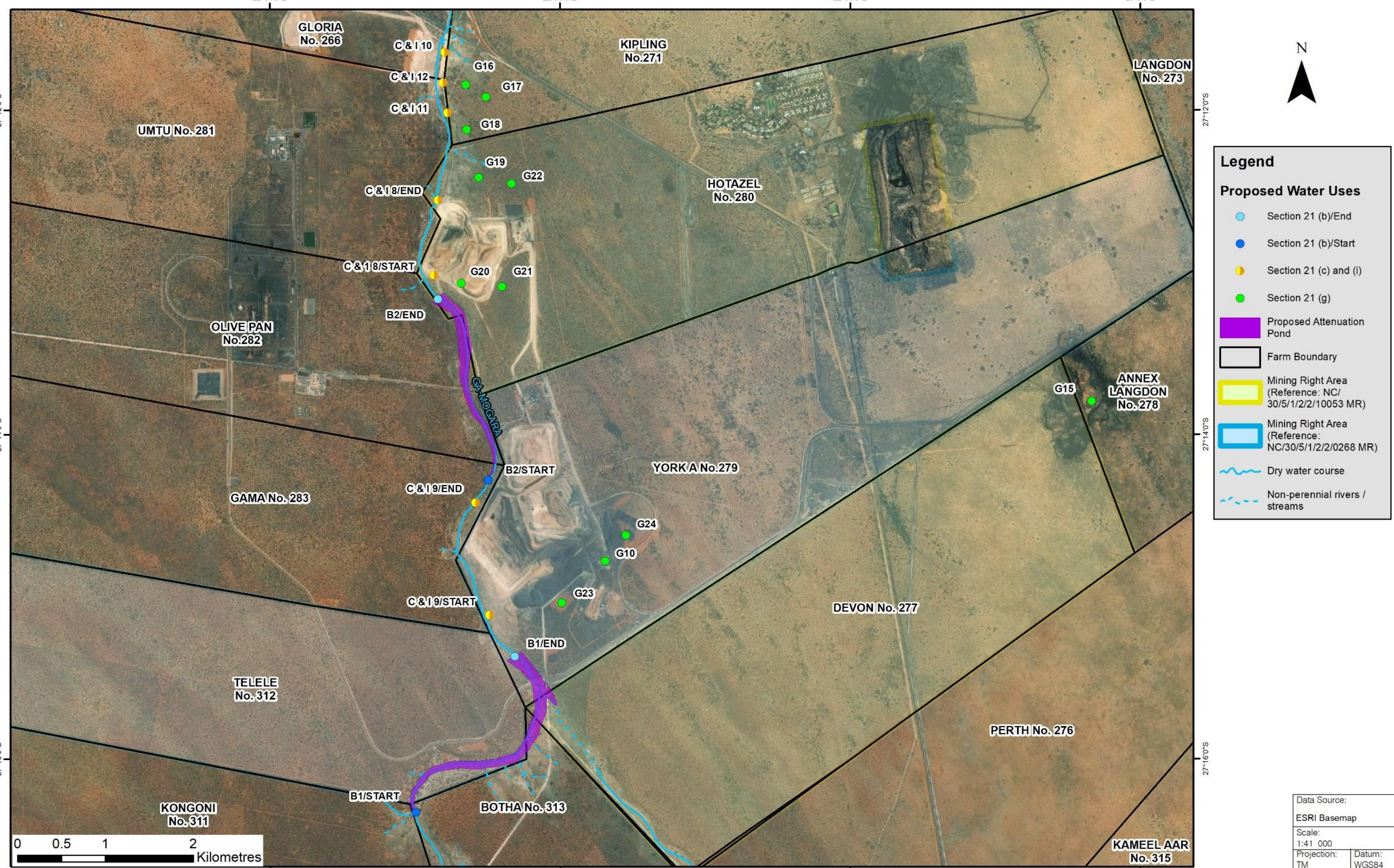

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Central Meridian/Zone: 23	
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Project No: 574378	Appendix: A
Revision:	Date:

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KUDUMANE WULA

PROPOSED WATER USES

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27.2.5 Impacts to be mitigated in their respective phases

The impact assessment in Section 16 details the potential impacts associated with proposed KMR Expansion Project during the pre-construction, construction, operational and closure phases.

27.2.6 Impact management outcomes

In addition to implementing the management measures detailed in Sections 16, it is necessary to take account of compliance standards that are applicable to the identified impacts. These standards are presented in Table 27-6.

Table 27-6: Compliance standards to be achieved with regards to social and environmental aspects

Environmental aspect	Phase/Time period	Standard to be achieved	Compliance with standards
Soils, Land Use and Land Capability Terrestrial Ecology	Continuous during construction, operations and closure.	To prevent soil contamination by implementation of: • Inspection and maintenance Plan; • Leak/Spill Procedure' • Emergency Preparedness Plan; • Waste Management; and	Manage soils in line with the requirements of the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN 37603 No 331). KMR Policies and Guidelines to manage and remediate spills.
	Continuous during construction, operations and closure.	To demonstrate active stewardship of land and biodiversity by: • Identifying and removing relevant species if necessary;	KMR Biodiversity Action Plan (BAP) Manage soils in line with the requirements of the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN 37603 No 331). KMR Policies and Guidelines to manage and remediate spills. GNR 893 Minimum Emission Standards.
Surface water	Continuous during construction, operations and closure.	To avoid or where not possible, minimise and remedy pollution of water • Implementing a Leak/Spill Procedure; • Continuously implementing the surface water monitoring programme; • Compiling monitoring report; • Implementing Stormwater Management Plans; and • Responding to complaints and implementing a grievance mechanism. • Compliance to WUL	Water Quality Objectives as specified in the Water Use License issued by DWS KMR Policies and Guidelines to manage and remediate spills.
Groundwater	Continuous during construction, operations and closure.	No dirty water spillage to the catchment thereby preventing contamination of waterbodies downstream by: • Continuously implementing the groundwater monitoring programme and model; and	KMR Policies and Guidelines to manage and remediate spills. Water Quality Objectives as specified in the Water Use License issued by DWS

Environmental aspect	Phase/Time period	Standard to be achieved	Compliance with standards
		• Responding to complaints and implementing a grievance mechanism with regards to groundwater. • Compliance to WUL	
Air Quality	Continuous during construction, operations and closure.	To minimise the entrapment potential of dust. • To keep PM_{10} (and in the future, $PM_{2.5}$) and dust fallout levels at key receptor sites around the project area within guideline levels. As the guidelines vary depending on the priority area and year, the South African Air Quality Information System (http://www.saaqis.org.za/) will be consulted for the most recent guidelines. These aforementioned standards will be achieved by: • Continuously implementing the dust monitoring programme; and • Appropriate dust suppression techniques.	GNR 893 Minimum Emission Standards.
Noise	Continuous during construction, operations and closure.	To minimise noise impacts on sensitive receptors by: • Developing a complaints register to record complaints regarding noise. • To maintain noise levels at the standards for suburban areas (SANS 10103) as far as practicable.	Compliance with SANS 10103 Acceptable Ambient Levels and SANS 10210 of 2004, the national standard for the calculating and predicting of road traffic noise SANS 10328 of 2008 Noise Control Regulations – General Notice R154 of 10 January 1992
Heritage	Continuous during construction, operations and closure.	To ensure heritage resources are not damaged during the mining process	Ordinance on Excavations (Ordinance no. 12 of 1980) (replacing the old Transvaal Ordinance no. 7 of 1925).
Social	Continuous during construction, operations and closure	To enhance benefits from the development of the Project; • To maximize opportunities for local residents; • To facilitate employment of local labour on the Mine; and • To avoid creating unrealistic expectations. These standards will be achieved by the implementation of the SLP and Social Management Plan, SED Plan, Stakeholder Engagement Plan and other Social Performance policies, procedures and plans.	KMR SLP

28 Financial provision and closure plan

28.1 Closure Objectives

The main closure objective for KMR, as defined in the EIAR/EMPr (Metago, 2010), is to return the project area to its pre-project state (pre-use land capability of natural / grazing land). In this regard, upon mine closure:

- No further mining activities will take place;
- The topography of the area will have been restored to its pre-project state (with the exception of the permanent mineralised waste facilities and possibly surface water management structures if required);
- Topsoil will have been replaced at disturbed areas; and
- Disturbed areas will have been re-vegetated.

In the event that water quality monitoring around any waste rock dumps indicates that the dumps are causing pollution, catchment paddocks and soakaways will be provided to minimise the risk of exposure to wildlife, livestock and humans. The waste rock dump (“WRD”) facilities would remain as permanent landforms at closure. Rehabilitation will be undertaken to ensure that a productive land use can take place post-closure (even though it is unlikely to be at the same carrying capacity) as per the EIA/EMPr for Devon and Hotazel at KMM (SLR, 2014).

Where the decommissioning and operational phases overlap, operational facilities will be used in support of decommissioning activities until such time as these facilities are decommissioned. Once these facilities are decommissioned, the same temporary contractor’s working areas used during the construction phase will be utilised.

Decommissioning and closure activities, as identified in the EIAR/EMPr (SLR, 2014) are listed below:

- Backfilling the open pits with waste rock material;
- Stabilising and profiling of permanent WRDs;
- Stabilising underground mine workings (existing mining rights area only);
- Dismantling and demolishing of infrastructure;
- Replacing topsoil resources on disturbed areas;
- Ensure that vegetation on rehabilitated areas is sustainable;
- Dismantling and rehabilitation of railway tracks and rehabilitation of roads (depending on end use);
- Rehabilitation of the disturbed areas where infrastructure has been removed by sloping, filling in excavations and re-vegetating where possible;
- The surface of the tailings dam will be covered with waste rock and/or vegetation (new mining rights area only);
- There will be a period of active after-care followed by a passive after-care phase;
- Maintenance of vegetation where this is used for rehabilitation;
- Maintenance of facilities such as fencing, fire breaks, access roads and ramps, overflow structures;
- Removal of any invasive species from the rehabilitated sites;
- Inspecting on an annual basis to repair any erosion gullies; and
- Monitoring of potential groundwater pollution plumes.

Rehabilitation success will be determined by monitoring trends in soil nutrient levels, soil microbial levels, vegetation cover and vegetation biodiversity levels and comparing data and temporal trends in the data to numerical targets. Rehabilitated areas will be monitored for a minimum period of five years, and managed where necessary to ensure the objective of restoring the land to it pre-mining land use capability. This issue will be revisited as part of the detailed closure planning for the project.

These closure objectives will need to consider a number of site-specific closure criteria in order to be incorporated and actioned within the final rehabilitation, decommissioning and mine closure plan. Proposed closure criteria have been defined in the closure and rehabilitation plan (Shangoni, 2021a).

28.2 Consultation with landowners and interested and affected parties

The objectives in relation to closure as detailed in Section 28.1 and rehabilitation will be made available for landowner and public consultation as part of the public participation process detailed in Sections 11.6 and 11.7.

28.3 Rehabilitation plan

KMR is in the process of compiling the Final Rehabilitation, Decommissioning and Mine Closure Plan (FRDMCP), with the associated Risk Assessment as required by the Financial Provision Regulations for all the activities associated with the proposed KMR Expansions Project.

28.4 Closure actions

Shangoni was appointed by KMR to compile the FRDMCP for Farms Devon 277 and Hotazel 280 in April 2021. This is in line with the promulgated financial provision regulations (GN. R. 1147), for its mining activities at KMR (Devon and Hotazel) (Shangoni, 2021a).

The actions listed in Table 28-1 are recommended as a way forward to ensure that the final approved land use vision for KMR is realised. The actions are currently being updated to include the KMR Expansions Project activities.

It is important to note these closure actions are for the existing KMR infrastructure and activities and do not include the KMR Expansion Project infrastructure. Shangoni will update the closure actions for the project.

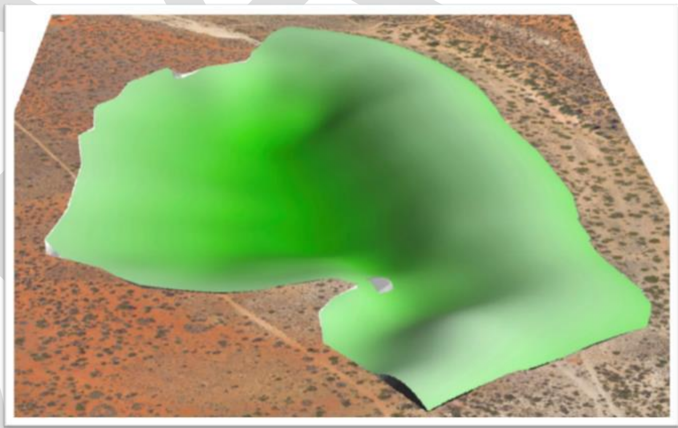
Table 28-1: Proposed actions to be implemented to realise approved end land use (Shangoni, 2021a)

Area	Closure actions

General closure planning	• Define, demarcate and map all lands portions believed restorable and those lands portions which are non-restorable;
	• Compile a Land use plan (LUP) that identifies, evaluates and considers all the feasible land uses for the site once mining has ceased, as part of closure planning (expansion on preliminary land uses listed in Section 6.4 of this report and specific allocation of areas within the mining right).
	• Stakeholder engagement and consultation (Municipalities, community, DMRE, DHSWS, DARDLEA etc.) on:
	  o closure planning;
	  o final land use; and
	  o structures/infrastructure to remain and be handed over to a third party.
	• Alignment between this FRDMCP and its associated appendices with the EMPr's. It is proposed that the rehabilitation and closure planning, vision and objectives from the FRDMCP are incorporated into the EMPr's during the next EMPr review.
	• Initiate rehabilitation throughout the operational phase on demonstration plots. These should be conducted to ensure that the natural vegetation of the Kathu bushveld, Gordonia duneveld as well as the areas to be utilised for grazing, can be achieved.
	• Follow up existing land claims throughout the operational phase, as this might impact on the final land use vision for KMM.

Area	Closure actions
	• Implementation of the rehabilitation programme defined by KMM throughout the operational, decommissioning and closure phases.
Storm water infrastructure (Surface water and Storm water control dams)	• Clean up sediment to a depth of 250 mm and dispose onto the nearby WRD (assumed to be clean sediment). • Remove and dispose of HDPE liner at an authorised recycling or waste disposal facility. • Remove and dispose of pumping infrastructure. • Breach and shape dams to a gradient of 1:5 to be free draining, where required. • Rip basin to alleviate compaction. • Vegetate the footprint area with a selection of endemic grass species.
Storm water infrastructure (Concrete silt traps and lined channels)	• Clean up sediment to a depth of 250 mm and dispose onto the nearby WRD (assumed to be clean sediment). • Remove and dispose of HDPE liner at an authorised recycling or waste disposal facility. • Remove and dispose of pumping infrastructure. • Demolish and excavate concrete structures to 1 m below ground level. • Bury concrete rubble at least 1m below natural ground level. • Shape and profile the disturbed surface areas to match surrounding topography and to ensure free drainage, thus limiting run-off erosion. • Vegetating the ripped footprint with a selection of endemic grass species.
Potable water supply infrastructure	• Demolish and dispose of all above surface steel infrastructure. • Steel structures that cannot be recycled must be disposed offsite as scrap metal. • Remove and dispose of pumping infrastructure. • Demolish and excavate concrete structures to 1 m below ground level. • Bury concrete rubble at least 1 m below natural ground level. • Shape and profile the disturbed surface areas to match surrounding topography and to ensure free drainage, thus limiting run-off erosion. • Vegetating the ripped footprint with a selection of endemic grass species.
Haul roads and other road infrastructure	• Assess road network to identify roads that will be required for post closure activities. • Reduce the width of the roads required for post closure activities to an appropriate width by: o Ripping the redundant road surface area to a depth of approximately 1 m to alleviate compaction. o Where roadbed exceeds a 1m thickness like at ramps and rail crossings, excessive road construction material must be excavated and disposed in the York pit void. o Vegetating the ripped footprint with a selection of endemic grass species. • All redundant road infrastructure will be rehabilitated by: o Ripping the road surface area to a depth of approximately 1 m to alleviate compaction. o Where roadbed is exceeds a 1 m thickness like at ramps and rail crossings, excessive road construction material must be excavated and disposed in the York pit void. o Demolish and excavate concrete foundations at culverts to 1 m below ground level. o Bury concrete rubble at least 1m below natural ground level o Shape and profile the disturbed surface areas to match surrounding topography and to ensure free drainage, thus limiting run-off erosion

Area	Closure actions
	○ Vegetating the ripped footprint with a selection of endemic grass species.
Hard Park and other laydown areas	• Demolish and remove all permanent and semi-permanent steel and concrete infrastructure. • Demolished steel structures that cannot be recycled must be disposed offsite as scrap metal. • Demolish and excavate concrete structures to 1 m below ground level. • Bury concrete rubble at least 1m below natural ground level. • Rip the compacted surface areas to a depth of approximately 1 m to alleviate compaction. • Shape and profile the disturbed surface areas including safety berms to match surrounding topography and to ensure free drainage, limiting run-off erosion. • Vegetating the ripped footprint with a selection of endemic grass species.
Workshops and Diesel storage	• Remove all assets/equipment that can be profitably removed for salvage or resale. • Clean all residue and silt from oil traps and dispose at a licenced waste disposal facility. • Demolish and remove all permanent and semi-permanent steel and concrete infrastructure. • Demolished steel structures that cannot be recycled must be disposed offsite as scrap metal. • Demolish and excavate concrete structures to 1 m below ground level. • Bury concrete rubble at least 1m below natural ground level. • Rip the compacted surface areas to a depth of approximately 1 m to alleviate compaction. • Shape and profile the disturbed surface areas including safety berms to match surrounding topography and to ensure free drainage, limiting run-off erosion. • Vegetating the ripped footprint with a selection of endemic grass species.
Admin and support buildings	• Two years prior to final closure, external stakeholders must be engaged actively to determine if there are any sustainable post closure use for the infrastructure. • If a sustainable post closure use for the admin and support buildings is identified ensure that all required legal documents and contracts are prepared for the transfer of assets. • If a sustainable post closure use for the infrastructure cannot be identified: ○ Remove all assets/equipment that can be profitably removed for salvage or resale. ○ Demolish and remove all permanent and semi-permanent steel and concrete infrastructure. ○ Demolished steel structures that cannot be recycled must be disposed offsite as scrap metal. ○ Demolish and excavate concrete structures to 1 m below ground level. ○ Bury concrete rubble at least 1m below natural ground level. ○ Rip the compacted surface areas to a depth of approximately 1 m to alleviate compaction. ○ Shape and profile the disturbed surface areas including safety berms to match surrounding topography and to ensure free drainage, limiting run-off erosion. ○ Vegetating the ripped footprint with a selection of endemic grass species.
Devon	• Backfilling the open pits with waste rock material.

Area	Closure actions
	• Replacing topsoil resources on disturbed areas. • Ensure that vegetation on rehabilitated areas is sustainable. • Rehabilitation of roads (depending on end use). • There will be a period of active after-care followed by a passive after-care phase. • Maintenance of vegetation where this is used for rehabilitation. • Maintenance of facilities such as fencing, fire breaks, access roads and ramps, overflow structures. • Removal of any invasive species from the rehabilitated sites. • Inspecting on an annual basis to repair any erosion gullies. • Monitoring of potential groundwater pollution plumes.
Hotazel opencast pit (Arangies, 2016)	• Maximize backfill of opencast pit during operational phase as per the backfill plan. • Only place calcrete on the surface WRD and use all BIF material as concurrent in-pit backfill material during LOM operations. • Material from the southern section of the WRD will be used to backfill the final pit void at the end of mine life. • Backfill material must tie in with the flood protection berm constructed to the west of the pit. • The pit void must be overfilled by at least 15% and then shaped to ensure natural drainage of surface water runoff (see Figure 9). • After shaping the backfilled material, a layer of 100 mm of topsoil will be placed over the backfilled material. The topsoil will then be ripped along the contours of the backfilled pit void. • The rehabilitated open pit must then be seeded with a selection of endemic grass species.  Hotazel pit proposed final landform
Hotazel Waste rock dump (Arangies, 2016)	• Construct the northern section of the Hotazel WRD at an angle not exceeding 20 degrees. • At the end of LOM, the southern portion of the WRD will be used to backfill the remaining pit void. • When sufficient material has been extracted from the WRD, the southern portion will be sloped at an angle not exceeding 20 degrees. • Reinstate toe paddocks along the southern toe of the final WRD. • Construct a peropit wall around the top perimeter of the WRD (1.5 m high at the angle of repose) to retain surface water runoff thereby limiting potential erosion of side slopes. • Construct cross walls along access ramps to slow down storm water runoff.

Area	Closure actions
	• Place a layer of at least 100mm of topsoil on the WRD and seed with a selection of endemic grass species.

28.5 Future land use after decommissioning

It is proposed in the mine closure plan (Shangoni, 2021a) that KMR will endeavour to rehabilitate the areas disturbed by mining activities to ensure that the areas are safe, stable and relate as close as possible to the state of the surrounding natural vegetation.

Currently, the most likely final land use is to use the area primarily for grazing and game farming. This proposed final land use is still to be discussed with the stakeholders (such as DMRE, local municipality, local communities, etc.) and agreed upon.

29 Mechanisms for Monitoring Compliance

Internal and external environmental monitoring is undertaken on an ongoing basis at KMR as required in the relevant authorisations, permits and licences. Details associated with the compliance monitoring is provided in the sections below.

29.1 Monitoring of impact management actions

A performance assessment against this EIA/EMPr will be undertaken every second year to assess the compliance against impact management measures for the KMR Expansion Project infrastructure and activities as detailed in Section 16.

29.2 Responsible persons for implementation of management actions

The key personnel to ensure compliance to this EMP report will be the operations executive, the environmental department manager and the stakeholder engagement manager. As a minimum, these roles as they relate to the implementation of monitoring programmes and management activities will include:

- Senior Operational Manager and Environmental Department Manager -
  - ensure that the monitoring programmes and audits are scoped and included in the annual mine budget;
  - identify and appoint appropriately qualified specialists/engineers to undertake the programmes; and
  - appoint specialists in a timeously manner to ensure work can be carried out to acceptable standards.
- HR/Stakeholder engagement department -
  - liaise with the relevant structures in terms of the commitments in the SLP;
  - ensure that commitments in the SLP are developed and implemented timeously;
  - establish and maintain good working relations with surrounding communities and landowners; and
  - facilitate stakeholder communication, information sharing and grievance mechanism.

29.3 Time period for implementation of management actions

The infrastructure and activities associated with the KMR Expansion Project are aligned with the planned LoM of the York A 279 opencast mine. The time period for the implementation of the management actions associated with the proposed KMR Expansion Project will be aligned with the different phases of the expansion activities as detailed in Section 16 above.

29.4 Specific environmental monitoring requirements

This section details the proposed specific environmental monitoring requirements for KMR Hotazel, Kipling and Devon and includes the monitoring measures of the following:

- Ground water;
- Surface water (including process water);
- Biodiversity (flora and fauna) annual survey;
- Air quality;
- Blasting; and
- Post rehabilitation monitoring.

29.4.1 Groundwater monitoring

Current groundwater monitoring

A total of fifteen (15) boreholes are included in the quarterly groundwater monitoring program for KMR. However, not all boreholes are routinely monitored due to either dry conditions or no access/demolished (refer to Table 29-1). The spatial distribution of the monitoring boreholes is shown in Figure 12-21. Based on the location and status of the boreholes, an updated monitoring programme is proposed.

Table 29-1: Existing groundwater monitoring boreholes for the KMR mine

Borehole ID	Lat.	Long.	Area	Oct. 20 Status
HGW01	-27.213	22.92191	±3 km south-west of Hotazel next to Ga-Mogara riverbed	No Access
HGW02	-27.2186	22.92076	±3 km south-west of Hotazel next to Ga-Mogara riverbed	Demolished
RGW01	-27.2398	22.9246	Directly north of mine next to Ga-Mogara riverbed	Dry
RGW02	-27.2315	22.92313	±1 km north of mine next to Ga-Mogara riverbed	Dry
T1	-27.2543	22.92326	Upgradient from mine on Telele Farm	Sampled
T2	-27.2542	22.92531		
T3	-27.2542	22.9212		
T4	-27.2579	22.92335		
T6	-27.2577	22.91924		
YGW01	-27.2481	22.93958	Upgradient from mine and next to railway	Sampled
YGW02	-27.2477	22.93086	Next to diesel tank	Demolished
YGW03	-27.2373	22.93379	Next to tyre bay	Sampled
YGW04	-27.2374	22.92649	Directly north of mine next to Ga-Mogara riverbed	
YGW05	-27.2405	22.94313	Next to railway loop	Sampled

Future groundwater monitoring boreholes (proposed)

The following recommendations are proposed to augment the KMR groundwater monitoring programme (Table 29-2):

1) Drill new Kipling boreholes (KGW01 and KGw02) at the proposed Kipling mine activities;
2) Drill new Hotazel Pit and WRDs boreholes (HGW04, HGW05 and HGW06);
    a) Include existing borehole HTWM005 into routine monitoring programme;
3) Re-drill (YGW02R) at a different location (western edge of York expansion pit);
    a) Drill new, York Wasbay/Diesel Storage monitoring borehole (YGW06);
4) It is of the opinion that RGW01 and RGW02 is too shallow to be included into the routine monitoring programme;
    a) However, it advised to do measure <u>ad-hoc</u> water levels to confirm the status;
5) Drill new Devon pit rehabilitation monitoring borehole; and
6) Perimeter boreholes T1 and T6 can be removed from the monitoring programme subject to agreement with authorities.

The spatial location of the proposed (future) groundwater monitoring boreholes is shown in Table 29-2. The monitoring programme should be revised annually based on the results and the Life of Mine plans.

Note: The proposed drilling positions are preliminary until the future mining footprint becomes available. This will be addressed as part of the annual groundwater model update.

Table 29-2: Proposed future groundwater monitoring boreholes for the KMR mine

Borehole ID	Lat.	Long.	Area	Mon. Frequency
HTWM005	-27.2118	22.9281	Upgradient of Hotazel Pit and WRDs	Quarterly quality (Monthly levels)
HGW04*	t.b.c		South of Hotazel pit (and WRD)	
HGW05*	t.b.c		Downgradient (north) of Hotazel pit (and WRD)	
HGW06*	t.b.c		Downgradient (west) of Hotazel pit (and WRD)	
RGW01	-27.2398	22.9246	Directly north of mine next to Ga-Mogara riverbed	Ad-Hoc
RGW02	-27.2315	22.92313	±1 km north of mine next to Ga-Mogara riverbed	
T2	-27.2542	22.92531	Upgradient from mine on Telele Farm	Quarterly quality (Monthly levels)
T3	-27.2542	22.9212		
T4	-27.2579	22.92335		
YGW01	-27.2481	22.93958	Upgradient from mine and next to railway	Quarterly quality (Monthly levels)
YGW02R*	t.b.c		Re-drill Borehole	
YGW03	-27.2373	22.93379	Next to tyre bay	
YGW04	-27.2374	22.92649	Directly north of mine next to Ga-Mogara riverbed	
YGW05	-27.2405	22.94313	Next to railway loop	
YGW06*	t.b.c		Wash bay/Diesel Storage Area	
KGW01*	t.b.c		Downgradient (east) of proposed Kipling pit	Quarterly quality (Monthly levels)
KGW02*	t.b.c		Downgradient (east) of proposed Kipling WRD	
DGW01*	t.b.c		East of abandoned (Devon) pit	Quarterly quality (Monthly levels

29.4.2 Air quality monitoring

KMR currently has a dust fallout and PM10 (including inhalable manganese) monitoring network. The programme for monitoring is monthly for dust fallout and continuous for PM10.

The established weather station should be serviced and maintained so that climatic data is more readily available.

29.4.3 Blasting

A monitoring programme for recording blasting operations is recommended. The following elements should be part of such a monitoring programme:

- Ground vibration and air blast results;
- Blast Information summary;
- Meteorological information at time of the blast;
- Video Recording of the blast; and
- Fly rock observations.

Most of the above aspects do not require specific locations of monitoring. Ground vibration and air blast monitoring however require identified locations for monitoring. Monitoring of ground vibration and air blast is done to ensure that the generated levels of ground vibration and air blast comply with recommendations. Proposed positions were selected to indicate the nearest points of interest at which levels of ground vibration and air blast should be within the accepted norms and standards as proposed in this report. The monitoring of ground vibration will also qualify the expected ground vibration and air blast levels and assist in mitigating these aspects properly. This will also contribute to good relationships with the neighbours.

Eleven (11) monitoring positions were identified as possible locations that will need to be considered. Not all points will be required at once but active monitoring and observation of where blasting is done will dictate the requirements for the areas around the pit. Some of these points may be applicable to more than one location to be monitored. Monitoring positions are indicated in Figure 29-1 and a list of the coordinates is provided in Table 29-3. These points will need to be re-defined with an availability of a detailed mining plan and after the first blasts done.

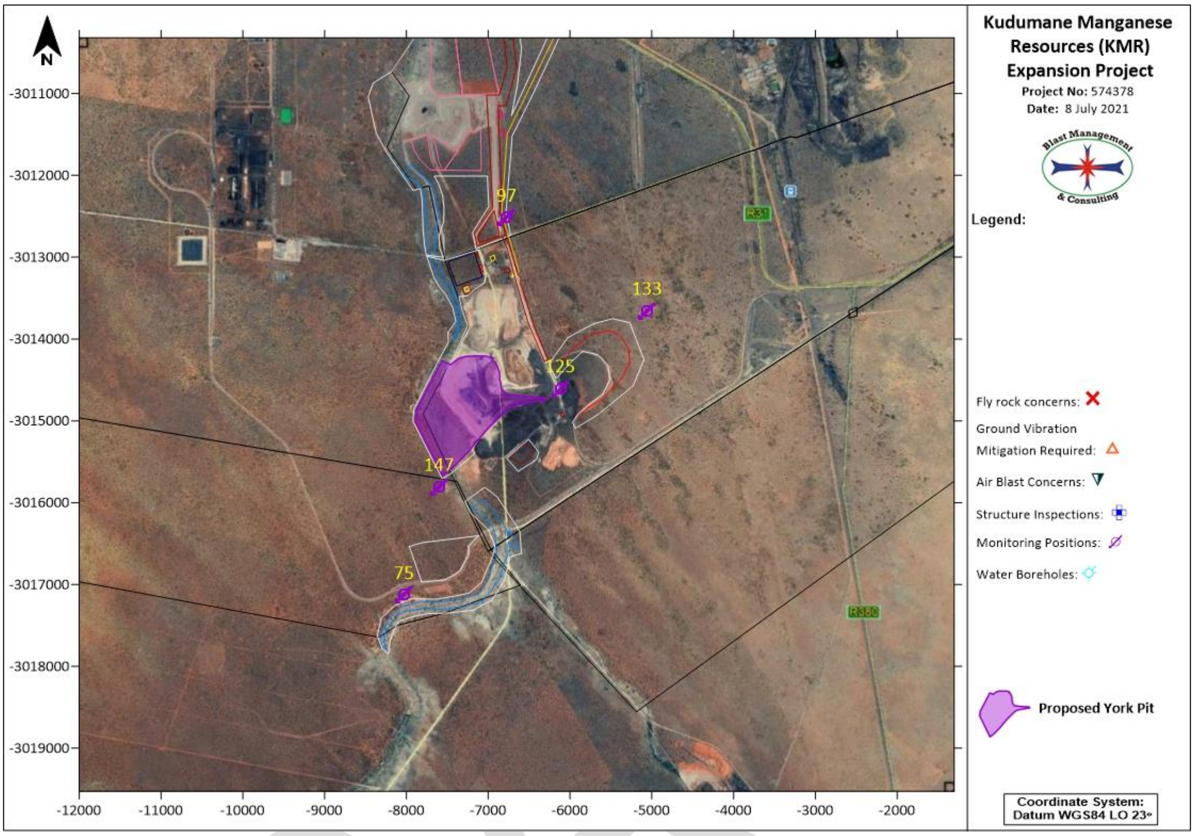


Figure 29-1: Suggested monitoring point positions for Hotazel, 280, Devon 277 and Kipling 271 opencast pit

Table 29-3: Suggested monitoring point positions for York A 279 opencast pit

Tag	**Description**	Y	X
Hotazel Pit			
40	Houses	4995.56	3009926.74
123	Attenuation Dam (Planned)	8000.15	3011927.89
Kipling Pit			
40	Houses	4995.56	3009926.74
127	Diversion R380 Road (Planned)	7553.33	3008875.04
150	Hydrocensus Borehole (wh02)	8016.87	3009442.75

29.4.4 Closure and post closure period

The purpose of implementing closure actions detailed in Section 28.4 is to reduce closure risk to an acceptable residual risk timeously. Based on the work required, KMR has determined that closure will be implemented over a five-year period, based on the premise that significant remedial work will have been undertaken on the WRDs and infrastructure decommissioned during the remaining Life of Mine.

29.4.5 Continuous maintenance

The mine undertakes continuous maintenance on infrastructure that has the potential to affect the environment. This infrastructure includes pipelines, roads, conveyors and infrastructure traversing watercourses. The maintenance is a result of planned inspections on these facilities.

29.5 Frequency of the submission of the performance assessment report

The following documents will be submitted to the relevant authorities from the start of construction until mine closure:

- EMPr performance assessment, submitted every two years to DMRE;
- Updated closure and rehabilitation cost estimate, submitted annually to the DMRE in accordance with DMRE requirements;
- Water monitoring reports, submitted to DWA in accordance with water use license requirements;
- Air quality monitoring reports, submitted to the relevant authority in accordance with the departmental requirements; and
- Detailed plan for decommissioning/closure submitted 5 years before closure, submitted in accordance with DMRE requirement.

29.6 Environmental awareness plan

KMR has previously compiled an Environmental Emergency Preparedness and Environmental Awareness Plan for the current KMR operations. This Environmental Emergency Preparedness and Environmental Awareness Plan will be implemented for the new activities and infrastructure proposed as part of this EIA/ EMPr. Refer to Appendix K for the KMR Environmental Emergency Preparedness and Environmental Awareness Plan.

29.7 Specific information required by the competent authority

As yet, no information has been requested by the competent authority.

29.8 Undertaking

I Selma Nel herewith confirm:

- The correctness of the information provided in the reports;
- The inclusion of comments and inputs from stakeholders and Interested and Affected parties;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

Signature of the EAP

DATE: 12 October 2021

30 Statement of SRK Independence

Neither SRK nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK has no prior association with KMR in regard to the mineral assets that are the subject of this Report. SRK has no beneficial interest in the outcome of the technical assessment being capable of affecting its independence.

SRK's fee for completing this Report is based on its normal professional daily rates plus reimbursement of incidental expenses. The payment of that professional fee is not contingent upon the outcome of the Report.

Prepared by

Selma Nel

Principle Environmental Scientist

31 References

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SLR (2014a): Groundwater Assessment Report in support of the Environmental Impact Assessment for the new mining rights. Kudumane Manganese Mine. SLR Project No.: 710.14003.00006.

Appendices

Appendix A: KMR Environmental Application

Appendix B: Environmental Application Acceptance Letter

Still awaiting acceptance letter from the DMRE. This will be included in the final

Appendix C: EAP CV

Appendix D: Specialist Terms of Reference

Appendix E: Hotazel, Kipling and Devon Listed Activities Map

Appendix F: Attenuation Dam Option Analysis

Appendix G: Public Participation Documentation

Appendix H: DMRE Meeting Minutes

Appendix I: Specialist Studies

Biodiversity Specialist Study

Blasting Specialist Study

Closure Specialist Study

Freshwater Specialist Study

Groundwater Specialist Study

Heritage Specialist Study

Noise Specialist Study

Socio-Economic Specialist Study

Soils and Land Capacity Specialist Study

Surface Water Specialist Study

Traffic Specialist Study

Visual Specialist Study

Appendix J: Final Site and Sensitivity Map

Appendix K: KMR Environmental Emergency and Awareness Plan

SRK Report Distribution Record

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