

BASIC ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED MINING PERMIT (CRESWELL PARK) AND WASTE MANAGEMENT ACTIVITIES ON A PORTION OF PORTION 408 AND A PORTION OF PORTION 407 OF THE FARM ROODEPOORT 237 IQ, MAGISTERIAL DISTRICT OF JOHANNESBURG, GAUTENG.

DMR REF. NO: GP 30/5/1/3/2 (10290) MP

MALANSCHOLES NO: MSC/64/18/WESTWITS – CRESWELL PARK

Submitted to:

Department of Mineral Resources
Gauteng Region

Copies of the Draft BARs will be placed at the following locations for public review:

Name and Location	Physical Address
Roodepoort Civic Centre	100 Christiaan de Wet Road, Florida Park, Roodepoort
Witpoortjie Library	22 Payne Street, Witpoortjie, Roodepoort
Sol Plaatjie Hall	1960 Motlaka Street, Sol Plaatjie, Roodepoort
Leases Bowling Club	1724 Tornado Cres, Georgia, Roodepoort

Please contact Malan Scholes Consulting (MSC) for an electronic copy of the BAR to be emailed or provided on CD.

All comments on the BAR should be submitted to Malan Scholes Consulting at the details shown below. Comments received will be used to update the BAR, as relevant, and copies of all the comments will be included with the BAR when submitted to DMR. Please ensure that your comments are submitted on or before 20 August 2018 (Creswell Park).

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Note: If using post, please also contact us telephonically to notify us of your submission.

DOCUMENT HISTORY
Document Control, Quality Control and Disclaimer

Report	Draft Basic Assessment and Environmental Management Plan for the proposed Creswell Park Mining Permit.		
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Responsible person	Date	Position	Responsibility	Signature
Catherine da Camara	2018/07/11	Environmental Assessment Practitioner	Reviewer	
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mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

BASIC 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).

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EXECUTIVE SUMMARY

West Wits Mining MLI (Proprietary) Limited (West Wits) intends to apply for a mining right and mining permits in terms of the Mineral and Petroleum Resources Development Act (MPRDA) (No. 28 of 2002) for gold, uranium and silver over their current prospecting right area (GP 30/5/1/1/2/10035 PR). Consent in terms of Section 11(2) of the MPRDA to cede a renewed prospecting right MPT No. 29/2016 from Mintails SA Soweto Cluster (Proprietary) Limited to West Wits was granted by the Department of Mineral Resources (DMR) in 2018. The proposed mining permit for Creswell Park will be located on a Portion of Portion 408 of the Farm Roodepoort 237 IQ and a section of the access/haul road will be located on a portion of Portion 407 of the the Farm Roodepoort 237 IQ Gauteng Province. The mining permit area is 4.9428 hectares (ha) in extent, whereas the surface activities totals 6.56ha.



On behalf of West Wits, Malan Scholes Consulting (Pty) Ltd (MSC) appointed Elemental Sustainability (Pty) Ltd (Elemental-S) to undertake the Environmental Authorisation Application processes that form part of two (2) proposed opencast mining permit areas that are less than 5 hectares, namely the Creswell Park opencast pit and Kimberley West opencast pit. Elemental-S is the independent Environmental Assessment Practitioner (EAP) responsible for compiling the two (2) separate Basic Assessment Reports (BARs) and incorporating all necessary environmental specialist studies into the

two (2) separate BARs, which are peer reviewed by Exigo Sustainability (Pty) Ltd an EOH Company. Whereas, SLR Consulting (South Africa) (Pty) Ltd (SLR) are playing a support role in the Public Participation Process.

West Wits Mining MLI (Proprietary) Limited (West Wits) has started the environmental assessment processes that form part of the two (2) mining permit applications to the Department of Mineral Resources (DMR) for the Creswell Park and Kimberly West opencast areas. The mining permit opencast areas would each be mined and rehabilitated within 1 to 2 years.

This Basic Assessment Report is for the proposed Creswell Park opencast pit, which is located within the City of Johannesburg Municipality and Roodepoort Magisterial district. Creswell park project area is located adjacent to the Creswell Residential area, approximately 750m east from the edge of Roodepoort and approximately 4km west of Florida. The proposed areas is approximately 17 kilometres (km) west of Johannesburg, 14km South East from Krugersdorp, 15km south west of Randfontein and 9km north of Soweto.

Legislative Requirements

A summary of the most important legislation applicable to the proposed project are the following:

- *Constitution of South Africa, 1996 (Act No. 108 of 1996) [as amended];*
 - Section 24(a): Everyone has the right to an environment that is not harmful to their health or well-being.
- *National Environmental Management Act (No. 107 of 1998) [as amended]*
 - Section 28 (1): Duty of Care and responsibilities to minimise and remediate environmental degradation.
- *EIA Regulations, 2014 (Government Notices 982) [as amended]*
 - The EIA regulations prescribes the manner and content of the Basic Assessment and Public Participation Processes to be followed.
- *Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) [as amended]*
 - In order to apply for a mining permit, an application was submitted on the Department of Mineral Resources' SAMRAD online application system.
- *National Water Act (Act No.36 of 1998) [as amended]*
 - Section 19: Prevention and remedying effects of pollution
- *National Environmental Waste Act (Act No. 59 of 2008) [as amended]*
 - Section 16: General duty in respect of waste management
- *National Nuclear Regulator Act (No. 47 of 1999) (NNR)*
 - Section 22: Certificate of registration, for the handling and management of gold and uranium containing material.

- *List of Waste Management Activities that have, or are likely to have a detrimental effect on the environment as promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended];*
- *Waste Classification and Management Regulations and Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended];*
- *Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015);*
- *Mine Health and Safety Act, 1996 (Act No. 29 of 1996) [as amended];*
- *National Heritage Resources Act, 1999 (Act No. 25 of 1999);*
- *National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) [as amended];*
- *National Dust Control Regulations, 2013 (Government Notice 827 of 2013);*
- *Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) [as amended];*
- *National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended];*
- *Alien and Invasive Species Regulations (Government Notice 598 of 2014) and Alien and Invasive Species List, 2016 in terms of NEMBA (Government Notice 864 of 2016);*
- *Conservation of Agricultural Resources Act (no. 43 of 1983);*
- *Deeds registries Act, 1937 (Act no. 47 of 1937) [as amended];*
- *Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended];*
- *Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995); and*
- *Other relevant national, provincial, district and local municipality legislation and guidelines that may be applicable to the application. Some of these are discussed in the next section.*

Need and Desirability

The Need and desirability of the project is described in accordance with the Guideline on Need and Desirability (GNR 891 of 2011). The main benefits associated with the proposed project are:

- Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees;
- Implementation of the proposed project will result in skills development associated with the mining method;
- To mine an existing reserve resource and to thereafter rehabilitate;

- The improvement of historical impacted land and newly impacted areas through rehabilitation and removal of rubble and rubbish illegally dumped.
- The availability of the economically mined and rehabilitated land being freed up for housing developments earmarked for the area, that aims to reduce the housing backlog experienced by the City of Johannesburg, while at the same time creating employment and extracting mineral resources for the benefit of the economy;
- Mined and rehabilitation land holds opportunity for spatial integration by decreasing fragmentation and unlocking development potential in large areas;
- The eradication of access to dangerous historic workings targeted by informal miners (Zama Zama's), which are mainly illegal immigrants that pose a threat to the health and safety of the communities and themselves while mining illegally; and
- Short time period associated with the mining and rehabilitation of the area.

The project is aligned with the objectives of the MPRDA (Act 28 of 2002):

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

The net benefit to South Africa as a whole is a product produced for the world commodity market, earning South Africa the necessary foreign exchange and capital needed for a healthy economy and further capital investments in development projects for the long-term future of the country.

Gold is a unique metal, used as bullion and in jewellery, glass and electronics devices production. Thanks to its unique properties, gold has remained a critical material in the electronics sector. The quantity of gold utilised are significant, in 2016 more gold was used in technical applications than either platinum or palladium, two metals commonly associated with the industrial sector, while the amount of gold used in technology was roughly equivalent to central bank gold purchases between 2010 and 2016. The geology of the area is known for gold bearing reefs, and from a mining perspective is ideal for the type of land use.

Illegal mining of gold resources are of significant concern. The illegal mining is a risk to the economy of the country and local area as no wages, taxes and profits are paid. No social economic benefit is gained from the illegal operations. The illegal mines also holds a significant risk to the local communities and the environment. The illegal mining results in un-rehabilitated and unstable land

with significant environmental impacts. Blasting as a mining method is utilised by the illegal mines and can cause significant damage to infrastructure and fuel/gas pipelines located in the area.

On the 20 October 2014, the Department of Environmental Affairs published a Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010, in Government Notice 891 of 2014. The key components are listed and discussed below:

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

Ecological sustainable developments and use of natural resources

As a result of the nature of mining project, impacts on biodiversity areas including aquatic ecosystems, linkages between biodiversity areas and related species and the role that they play in the ecosystem probable.

The project area has been selected on the basis of the presence of economically mineable resources. The mining area would be located on land that has been impacted by historical and current mining activities, illegal dumping of waste and urbanisation. Sensitive ecological areas are associated with a wetland approximately 480 north of the study area (See Annexure E for Sensitivity Map). It is anticipated that the mine will have no impact on this water source. No other water sources are located within close proximity of the site.

The Transformed Grassland and Secondary Grassland Habitat Units as identified on the site have been significantly disturbed as a result of historic and on-going anthropogenic activities and the proliferation of alien and invasive plant species. The floral habitat within the Secondary Grassland Habitat Unit is already largely transformed and of decreased ecological integrity. The floral composition present within the Creswell Park Mining Permit Application area is considered to be in a transition between a pioneer and sub-climax state as a result of anthropogenic activities including alien and invasive plant proliferation. This has resulted in a moderately low ecological importance and sensitivity rating. It is highly unlikely that this habitat unit will support any faunal or floral SCC. The proposed mining and related activities are therefore unlikely to have a significant impact on this habitat unit or the ecological provisions therein.

Promoting justifiable economic and social development

Community/society priorities are officially expressed through public documents including the provincial growth and development strategy and spatial development framework documents. In this

regard the West Wits mining right application falls within an area defined in the City of Johannesburg spatial development framework (SDF) 2040 as a Transformation Zone.

The project is in line with the objective of the Gauteng Spatial Development Framework (GSDF) and the Gauteng Provincial Environmental Management Framework (GPEMF). One of the opportunities as identified in the GSDF is that a rehabilitated mining belt holds opportunity for spatial integration. Mined and rehabilitated land being freed up for housing developments will decrease fragmentation, unlocking development potential in large areas that can be used for future urban development and infill. Where there is a mineral resource the DMR does not allow development that could result in sterilization of a mineral. Therefore if the mineral is mined it allows for the opportunity for development to take place.

The environmental management zone for the proposed area in terms of the GPEMF is zone 1. The intention with this zone is to streamline urban development activities and to promote development infill, densification and concentration of urban development, in order to establish a more effective and efficient city region that will minimise urban sprawl into rural areas. The proposed mining activity is in line with the GPEMF zone as the mined and rehabilitated land will be freed up for housing development.

The proposed project will benefit society and the surrounding communities both directly and indirectly by generating additional employment at the proposed operation and through the extraction of mineral resources and beneficiation of mineral resources within Gauteng. Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees.

Prevention and mitigation measures as recommended by the specialists, were included in this Basic Assessment Report (BAR) and the Environmental Management Programme (EMPR). The implementation of the EMPR will ensure that impacts are effectively managed and kept to a minimal. The potential cumulative impacts were also assessed and found to be of low significance after mitigation for the mining period.

Project Description

Construction phase

Establishment of the facilities required for the opencast mining activities will take place during the construction phase. It should be noted that the construction activities will also form part of the mining (operational) phase of the project and will include establishment of the following: Clearing of vegetation and removal of overburden. Vegetation will initially be removed, and topsoil will be

excavated and hauled to an identified topsoil stockpile for used during rehabilitation. Access to the proposed site will be from the existing road network and internal haul roads will be linked up with access roads. Clearing and removal of rubble and rubbish illegally dumped on the proposed site will take place. Waste will be transported to identified waste disposal facilities.

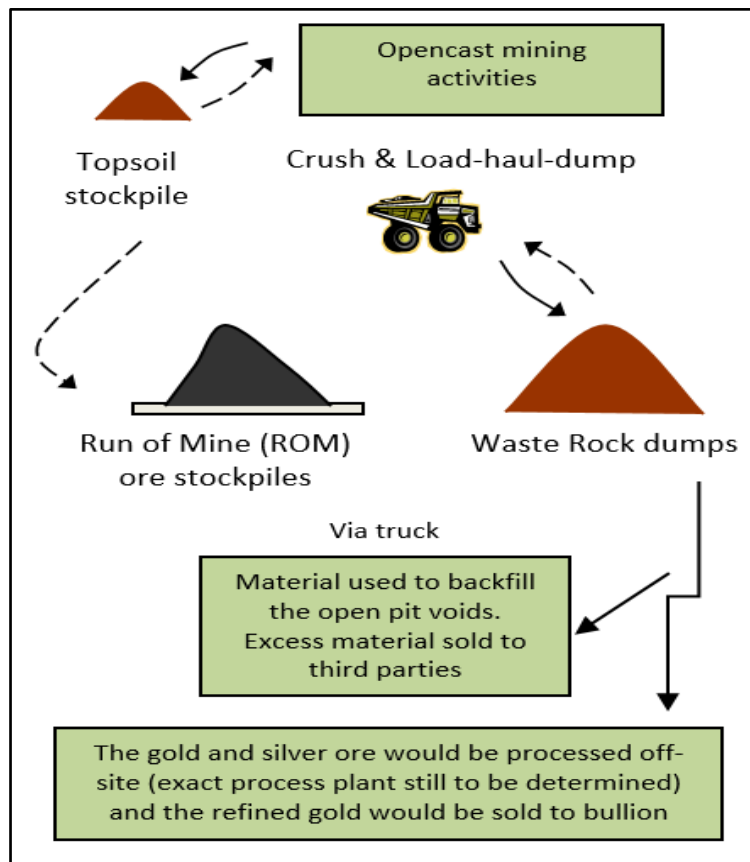
Managerial and supervision during the construction and operational phase will be performed from the existing Sol Plaaityje operation site. No additional infrastructure is therefore required. No processing infrastructure will be constructed as the ore will be transported to an offsite processing facility.

Operational phase

Open cast mining activities would include the following: Topsoil will be excavated and hauled to an identified topsoil stockpile. Waste material below the topsoil will also be excavated and hauled to the identified waste rock dump. Ore will be excavated and hauled to an ore stockpile for initial crushing before transportation to the processing plant. Crushing of the ore will take place to a maximum lump size (P100) of 200mm. Breakage of any material that is not susceptible to free-dig excavation will be enabled through excavators fitted with modern rock breaking technology and it is expected that no blasting will be required at the open pit target.

Rock breaking will be done through the utilisation of Xcentric Rippers. The technology provides a safe alternative in the working field, without any of the environmental hazardous associated with blasting. The risk of rock fly and structural damage to houses are reduce to almost negligible levels as a result of the use of the alternative technology. The resources at the open pit targets are generally outcropping and production can commence at the onset of mining activities. Open pit mining activities will be performed by a mining contractor and production rate of approximately 15 000 tonnes per month is anticipated.

The conceptual flow diagram associated with the proposed project is illustrated below.



Alternatives

The overall mining permit area is indicated in Appendix C, with locations of the individual activities on site. Areas to be avoided in terms of sensitivities are also indicated on the sensitivity maps in this report (**Appendix E**).

The following alternatives were investigated as feasible alternatives:

a) Location Alternatives proposed and preferred option.

Mining is determined by the present and availability of minerals. Minerals can only be mined where they exist. The location of the open pit mining areas was informed by the presence of economically mineable resources to which West Wits would have access. Extensive prospecting has indicated the presence of gold bearing reef on these properties. Therefore, the specific locations and extent of the mining activity is relatively set. The layout of the open pit operation has been designed to optimise the extraction of mineral resources. The topsoil and waste rock dumps have been positioned to create a safety, visual and/or noise berm between the mining operations and nearby receptors. Haul roads will be constructed, no other surface infrastructure is planned for the area.

The proposed property is in an area dominated by current and historical mining activities. The site is infested with alien vegetation, extensive illegal dumping of waste has taken place and illegal mining that is causing destabilisation of the area.

Minerals can only be mined where identified and economically viable, therefore it was not practical to select any other sites. No location alternatives was considered however a number of layout alternative and technology alternative were considered as described below.

b) The type of activity to be undertaken

The shallow ore reserves that were identified during prospecting would be developed in the form of open pit mining, as the area cannot be accessed using underground mining methods. The open pit mining area will consist out of a single cut and mining operations will be undertaken using a conventional excavate, load and haul mining cycle. A number of activity alternatives were investigated as listed below:

Mining method alternatives:

The following mining methods were investigated:

Alternative 1: Drill and Blasting

Drill and blasting as a mining method was investigated for the Creswell Park mining permit. The following risk associated with the method was identified.

- Dangerous rock
- High ground vibration
- Blasting Fumes (air and water pollution)
- High air pressure shock waves
- Damage to infrastructure

As a result of the close proximity of houses and other infrastructure to the mining area drill and blasting will not be considered as a mining method.

Preferred Alternative: Xcentric rippers

The use of modern rock breaking equipment (Xcentric Rippers) was investigated as a mining method to be utilised for the opencast mining at Creswell Park. The use of Xcentric Rippers was chosen as the preferred alternative over drill and blasting for the following beneficial reasons:

- Low ground vibration
- No air over-pressure shock waves
- No dangerous rock fly
- Low dust emissions
- No blasting fumes; and
- No leaching of chemicals to receiving environment

The preferred alternative will be assessed in this report.

Construction of Infrastructure

A number of layout alternatives were considered that included the placement of topsoil dumps, waste rock dumps and roads, the construction of infrastructure were also investigated. The preferred alternative regarding infrastructure is to utilise the existing infrastructure located at the Sol Plaatjie operation. No permanent infrastructure will be constructed on site. No processing plant or tailing storage facility will be constructed for the project. No infrastructure will remain on the mining area after rehabilitation of the area.

Ore Processing and transporting alternatives

A number of alternative were investigated for the processing of ore. The construction of a process facility were investigated and found not to be feasible for this operation. The preferred alternative will be processing of ore at an establish facility off site. This will ensure optimisation of the current process facility and that no tailing storage facility will be constructed and operated in the area. The utilisation of existing processing plants and tailing storage facilities will be beneficial to the project.

No transport alternatives were investigated as a result of the distance to the facility, route alternatives were investigated in the traffic impact assessment and the preferred route has been established. The ore will be transport by truck to the facility. West Wits has an existing toll agreement with Sibanye, alternative transport routes and toll treatment facilities are investigated by West Wits. For this application the transport and treatment alternatives are not assessed.

c) The design or layout of the activity

The design and layout of the mining activity is dependent on the mining plan. The mine planning is done in such a way to reduce the amount of material handling and to optimise the recovery of the resource. The topsoil and waste rock dumps have been positioned to create a safety, visual and/or noise berm between the mining operations and nearby receptors.

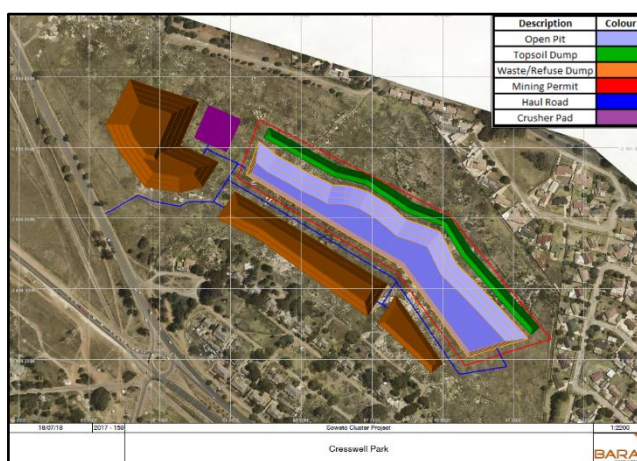
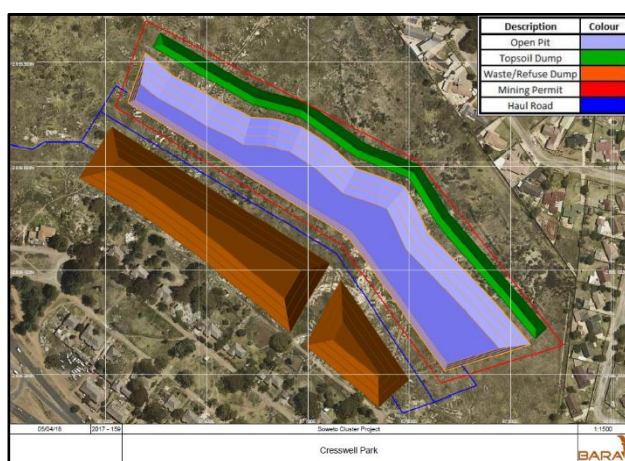
Various designs and layout for the mining operation has been considered and the final layout has been developed based on the availability of the gold reef as indicated by the prospecting conducted and inputs from specialist studies, stakeholders and landowners. A number of alternatives for the placement of waste rock dumps, topsoil stockpiles and road network was investigated. A sensitivity analysis (see Appendix E) was utilised to position the layout. The assessment of the environmental attributes (specialist areas) that informed the sensitivity analysis essentially determined the site layout. The attributes that were included in the sensitivity analysis are:

- Availability of the resource;
- Avoidance of Sensitive areas;
- Specialist Studies;
- Legislative requirements;
- Limiting material handling;
- Existing road network;
- Servitudes; and
- Comments from I&AP's and land owners.

The following two alternatives have been identified.

Alternative 1: Preferred Alternative

Alternative 2



In both alternatives the mining area, topsoil stockpile area, the volume of waste rock and duration of the activity remain constant. For this reason it can be assume that the scale (extent), magnitude (intensity) and duration of the two alternatives are comparable. In alternative 1 the waste rock dump consist out of two areas. In alternative 2 the waste rock dumps consist out of three (3) waste rock dumps. The volume of waste rock remains constant between the two alternatives however in alternative 2 the height of the waste rock is reduce and a third waste rock dump areas is created west

of the open pit area. This waste rock dump is utilised to create a visual barrier between the sensitive receptor located west of the proposed mining area.

In both alternatives the stockpile and waste rock dump areas will act as a visual barrier to the opencast area. No infrastructure will be constructed on the site as existing infrastructure will be utilised. The preferred alternative will be assessed in this report.

d) The operational aspects of the activity

No permanent services including water supply, electricity, or sewerage facilities are required. All infrastructure to be developed will be mobile and temporary including generators, portable toilets, crushers and water tanks. Alternatives for layout, site location, mining activities and transportation, processing of ore are discussed above.

e) The option of not implementing the activity

The “no-go” alternative refer to the option of not going ahead with the proposed project. This would mean that there would be no change to the current status of the site and the positive social-economic and other benefits of the proposed project would not be realised. The “no-go” alternative will result in the sterilisation of the resource by leaving the valuable resource in the ground. It will restrict West Wits as the right holders to mine the area. Implementation of the “no-go” alternative will lead to the following potential positive impact not taking place.

- Direct economic benefits associated with wages, taxes and profits. Indirect economic benefits associated with the procurement of goods and services and the spending power of employees.
- The improvement of historical impacted land and newly impacted areas through rehabilitation and removal of rubble and rubbish illegally dumped.
- Freed up land for housing developments earmarked for the area, that aims to reduce the housing backlog experienced by the City of Johannesburg,
- Creating employment and extracting mineral resources for the benefit of the economy;
- Improving spatial integration by decrease fragmentation, unlocking development potential in large areas; and
- The eradication of access to dangerous historic workings targeted by informal miners (Zama Zama's), which are mainly illegal immigrants that pose a threat to the health and safety of the communities and themselves while mining illegally.

If the “no-go” alternative if implemented the area will not be available for housing developments as a known mineral resources are present in the site and the DMR will not give consent for housing developments over a known resource. The applicant is in consultation with property developments/ landowners and the DMR to make the land available after rehabilitation of the area has taken place.

According to Section 24 of the Constitution, a development must be ecologically sustainable and also support socio-economic development. The proposed mining activities have the potential to have a positive and negative impact on the ecological environment as well as the social environment of the area. These impacts, however, can potentially be prevented, minimised, mitigated and managed to low levels, as shown through the impact assessment.

i) Details of the Public Participation Process Followed

(Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land)

A joint Public Participation Process is being undertaken for the proposed mining permit. The process is undertaken to ensure compliance with regard to the requirements in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended] (MPRDA), the National Environmental Management Act, 1998 (Act No. 107 of 1998) [as amended] (NEMA), the National Environmental Management: Waste Act, 2008 (Act No 59 of 2008) [as amended] (NEMWA), the National Water Act, 1998 (Act No. 36 of 1998) [as amended] (NWA) and Environmental Impact Assessment Regulations (2014) [as amended].

Details of the Public Participation process followed

A Public Participation Process is undertaken for the Environmental Authorisation for the mining permits. The process is undertaken to ensure compliance with the requirements in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended] (MPRDA) and the Environmental Impact Assessment Regulations (2014) [as amended]. This section describes the public participation process (PPP) undertaken to date in line with Chapter 6 of the EIA Regulations (2014) [as amended]. The intention of the PPP was to inform Interested and Affected Parties (I&APs), in sufficient detail, of the proposed project in order that I&APs may contribute meaningfully to the EIA process. SLR Consulting (South Africa) (SLR) has been appointed to play a support role in the Public Participation Process.

The PPP to date has included notification of I&APs through distribution of a Background Information Document (BID), placement of newspaper advertisements, placement of site notices, distribution of flyers, radio announcements, focussed engagement and meetings with community structures and public open meetings. A key aspect of public consultation is the notification of landowners, occupier

and users within and adjacent to the application area. More detail in this regard to the process followed is provided below.

Interested and affected party (I&AP) database

As part of the PPP an I&AP database has been developed for the project. I&APs identified for the project include:

- landowners, lawful occupiers and ward councillors within and adjacent to the mining permit application area
- ratepayer organisations, community leaders and community structures
- non-government organisations and associations working in the area
- mines, industry and businesses in the area
- parastatals
- commenting authorities:
 - Gauteng Department of Agriculture and Rural Development (GDARD)
 - Department of Water and Sanitation (DWS)
 - Department of Agriculture, Forestry and Fisheries (DAFF)
 - Department of Rural Development and Land Reform (DRDLR): Land Claims Commissioner
 - Department of Roads and Transport (DRT)
 - South Africa Heritage Resource Agency (SAHRA)
 - Provincial Heritage Resources Authority Gauteng (PHRAG)
 - Department of Economic Development
 - City of Johannesburg Health Department
 - City of Johannesburg Metropolitan Municipality
 - Roodepoort Magisterial District Municipality
 - Krugersdorp Magisterial District Municipality.

I&APs who attended meetings and /or submitted contact details have been registered on the I&AP database. The latest copy of the database is included in Appendix F-i. The database will be updated on an on-going basis throughout the process.

Mining Permit Applications: (namely Creswell Park opencast pit and Kimberley West opencast pit).

- Elemental-S is the lead EAP with SLR play a supporting role in the Public Participation Process
- The BARs have not yet been placed out for public review yet, as the independent specialists have not yet completed their assessments

- The review period for the Creswell Park permit application will be from 20 July 2018 and 20 August 2018.
- The review periods for the Kimberley West started 22 June and will end on 23 July 2018.
- Please send all comments to projects@malanscholesconsulting.co.za and/or to 720.13087.00001@slrconsulting.com

Mining Right Application:

- SLR is the lead EAP and is responsible for all Public Participation
- Please find the link to the Scoping Report for the West Wits Mining Project on SLR's website: <https://slrconsulting.com/za/slr-documents/scoping-report-for-the-west-wits-mining-project>
- A copy of the scoping report has been made available for a 30-day review and comment period, was from 17 May 2018 to 17 June 2018.
- Please send all comments to mmedallie@slrconsulting.co.za and/or 720.13087.00001@slrconsulting.com

Registration of any I&AP's can take place by registering on the I&AP's database, by sending details of the I&AP to MSC and or SLR. Please feel welcome to contact us should you have further queries or would need additional clarification.

Advertisements and site notices

During the initiation of the PPP, advertisements were placed in the following newspapers:

- Daily Sun on Thursday 22 March 2018 (national newspaper);
- Roodepoort Record on Friday 23 March 2018 (local newspaper);
- Dobsonville Urban News on Friday 30 March 2018 (local newspaper).

A copy advertisements placed are included in Appendix F-ii.

Site notices (400) in a mixture of English, Afrikaans, Zulu and Sotho were placed in key conspicuous positions in and adjacent to the greater mining right application area and mining permit area (between 23 and 28 March 2018). Where requested by ward councillors additional notices were provided as A4 handouts to the councillors for distribution in their wards. A copy of the site notices are presented in Appendix F-iii with the location of the notices presented in Appendix F-iv.

Additional Advertisements and site notices

In May, additional advertisements were placed in the following newspapers:

- Roodepoort Record on Friday 4 May 2018;
- Roodepoort Record on Friday 11 May 2018;
- Daily Sun on Friday 18 May 2018;
- Roodepoort Record on Friday 18 May 2018;
- Soweto Urban Dobsonville on Friday 18 May 2018;
- Soweto Urban Dobsonville on Thursday 19 July 2018;
- Daily Sun on Friday 20 July 2018; and
- Roodepoort Record on Friday the 20 July 2018

A copy of the additional newspaper advertisements are included in Appendix F-viii

Additional site notices (in English) were placed at key locations in and adjacent to the mining right application area and mining permit area and flyers containing the same information were handed out (between 11 and 17 May 2018).

The following further site notice and flyers were distributed specifically for the Creswell Park mining permits.

- Georgia (Ward 84) 7x site notices and 50x flyers
- Hamberg (Ward 84) 3x site notices and 50x flyers
- Creswell Park (Ward 70) 13x site notices and 100x flyers
- DRD (Ward 127) 2x site notices

A copy of the site notices are presented in Appendix F-ix with the location of the notices presented in Appendix F-x. The flyers distributed are presented in Appendix F-xi.

Additional Site Notices were placed and flyers were distributed for the mining right and mining permit as presented below.

Kimberley West

- Tshepisoong (Ward 128) 10x site notices and 200x flyers
- Leratong Village (Ward 127) 10x site notices and 200x flyers
- Bramfischerville (Ward 49) 15x site notices and 300x flyers
- Witpoortjie (Ward 71) 10x site notices and 200x flyers

16 May 2018

- Dobsonville Gardens (Ward 53) 10x site notices and 100x flyers
- Bambayi (Ward 50) 10x site notices and 100x flyers

- Thulani (Ward 129) 10x site notices and 100x flyers
- Emdeni (Ward 52) 10x site notices and 100x flyers
- Zola (Ward 51) 10x site notices and 50x flyers
- Zondi (Ward 46) 10x site notices and 100x flyers
- Tshepisoong (Ward 128) 5x site notices and 100x flyers

15 May 2018

- Meadowlands West (Ward 45) 10x site notices and 100x flyers
- Meadowlands West (Ward 43) 10x site notices and 100x flyers
- Meadowlands East (Ward 41) 10x site notices and 100x flyers
- Meadowlands East (Ward 40) 10x site notices and 100x flyers
- Bramfischerville (Ward 44) 10x site notices and 200x flyers
- Bramfischerville (Ward 49) 10x site notices and 200x flyers
- Dobsonville (Ward 47) 10x site notices and 150x flyers
- Dobsonville (Ward 48) 10x site notices and 100x flyers

14 May 2018

- Leratong (Ward 7) 50x flyers
- Goudrand/Matholesville/Sol Plaatjie /Leratong Village (Ward 127) 10x site notices and 100x flyers
- Florida/Fleurhof (Ward 70) 10x site notices and 150x flyers
- Witpoortjie/Davidsonville (Ward 71) 10x site notices and 100x flyers
- Roodepoort/Georginia/Hamberg (Ward 84) 10x site notices and 100x flyers

Radio Announcements

Radio announcements were also made on Jozi FM on Friday 18 May 2018.

Background Information Document (BID)

A BID document was compiled for the proposed project. The purpose of the BID was to inform I&APs about the proposed project, the EIA process, environmental attributes, possible impacts and means of providing input into the EIA process. The BID was made available in English and included details of the public scoping meetings. The BID was distributed by email, at the public scoping meetings and by hand (starting on 23 March 2018). Hand delivery of BID's were again undertaken on 11 April and 12 April 2018. The BID is presented in Appendix F-v and the proof of distribution are included in Appendix F-vi.

Public meetings

Public scoping meetings

The purpose of holding the public scoping meetings was to:

- to provide an overview of the project and related EIA process
- to provide an overview of the social and labour plan (SLP);
- to provide I&APs with an opportunity to:
 - raise any issues and concerns (both positive or negative)
 - provide input on any environmental sensitivities and potential impacts
- to record issues within the formal assessment process so that they can be addressed during the course of the EIA
- to outline the way forward.

The date, venue and time of the public scoping meetings are provided in Table 1.

Table 1: Public Scoping meetings

Date	Venue	Time
Tuesday 3 April 2018	Sol Plaatjie Hall, Sol Plaatjie	11h00
	E-Hall, Matholesville	17h00
Wednesday 4 April 2018	NG Kerk, Witpoortjie	17h00
Thursday 5 April 2018	Multi-Purpose Centre, Bram Fischerville	17h00
Friday 6 April 2018	Moses Kotane Primary School, Bram Fischerville	17h00

The meetings were held in English due to the diversity of languages present at the meetings. However, attendees were informed that they could ask questions in any language with which they were comfortable. Copies of the BID were made available to attendees at the meetings. Maps indicating the local setting of the project were displayed on the walls at the meetings. Minutes of the meetings are included in Appendix F-vii.

Additional scoping meetings were held as presented below. Queries concerning the mining permits were also addressed at these meetings. The minutes of these meetings will be included in the final basic assessment report.

Table 2: Additional Public Meetings

Date	Venue	Time
Thursday 31 May 2018	Roodepoort City Hall, Roodepoort	18h00
Monday 4 June 2018	Tshepisong Multi-Purpose Centre	16h00

Focused meetings with community structures

A number of focus group meetings took place with individuals from municipal and community structures.

- Georgia South Residents Forum, Maxam Dantex, Transnet and Rand Leases.

Review of the Draft Basic Assessment

I&AP review of Draft Basic Assessment Report

The Draft BAR and EMPR are herewith released for a period of 30 days from 20 July 2018 to 20 August 2018. Hard copies of the Draft BAR and EMPR are herewith submitted to all organs of state and relevant authorities. In addition copies are placed at the following locations as presented below:

- Roodepoort Civic Centre;
- Witpoortjie Library;
- Sol Plaatjie Hall;

An executive summary of the Draft Basic Assessment has been made available to I&APs:

- via email and post to registered I&APs on the I&AP database;
- via email to municipal structure; and
- hard copies were provided to ward councillors for distribution in their respective wards.

In addition, registered I&APs have been notified of the availability of the Draft Basic Assessment for review via SMS and E-mail notifications. Electronic copies of the Draft Basic Assessment will be made available on request.

Where meetings take place during the review period, hard copies of the executive summary will be provided.

Next Phase - Way forward

All comments received from I&APs and organs of state and responses sent will be included in the final BAR and EMPR to be submitted to the Competent Authority (CA).

DMR review of scoping report

On completion of the 30-day review period, a Final BAR will be compiled which will include comments received during the I&AP review period. The report will be submitted to the DMR for its review via the online web portal.

Summary of Issues raised

A high level summary of the issues/concerns raised during the public meetings are presented below, (please refer to Appendix Fxii for detailed the comments and response report).

- Illegal mining
 - Safety concern
 - How will illegal mining be stopped by the legal mining
- Health issues
 - Air Pollution from dumps/ stockpiles
 - Air pollution from mining – dust
 - Noise impact
 - Radiation concerns
 - Water Quality – pollution of resource
- Jobs creation
 - Benefit to the community, Skills development
- Safety concern with mining
 - Open pits
 - Sink holes (not applicable to the area)
- Damage to Houses – Cracks
- Sasol /Transnet pipelines
- Relocation of communities
- Rehabilitation of pits - Loss of biodiversity
- Traffic impacts
 - Capacity of roads
- Logistics (transportation, electrical, plumbing and building infrastructure).
- Procurement requirements of West Wits

- Employment and number of employees (Empowerment)

Specialist studies

The following specialist studies have been conducted:

- Geo-hydrological impact Assessment
- Geo-chemical assessment;
- Terrestrial Ecology Impact Assessment
- Heritage impact assessment
- Noise Impact Assessment
- Air Quality Impact Assessment
- Traffic impact assessment;
- Closure Plans;
- Closure cost estimate;
- Vibration Statement;
- Radiation Statement; and
- Lithological Statement

The main objective of the specialist studies is to provide independent scientifically sound information on issues of concern relating to the project proposal. The findings and recommendations identified by the various specialist studies undertaken, were incorporated into the Basic Impact Assessment and Environmental Management Programme (EMPr). Please see a summary of the specialist studies below.

Groundwater Assessment

Groundwater Basic Assessment Report for the Creswell Park Mining permit was completed by NOA Agencies (Pty) Ltd. Hydrogeological field investigations were performed to assess the local aquifer characteristics. The following were key outcomes:

- The Witwatersrand and Ventersdorp formations (local aquifers) are least vulnerable.
- Based on the aquifer classification map published by the DWS in August 2012 the aquifer classification system defines the Witwatersrand and Ventersdorp as minor aquifers.
- Based on the susceptibility classification the Witwatersrand and Ventersdorp formations have a low susceptibility to contamination.

A project wide hydrocensus was completed in 2018 and 13 boreholes were identified, of which only 4 water levels could be measured. The number of measurable groundwater points raised a concern

with regards to a gap in available groundwater levels and quality in or close to the Creswell Park Open Pit. Additional work (drilling and aquifer/water quality testing of 2 monitoring boreholes) are proposed before mining commences. The groundwater flow model should also be updated once this data becomes available. An additional 123 properties were assessed, however, the land owners indicated no boreholes are located on these properties. Neighbouring mining monitoring data was not available at the time of reporting on the Creswell Park open pit proposed development. The closest borehole recorded with a water level is WitBH4, located 400 m North West of the open pit, with a recorded water level of 11.9 mbgl. The recorded water level elevation at WitBH4 i.e. 1728 mamsl is approximately 2m below the bottom of the Creswell Park open pit.

Samples were taken at 6 boreholes and 4 surface water points. The samples indicated historical and present influences rendering the water unfit for human consumption. This indicated a high present impact on the baseline groundwater and surface water environments. Based on the SANS241 drinking water guideline the sampled groundwater and surface water is not fit for human consumption (unless treated).

The numerical groundwater flow model was constructed based on the available data. The groundwater flow model should be viewed as conceptual and qualified rather than calibrated due to the low density of data points in and around the proposed Creswell Park open pit area.

- Mine dewatering is note foreseen due to the shallow open pit proposed (i.e. <15m deep). Minor seepage and dewatering could be required during the wet season and runoff from the Waste Rock Dump (WRD) and local catchment.
- The sampling of the waste rock was conducted by Shango Solutions (Pty) Ltd. A detailed report is available on the site and sample selection for analyses compiled by Prof Sybrand A. de Waal i.e. Note on the lateral lithological continuity of the Upper Witwatersrand Supergroup rocks. The following key conclusion is worth noting:
 - On the strength of historic knowledge and by considering that the proposed opencast – Creswell Park covers the same stratigraphic horizon as sample Z8501 and Z8502 (See Table below);
 - Samples Z8501 and Z8502 are acceptable compositional estimates of the hanging wall composition of the Main Reef at opencast area Creswell Park
- The geochemical nature of the waste rock was assessed and reported on in detail in West Wits Mining MLI (Pty) Ltd: Creswell Park Open Pit Mine Geochemical Specialist Assessment, Robert N Hansen. May 2018. The following key conclusions from the report was considered with the mass transport simulations for the Waste Rock Dump:

- Acid Mine Drainage (AMD): The acid base accounting and geochemical modelling have indicated that due to the absence of iron sulphide minerals the risk of the development of AMD conditions in the waste rock environment is negligible.
- Leaching of metal(loid) contaminants: The leach test indicated that all three potential contaminants are below detection in the waste rock leachate and the three that are above detection have concentrations significantly below the regulatory values. The geochemical model, which was developed to evaluate the leach test, also shows that the risk of leaching of contaminants, especially the metalloid arsenic, from the waste rock is negligible. This is also due to the absence of iron sulphide as well as the high stability of the minerals comprising the waste rock at the mining conditions.
- Mitigation: Due to the low risk associated with the formation of AMD condition as well as the negligible risk of the leaching of contaminants from the waste rock material, some mitigation measures associated with the installation of the required liner will be required.
- For the mass transport simulations, due to the absence of any possible leachate, a conceptual mass transport simulation was conducted for management purposes and assist the applicant in monitoring the possible influence of the WRD during operations and the backfilled open pit during post operations. A conceptual background value of 5 mg/L was assigned to the host rock, and a potential leachate from the WRD of 100 mg/L (i.e. 100% of a possible certain mass originating from the WRD and open pit post closure). This simulation intends to assist the applicant in continuing the monitoring protocol suggested. Please note that the mass migration simulation is for management purposes and the chosen parameters (5% for background and 100% for source) simulate worst case scenario i.e. although the source term would remain 100%, the background value may alter to 10, 20 or 50%, influencing the mass migration potential.

The possible impacts and mitigation measures were assessed, and key findings are as follows:

- The WRD has potential to leach minerals into the receiving environment and negatively influencing the groundwater and surface water quality. The Creswell Park open pit could induce a hydraulic gradient from the WRD towards the open pit, effectively capturing any mass migration from the WRD during operations. Post operations, once the groundwater levels recovered, mass migration may be temporarily redirected down gradient. However, the WRD will not continue to exist post closure as the material will be backfilled in the open pit during rehabilitation.



- Monitoring boreholes should be drilled between the WRD/open pit and the community to the south, east and north. A monitoring borehole should be drilled into the rehabilitated open pit and included in the post operational monitoring protocol.
- No decanting is expected after closure.

Geo-chemical Assessment

GeoDyn Systems (GeoDyn) was requested to conduct a geochemical risk assessment for the proposed Kimberly West open pit gold mine waste rock material. The mine will only produce waste rock as a mineral waste as no processing plant will be on site and therefore there will also be no tailings storage facility on site. The ore will be trucked to another processing facility.

A total of 10 samples were collected for this study, which were composited into 2 representative samples for laboratory analysis and an accredited laboratory. These are Creswell Park Waste Rock 1 (Z8501) and Creswell Park Waste Rock 2 (Z8502). The sampling of the waste rock was conducted by Shango Solutions (Pty) Ltd. A detailed report is available for the site and sample selection for analyses compiled by Prof Sybrand A. de Waal i.e. Note on the lateral lithological continuity of the Upper Witwatersrand Supergroup rocks. The following key conclusion is worth noting:

- Samples Z8501 and Z8502 are acceptable compositional estimates of the hanging wall composition of the Main Reef at opencast area Creswell Park

Planned Open pit	Reef to be mined	Sample Description	Sampling Coordinate (WGS 1984)		Sample No	Photograph
			Longitude	Latitude		
Creswell Park 1	Main Reef leader and Main Reef	Field sample of Main Reef hanging wall quartzite	27.895247	-26.181278	Z8502	
Creswell Park 2	Main Reef leader and Main Reef	Field sample of Main Reef hanging wall quartzite	27.863308	-26.164865	Z8501	

The objectives of the geochemical assessment were to:

- Conduct a waste classification of the waste rock.
- Determine the likelihood of the development of AMD conditions from the waste material.
- Determine the likelihood of leaching of potential contaminants from the waste rock material.

The waste classified as Type 3, thus requiring a Class C engineered barrier system. However, none of the constituents in the leach test exceeded the regulatory guideline values. In addition, the geochemical model indicated that the waste rock is comprised of minerals which are very stable in the specific mining environment being considered. In addition, the waste rock itself as well as the secondary mineral products which are expected to form very slowly as the waste rock minerals weather, have the capacity to remove contaminants from solution through the process of adsorption.

The waste rock material contains no iron sulphide minerals. Therefore, the risk of the formation of AMD conditions due to the waste rock material is negligible. The results indicate that the significance of both potential impacts rate as Very Low. The cumulative impacts of the impacts rate as Low. This is predominantly because of the fact that the development of AMD conditions as well as the leaching of contaminants from the waste rock is unlikely. The waste rock material is classified as Type 3 according to NEMWA Regulation 635. Due to the stability of the waste rock material as well as the negligible risk of the formation of AMD conditions, it is recommended that the waste rock be re-classified as Type 4, which is inert.

Terrestrial Ecology Assessment

Scientific Terrestrial Services (STS) was appointed to conduct a terrestrial ecological sensitivity scan as part of the Mining Permit Application. From the field two habitat units were identified during the field assessment, namely Secondary Grassland Habitat and Transformed Habitat.

The Secondary Grassland habitat unit comprises small pockets of modified grassland and stands of alien and invasive plant species resulting from historic and current anthropogenic activities. Edge effects from the surrounding residential developments, illegal dumping and ongoing illegal mining activities have further degraded the habitat unit. Due to the high levels of disturbance, only common floral species were noted within the mining permit area with no threatened species encountered.

The Transformed Habitat Unit is considered to be in a significantly modified ecological condition, abundant in alien and invasive floral species such as *Tagetes minuta*, *Acacia mearnsii* and *Melia azedarach*. The transformed areas also include existing illegal and historical mining areas. As a result of habitat degradation and alien and invasive plant proliferation, the habitat suitability for faunal and floral species has been significantly compromised, notably for SCC;

In order to identify possible sensitive habitat areas e.g. watercourses, that may potentially be impacted by the activities within the Creswell Park Mining Permit Application Area, a 500m “zone of investigation” was defined around the Mining Permit Application Area, in accordance with Regulation GN509 of the National Water Act, 1998 (Act 36 of 1998) as promulgated in 2016. Assessing the wetland conditions, state and sensitivity did not form part of the scope of work for this assessment

report, however the proximity of wetland features were highlighted as potential sensitive habitat within the investigation area.

Only a small portion of a wetland was identified within the Investigation Area around the Creswell Park Mining Permit Application Area, approximately 482m north of the Mining Permit Application Area. Due to the distance of this wetland from the Creswell Park Mining Permit Application Area and the fact that this wetland feature is upgradient of the Mining Permit Application Area and the fact that extensive urban infrastructure occurs between the feature and the proposed mining area, it is considered unlikely that the proposed mining activities within the Mining Permit Application Area will pose a risk to the wetland.

Based on the findings of the ecological assessment, from a terrestrial ecological perspective, the proposed mining activity poses minimal risk to the faunal and floral resource management and conservation initiatives for the area, due to the significantly decreased ecological integrity and transformation of the area. However, in order that the significance of perceived impacts remain low, it is essential that the recommended mitigation measures for the identified impacts are adhered to so as to ensure that the ecology within the proposed Mining Permit Application Area along with the surrounding zone of influence is protected or adequately rehabilitated where necessary, in order to ensure that the intended post closure land use objectives are met.

Heritage Assessment

PGS Heritage (Pty) Ltd was appointed to undertake a Heritage Impact Assessment (HIA) for the mining permit application for the proposed opencast pit referred to as Creswell Park.

The archival and historical research has revealed that the entire area of the farm Roodepoort 237 IQ, on which the proposed Creswell Park opencast mining footprint is situated, has been affected on a continual basis by historical mining activities. These mining activities have continued to the present day, both formally and informally (illegal). The ground affected by the Creswell Park opencast footprint is therefore extremely disturbed.

The HIA study has shown that although the project footprint does not contain heritage resources, the immediate surrounding area does contain some heritage resources. Through data analysis and a site investigation the following issues were identified from a heritage perspective.

The data analysis has enabled the identification of possible heritage sensitive areas that included:

- Structures/buildings (residential);
- Burial grounds and graves;

- Possible archaeological sites (based on experience)

Note that these structures refer to heritage sites as listed in the table below.

Table: Tangible Heritage sites in the area adjacent to Creswell Park opencast footprint

Name	Description	Legislative protection
Architectural Structures (residential)	Possibly older than 60 years	NHRA Sect 3 and 34
Burial grounds and graves	Possibly older than 60 years	NHRA Sect 3 and 36
Archaeological sites	Possibly older than 100 years	NHRA Sect 3 and 35

Field assessment was conducted on two separate days (26 April and 8 May 2018) by vehicle and on foot by a team from PGS consisting of an archaeologist and a heritage specialist. During the field assessment of the Creswell Park pit footprint, no heritage sites were identified within the footprint area. The possible sensitive areas (i.e. Ridge, possible features, Features and Forest Area) is NOT present on the site. The only sensitive heritage areas identified in the surrounding area are CP001 (Muslim cemetery), CP002 and CP003 (historical housing) and Site PB, 2008 (historical ash midden). None of the features are within the proposed site boundary.

A Muslim cemetery (Site CP001) and two residential areas (Site CP002 and CP003) containing historical housing structures were identified in close proximity to the footprint area. All three identified sites are situated extremely close to the Creswell Park opencast footprint area; therefore, these sites are described below. In addition, an historical ash midden was identified by a previous HIA study (Site PB, 2008) (Birkholtz, 2008), which is located just outside the northern boundary of the opencast area footprint.

Conclusion and Recommendations

The Creswell Park opencast mining footprint has been disturbed extensively by historical and recent gold mining activities. Any archaeological or other heritage resources that existed within the footprint have been destroyed by these activities and therefore the additional project impacts will not increase or decrease the significance of the existing baseline impacts within the footprint area. The impact is going to happen and will be short term in nature. The impact risk class is thus Low with regards to cumulative impacts within the footprint area.

No fatal flaws were identified from a cultural, historical, archaeological and paleontological perspective. Since no heritage resources were identified within the Creswell Park opencast footprint area, the overall direct impact of the development on heritage resources is regarded as Low to negligible and no mitigation measures are required for the footprint area. However, the indirect impact

of the proposed project unmitigated on the heritage resources identified in the immediate vicinity of the footprint will be Medium and will require a certain amount of mitigation.

It is the considered opinion of the specialist, based on the findings of the desktop research together with the fieldwork findings, that the overall direct impact on heritage resources is acceptably low although the indirect impact on heritage resources is Medium before mitigation. However, provided the mitigation measures recommended for the identified sites situated adjacent to the proposed Creswell Park opencast footprint are implemented, the project can be approved from a heritage perspective.

Noise Impact Assessment

Airshed Planning Professionals (Pty) Ltd (Airshed) was commissioned to undertake a specialist environmental noise impact study for the Creswell Park Basic Assessment Report (BAR). The main objective of the noise specialist study was to determine the potential impact on the acoustic environment and noise sensitive receptors (NSRs) as a result of the development of the proposed project and recommend suitable management and mitigation measures.

The baseline acoustic environment was described in terms of the location of NSRs, the ability of the environment to attenuate noise over long distances, as well as existing background and baseline noise levels. The following was found:

- The closest NSRs to the project site (topsoil stockpile) is ~20 m to the southwest.
- Vehicles are the main contributors to the acoustic environment of the area.
- The baseline noise levels (as measured during the survey) was 41.75 dBA during the day and 41.64 dBA during the night.

The main findings of the impact assessment are:

- Construction and closure phase impacts are expected to be similar or slightly lower than simulated noise impacts of the operational phase.
- Based on the noise sources inventory for the project the noise measured (at sources) at the equipment ranged from 118.6 dBA (Rock breaking) to 126.2 dBA (bulldozer).
- The noise levels from the project operations exceeds the selected noise criteria at the closest NSR's surrounding the project site.

The following key recommendation are made:

- A monitoring programme as per the requirements of the international finance corporation (IFC) and SANS 10103:
 - Annually during the operational phase at the closest NSR; and

- In response to complaints received.
- Minimising the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level near the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level' (Burgess & McCarty, 2009).

Based on the findings of the assessment and the close proximity of NSRs to the project, it is recommended that the mitigation and monitoring measures recommended in this report are in place during the operational phase of the project.

Air Quality Assessment

Airshed Planning Professionals (Pty) Ltd (Airshed) was appointed to undertake an air quality specialist study for the project as part of the Basic Assessment process. Sensitive receptors in the vicinity of the Creswell Park operations include the residential areas of Creswell Park to the north, east and south of the mining operations. For the purposes of this assessment all residences within these areas were considered as sensitive receptors.

The main findings from the baseline assessment are as follows:

The flow field is dominated by winds from the north-north-east. During day-time conditions, winds from the north increase in frequency, with winds from the north-north-east sector increasing at night. Existing sources of emissions in the study area include vehicle exhaust and entrainment on paved and unpaved roads, household fuel burning, biomass burning (veld fires), industrial activities, mining operations and wind erosion from exposed areas and tailings storage facilities. High dust fallout rates recorded at all current sampling locations during the windy spring months from September to November indicates that wind erosion is likely a significant source of dust emissions in the study area.

The main findings from the impact assessment are as follows:

The main sources of dust emissions from the Creswell Park operations are likely to be materials handling of Run of Mine (ROM) and waste rock in the pit and of waste rock at the Waste Rock Dump (WRD) and vehicle entrainment emissions from haul trucks and other mobile equipment.

With no mitigation measures applied simulated highest daily PM₁₀ (inhalable particulate matter less than 10 µm in diameter) concentrations exceed the South African National Ambient Air Quality

Standards (SA NAAQS) at the closest sensitive receptors located to the east of the operations. With simple mitigation measures such as wet suppression of dust at material handling points and regular water sprays on haul roads, simulated incremental PM₁₀ concentrations due to the Creswell Park operations are in compliance with the SA NAAQS at all sensitive receptor locations. Even with no mitigation measures applied simulated inhalable particulate matter less than 2.5 µm in diameter (PM_{2.5}), nitrogen dioxide (NO₂), sulfur dioxide (SO₂) and carbon monoxide (CO) concentrations are in compliance with the SA NAAQS for all averaging periods and simulated highest monthly dust fallout rates are in compliance with the SA National Dust Control Regulations (NDCR) residential limit at all sensitive receptor locations and in compliance with the SA NDCR non-residential limit at all off-site areas.

With no mitigation measures applied the incremental impact of the Creswell Park operations on the receiving environment is expected to be MEDIUM. With 50% mitigation of material handling emissions and 30% mitigation of vehicle entrained dust from unpaved roads, the incremental impact of the Creswell Park operations is expected to be LOW. The cumulative impact during the mining phase (with mitigation measures applied) is expected to be MEDIUM, but the short life of the Creswell Park operations means that long term impacts (annual average pollutant concentrations) are unlikely to exceed the SA NAAQS.

Based on the findings above the following recommendations are made:

It is recommended that:

- Best practice mitigation measures (wind breaks, wet suppression etc.) for both the mining and rehabilitation phases.
- A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns;
- Wet suppression techniques should be used to control dust emissions, especially in areas where dry material is handled or stockpiled.
- Exposed soils and other erodible materials should be re-vegetated or covered promptly;
- New areas should be cleared and opened-up only when absolutely necessary;
- Surfaces should be re-vegetated or otherwise rendered non-dust forming when inactive;
- Storage for dusty materials should be enclosed or operated with efficient dust suppressing measures;
- Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems;

- Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts.
- Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions.
- Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates.
- The vehicle fleet be regularly serviced and maintained to minimise CO, NO₂, SO₂ and greenhouse gas emissions.
- Older vehicles in the current fleet should be replaced with newer, more fuel-efficient alternatives where feasible.
- PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location on the southern or western edge of the residential area of Creswell Park, directly to the north and east of the operations.
- If PM₁₀ concentrations are found to be in exceedance of the NAAQS at the closest sensitive receptor locations additional dust suppression measures should be investigated. If the mitigation measures employed are considered best practise, additional offset measures should be considered. Such offset measures include upgrading of public road surfaces, electrification of houses for cooking and heating or supply of cleaner burning fuel for cooking and heating purposes.

Traffic Impact Assessment

Siyazi Gauteng Consulting Services (Pty) Ltd. was appointed to conduct a Traffic Impact Assessment (TIA) for the proposed Creswell Park portion of the proposed West Wits Mining operation.

The proposed mining development would involve opencast mining which would include conventional open pit mining operations of load and haul. Ore excavated will be transported by haul trucks via the existing roads network to a processing plant located off-site. It is proposed that up to 47 925 tonnes of ore would be transported to the off-site processing plant over a maximum period of 4 months.

The following scenarios were investigated as part of the TIA:

- a. Scenario 1: 2018 peak hour traffic without background traffic growth, without the proposed mining development (status quo);
- b. Scenario 2: 2019 peak hour traffic with background traffic growth, with the proposed mining development (operational phase);

Based on a site inspection of the existing road network adjacent to the site under investigation, traffic surveys, calculations and reference to the relevant traffic engineering guideline documents, the following findings and recommendations were made:

- Summary of Intersections that require improvements without and with the proposed mining development; and
- Need for improvements without and with the proposed mining development.
- Pedestrian walkways and crossings should be provided at the proposed access intersections to ensure a split between vehicle traffic and pedestrians moving around the intersections; and
- Road markings, reflective road studs (LED), road signs, overhead lights should be provided and maintained at all the relevant intersections under investigation to ensure visibility during night time, proper visibility of intersection lane geometry and sufficient information to road users; and
- As part of the proposed mining development, it is recommended that ore haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods.

The following recommendations are made in terms of the detailed design phase of roads for the proposed project:

- Detailed investigations should be conducted in conjunction with the relevant road 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 needs to be prepared in conjunction with the relevant road authority on public roads where trucks will operate as soon as the project has been approved in order to ensure that the consumables, ROM ore and workers can be transported at all times.

In conclusion of the findings as part of the investigations, Siyazi Gauteng Consulting Services (Pty) Ltd is of the opinion that the proposed mining development would have a manageable impact on the relevant roads network as long as the mitigating measures are implemented as recommended and should thus be granted authorisation.

Closure Assessment

Golder Associates Africa (Pty) Ltd (Golder) was appointed to compile a Mine Closure Plan (Closure Pan) for the proposed Creswell Park opencast pit. The Closure Plan was compiled in alignment to the NEMA GN R. 1147 Regulations. Good practice measures widely adopted by the South African and international gold mining industry were incorporated where deemed necessary.

The approach adopted in undertaking closure planning for Creswell Park is founded on three key planning foci.



1. The application of an iterative closure planning / design process



This iterative process underpins the principle that planning for closure should occur throughout the life of the mine, with solutions continually being refined via a cyclical process of survey, analysis and design.

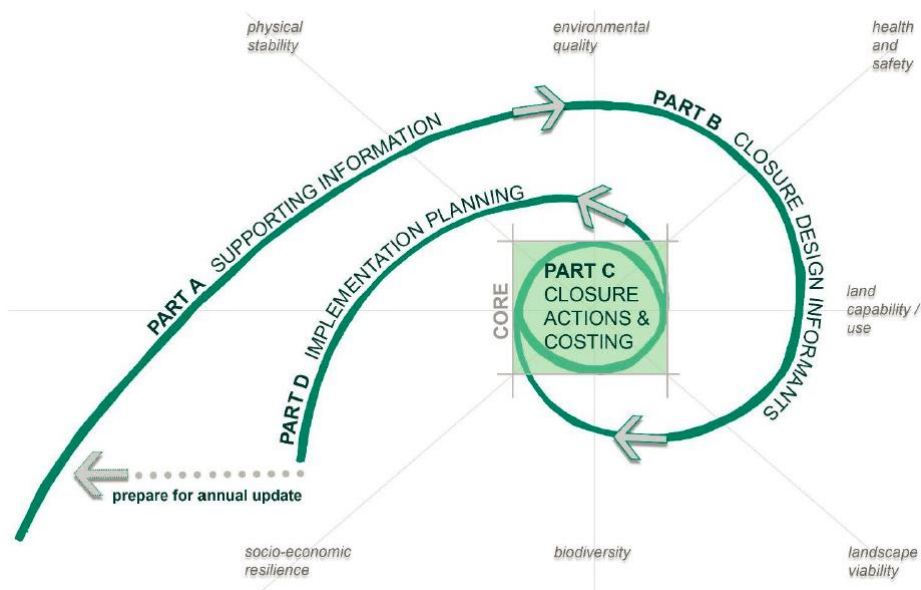
2. An entrenchment of seven key closure objectives:

<p>physical stability</p>	<p>To create a physically stable, safe, rehabilitated landscape that limits long term environmental degradation, erosion and failure / collapse of unavoidably remnant mining residue which are present on the mine site post closure, thus enabling the successful establishment of the planned post-mining land use</p>
<p>environmental quality</p>	<p>To ensure that local environmental quality is not adversely affected by possible physical effects and chemical contamination arising from the mine site or individual facilities, as well as to sustain catchment yield as far as possible after closure</p>
<p>health and safety</p>	<p>To limit the possible health and safety threats to humans and animals using the rehabilitated mine site as it becomes available</p>
<p>land capability land use</p>	<p>To re-instate a suitable land capability over the mine site to facilitate the progressive implementation of the planned post-mining land use</p>
<p>landscape viability</p>	<p>To create a landscape that is self-sustaining and over time will converge to the desired ecosystem structure, function and composition</p>

	<p>To encourage, where appropriate and as aligned to the planned post-mining land use, the re-establishment of native vegetation on the rehabilitated mine site such that the terrestrial biodiversity is largely re-instated over time in line with the housing development requirements.</p>
	<p>To ensure that there constructive engagement and alignment with local communities and regulatory authorities regarding the proposed end land use</p>

3. The application of a tiered risk-based process to allow for a true understanding of the challenges and opportunities that needs to be addressed and refining, abstracting and prioritising essential issues.

The structure, development (intensification) and application of the above foci is illustrated below, with each section of the Closure plan described below.



Closure Cost Assessment

The summary of the scheduled closure costs calculated for the proposed Creswell Park opencast pit are indicated in the table below.

18102155 Creswell Park Opencast Pit Closure Costs, as at June 2018			
Closure components		Unscheduled Closure (2018)	Scheduled Closure (2019)
1	Infrastructural aspects	R -	R -
2	Mining aspects	R -	R 3,394,419.55
3	General surface rehabilitation	R -	R 94,322.26
Sub-Total 1		R -	R 3,488,741.81
5 Post-Closure Aspects			
5.1	Surface water monitoring - 5 years	R -	R 229,994.20
5.2	Groundwater monitoring - 5 years	R -	R 313,888.70
5.3	Rehabilitation monitoring - 3 years	R -	R 211,722.00
5.4	Care and maintenance - 3 years	R -	R 219,372.71
5.5	Contingencies for post-closure aspects	R -	R 97,497.76
Sub-Total 2		R -	R 1,072,475.37
6 Additional Allowances			
6.1	Preliminary and general	R -	R 348,874.18
6.2	Contingencies	R -	R 348,874.18
6.3	Additional studies	R -	R 208,792.50
Sub-Total 3		R -	R 906,540.86
Grand Total Excl. VAT. (Sub-total 1 +2 +3)		R -	R 5,467,758.04

Radiation

SciRAD consulting was appointed to provide a statement on Radiation impact for the West Wits – Creswell Park mining permit and the possible health risk for surrounding communities and workers. Uranium and Thorium and their daughter products (e.g. Radium and Radon) are the radioactivity found in the gold and uranium bearing ore. The radiation from the ore may present a health risk to the public living close to the mine. The risk to members of the public may come from various sources:

- Inhalation of radioactive dust and radon,
- Exposure to the radioactive dust deposited in the area as a result of the mining operations.

However, studies at a number of mines in the Witwatersrand area have shown that the radiation dose to members of the public is not expected to exceed the 250 microSievert (0.25 mSv/a) per year dose limit (for a single operation) set by the National Nuclear Regulator (NNR). In addition, for the Creswell Park operation, dust concentrations are expected to be low with mitigation measures (refer to the Airshed Air Quality Assessment), groundwater in the area is not potable (refer to the Noa Agencies Groundwater Report) and tailings - that could potentially pollute the environment – will not be present. These aspects will contribute to a reduction in the radiation dose compared to other operations. It may therefore be concluded that radiation from the Creswell Park mining operations presents a very low health risk to members of the public.

The health risk for workers at the mine will be exposed to the same radiation sources as the public but at higher concentrations, due to closer proximity to these sources. Still, the worker doses are not expected to exceed the worker dose limit of 20 mSv/a (20 000 microSievert). The radiation from the

Creswell Park mining operation may therefore present a low health risk to the workers on site. Possible risk after closure. Remediation, from a radiological perspective, must be performed according to the NNR's Regulatory Guide – Site Remediation and Release from Regulatory Control (RG-0026). If remediation is done properly, the risk to the environment and the public is expected to be low. A radiological assessment has been initiated to determine the remediation requirements for the activity. The assumed conclusion can only be confirmed once the radionuclide analyses have been received and used as input in the radiological assessments that are currently underway.

Vibration Assessment

Cambria CC was appointed to assess the possible impact associated with vibration during opencast mining at the West Wits – Creswell Park mining permit area. Vibration measures were undertaken at an existing opencast area (i.e. Sol Plaatjie). No blasting will take place on site and rock breaking will be done through modern rock breaking methods (Xcentric rippers). As a result that no blasting will take place the risk of rock fall is negligible small and was not assessed as a risk.

A White Industrial Mini Seis II seismograph was used to measure the disturbance levels. The seismograph is equipped with a tri-axial geophone and a microphone so it is capable of measuring vibration and noise simultaneously. The seismograph was initially set up at a distance of 15m from the ripper. The trigger levels were set to 0.762mm/sec for ground vibration and to 106dB for air disturbance (noise). Monitoring was carried out at both locations for almost one hour. The seismograph was then moved to a second position 45m away from the ripper. The vibration trigger level was initially set to 0.254mm/sec and the air trigger was left at 106dB, which is the lowest possible trigger setting. The vibration trigger was then changed to 0.381mm/sec because of the number of haul trucks that were moving in the close proximity to the seismograph location.

Analysis of the ground vibration levels recorded at a distance of 15m from the ripper shows that 57% of the events recorded registered levels of less than 1.0mm/sec, 89% of the events recorded registered levels of less than 1.5mm/sec, 95% of the events registered levels of less than 2.0mm/sec and 100% of the events registered levels less than 2.5mm/sec.

The vibration levels were highest close to the ripper and the levels had attenuated significantly at a distance of 45m. The same was true for the air /noise disturbance. In the table below the ground vibration level reduces from 2.29mm/sec at 15m to 0.508mm/sec at 45m. The highest PPV level recorded at 15m from the ripper was utilised to model the possible impact of ground vibration with increase in distance. The results show how the PPV levels decrease rapidly with increase in distance. The results show how the PPV levels decrease rapidly with increase in distance. Based on the measurements made and the calculations performed the vibration levels at any distance greater than

100m from the pit will be imperceptible. If the calculated values are compared to the USBM and DIN recommended standards it is clear that they are well within the proposed limits. The results are presented below.

VIBRATION	
Distance increment metres	Vibration Level
Distance (m)	PPV (mm/s)
15	2.28
20	1.42
30	0.73
35	0.56
40	0.45
45	0.37
50	0.31
100	0.10
150	0.05
200	0.03
235	0.02

Despite the low levels predicted, the vibrations may still attract attention as the highest levels fall into the 'distinctly perceptible' human response category at distances starting at about 50m. The effect of ground vibrations on humans is summarised in the table below.

Effect on Humans	Ground Vibration Level in mm/sec
Imperceptible	0.025 – 0.076
Barely perceptible	0.076 – 0.254
Distinctly perceptible	0.254 – 0.762
Strongly perceptible	0.762 – 2.540
Disturbing	2.540 – 7.620
Very disturbing	7.620 – 25.400

Conclusion

The ground vibration levels were highest close to the Xcentric ripper's area of operation. The levels attenuated rapidly with increase in distance. Vibration levels at distances greater than 50m will be negligible in this geological environment. The ground vibration levels recorded in close proximity to the equipment were not high enough to cause damage to structures. The levels recorded at a distance of 45m were even lower and is within the lower end of the Distinctly Perceptible range. The vibration decreases to the imperceptible range within 100m from the activity. The close sensitive receptor to the proposed Creswell Park mining activity will be greater than 50m and based on the measurements will be between the distinctly perceptible to barely perceptible range.

The Kimberley Reef rock in pit 3 was weathered and appeared to break very easily. The vibration levels will vary in response to how competent the rock mass is in a specific geological environment.

The low levels recorded in pit #3 would not necessarily be the case in other areas where a more competent rock mass is encountered. Higher vibration levels should be expected when this occurs. It may be necessary to carry out control monitoring in the different mining areas as and when required.

Reasoned Opinion of the EAP

Based on specialist studies and the impact assessment undertaken no fatal flaws have been identified. However, several environmental and social impacts are envisaged from construction phase through to post-closure. The assessment of the proposed project presents the potential for highly negative impacts to occur on the geology and loss of resources before mitigation measures are implemented. The impact on the bio-physical, cultural and socio-economic environments is expected to be medium to low. With mitigation these potential impacts can be prevented or reduced to acceptable levels. If all the recommendations of the specialists and mitigation measures provided in the Environmental Management Programme (PART B of this report) is effectively implemented and based on the information contained in this report as obtained from specialist there is no environmental, social or economic impact that is of such significant that the project should not proceed.

Summary of Key Recommendations

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through physical measures, the recommendations from the basic assessment report are included within the Environmental Management Programme (EMPR). The EMPR is based on all the information contained within this report as well as all the specialists' reports. The following key recommendations have been made by the specialist.

Key specialist recommendations

- An independent environmental control officer (ECO) must be appointed to monitor the implementation of the EMPR and audit reports to be kept by the applicant;
- Submission of a Water Use License Application and the undertaking of all relevant specialist studies for that purpose.
- Establish a stormwater management plan before construction of the activity is undertaken in line with requirements as set out in GN 704.
- The EMPR is a contractual document and must be implemented at all times during the all phase;
- An updated hydrocensus should be completed in a 500m radius around the Creswell Park open pit project area. The data recorded should be used to update the monitoring protocol and the groundwater flow model and associated management scenarios.
- A detailed monitoring program should be initiated before mining commence:

- Monitoring boreholes should be drilled between the WRD/open pit and the community to the south, east and north
- All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. The results should be recorded as the baseline against which all future possible impacts be measured and managed.
- Monitoring (water levels and quality) during mining should be performed monthly due to the short Life of Mine (4 months). Post operational monitoring should be conducted quarterly for at least 2 years post rehabilitation of the Creswell Park project area.
- A monitoring borehole should be drilled into the rehabilitated open pit and included in the post operational monitoring protocol. Water levels and water quality should be monitored on a quarterly bases.
- An alien vegetation management plan should be developed before the mine becomes operational.
- In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed instantly. These finds must be protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that mitigation (e.g. recording, collection) can be undertaken by a professional palaeontologist.
- A buffer zone of 100m (Section 17.6(a) of the Mine Health and Safety Act) is required to protect burial grounds and structures.
- A management and mitigation plan is recommended to minimise noise impacts from the project on the surrounding area.
- A monitoring programme as per the requirements of the International Finance Corporation (IFC) and SANS 10103:
 - Annually during the operational phase at the closest NSR; and
 - In response to complaints received.
- Waste rock and stockpiles to be utilized as noise barriers to reduce impact on surrounding sensitive receptors.
- Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday
- PM₁₀ monitoring for the duration of the mining and rehabilitation phases to be undertaken. The recommended location for PM₁₀ monitoring is at a suitable safe location.

- Detailed investigations should be conducted in conjunction with the relevant road 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 needs to be prepared in conjunction with the relevant road authority on public roads where trucks will operate as soon as the project has been approved in order to ensure that the consumables, ROM ore and workers
- Can be transported at all times. Road markings, reflective road studs (LED), road signs, overhead lights should be provided and maintained at all the relevant intersections under investigation to ensure visibility during night time, proper visibility of intersection lane geometry and sufficient information to road users; and
- As part of the proposed mining development, it is recommended that ore haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods.
- Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material.
- Radiological assessment, must be performed according to the NNR's Regulatory Guide – Site Remediation and Release from Regulatory Control (RG-0026).
- Closure plan and closure cost assessment to be updated annually. The closure plan to be updated based on a thorough assessment of the new regulations, namely GN.R 1228.
- Liner to be installed as required by waste classification and specialist recommendation.
- Concurrent/progressive rehabilitation must be implemented at all times and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint, but will also reduce the overall rehabilitation effort and cost;
- Rehabilitation of pit to take place in accordance with rehabilitation plan, procedure to ensure rehabilitation objects are achieve
- A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems.
- Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns

A variety of mitigation measures have been identified that will serve to mitigate the scale, intensity, duration or significance of the potential negative impacts identified. These include guidelines to be applied during all phases of the proposed mining activity. The EMPR contains detailed mitigation measures for all impacts identified. The proposed mitigation measures, if implemented, will reduce the significance and or probability of the identified impacts.

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ABBREVIATIONS

CA	Competent Authority
CBA	Critical Biodiversity Area
CoJ	City of Johannesburg
CoT	City of Tshwane
CSA	Constitution of South Africa (Act No. 108 of 1996)
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DTM	Dimensional Terrain Modelling
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPR	Environmental Management Programme
ESA	Ecological Support Area
ESM	Environmental Site Manager
GDARD	Gauteng Department of Agriculture and Rural Development
GDP	Gross Domestic Product
GPEMF	Gauteng Environmental Management Framework
GN	Government Notice
GIS	Geographic Information System
GPS	Global Positioning System
GSDF	Gauteng Spatial Development Framework
GVA	Gross Value Added
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
Mamsl	Metres above mean sea level
MHSA	Mine Health and Safety Act (Act No. 29 of 1996) [as amended]
MPRDA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (as amended)
NEMA	National Environmental Management Act, 1998 (Act no 107 of 1998) (as amended)
NEMAQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004) (as amended)

NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEMWA	National Environmental Management: Waste Act (Act No. 59 of 2008) (as amended)
NNR	National Nuclear Regulator
NHRA	National Heritage Resource Act, 1999 (Act No. 25 of 1999)
NVFFA	National Veld and Forest Fire Act (Act No. 101 of 1998)
NWA	National Water Act, 1998 (Act No. 36 of 1998) (as amended)
PM	Public Meeting
PPE	Personal Protective Equipment
PPP	Public Participation Process
RWD	Return Water Dam
SAHRA	South African Heritage Resources Agency
SANS	South African National Standards
SAWS	South African Weather Service
SDF	Spatial Development Framework
SLP	Social and Labour Plan
SM	Site Manager

IMPORTANT NOTICE

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

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

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

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

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

Objective of the basic assessment process

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

- (a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- (b) identify the alternatives considered, including the activity, location, and technology alternatives;
- (c) describe the need and desirability of the proposed alternatives,
- (d) through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine:
 - (i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
 - (ii) the degree to which these impacts—
 - (aa) can be reversed;
 - (bb) may cause irreplaceable loss of resources; and
 - (cc) can be managed, avoided or mitigated;
- (e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—
 - (i) identify and motivate a preferred site, activity and technology alternative;
 - (ii) identify suitable measures to manage, avoid or mitigate identified impacts; and
 - (iii) identify residual risks that need to be managed and monitored.

PART A

SCOPE OF ASSESSMENT AND BASIC ASSESSMENT REPORT

1. Introduction

West Wits Mining MLI (Proprietary) Limited (West Wits) intends to apply for a mining right and mining permits in terms of the Mineral and Petroleum Resources Development Act (MPRDA) (No. 28 of 2002) for gold, uranium and silver over their current prospecting right area (GP 30/5/1/1/2/10035 PR). Consent in terms of Section 11(2) of the MPRDA to cede a renewed prospecting right MPT No. 29/2016 from Mintails SA Soweto Cluster (Proprietary) Limited to West Wits was granted by the Department of Mineral Resources (DMR) in 2018. The proposed mining permit for Creswell Park (See Figure 1) will be located on a Portion of Portion 408 of the Farm Roodepoort 237 IQ and a section of the access/haul road will be located on a portion of Portion 407 of the the Farm Roodepoort 237 IQ Gauteng Province. The mining permit area will constituting an area of 4.9428 hectares (ha) and a total area of 6.56ha.



Figure 1: Creswell Park – Site location and layout.

The West Wits ('the project') Mining Right Application will include a Mining Work Programme as well as a Social and Labour Plan in addition to the integrated Environmental Authorisation application. SLR Consulting (South Africa) (Pty) Ltd (SLR) has been appointed as the EAP responsible for undertaking the required environmental regulatory processes and conducting public participation for the mining right application process. West Wits MLI (Pty) Ltd (West Wits) appointed Malan Scholes Consulting (Pty) Ltd (MSC) and not Malan Scholes Attorneys to facilitate the necessary regulatory processes that are required to form part of two (2) Mining Permit Applications and one (1) Mining Right Application.

On behalf of West Wits, Malan Scholes Consulting (Pty) Ltd (MSC) appointed Elemental Sustainability (Pty) Ltd (Elemental-S) to undertake the Environmental Authorisation Application processes that form part of two (2) proposed opencast mining permit areas that are less than 5 hectares, namely the Creswell Park opencast pit and Kimberley West opencast pit. Elemental-S is the independent Environmental Assessment Practitioner (EAP) responsible for compiling the two (2) separate Basic Assessment Reports (BARs) and incorporating all necessary environmental specialist studies into the two (2) separate BARs, which are peer reviewed by Exigo Sustainability (Pty) Ltd an EOH Company. Whereas, SLR Consulting (South Africa) (Pty) Ltd (SLR) are playing a support role in the Public Participation Process.

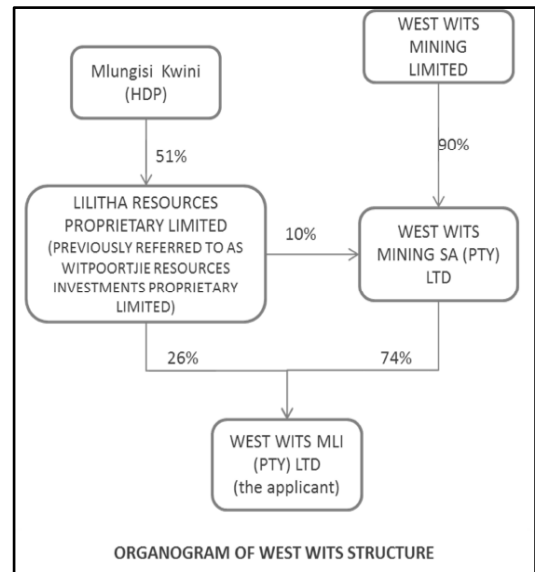
West Wits Mining MLI (Proprietary) Limited (West Wits) has started the environmental assessment processes that form part of the two (2) mining permit applications to the Department of Mineral Resources (DMR) for the Creswell Park and Kimberly West opencast areas. The mining permit opencast areas would each be mined and rehabilitated within 1 to 2 years.

The study area (Creswell Park) is located within the City of Johannesburg Municipality and Roodepoort Magisterial district. Creswell park project area is located adjacent to the Creswell Residential area, approximately 750m east from the edge of Roodepoort and approximately 4km west of Florida. The proposed areas is approximately 17 kilometres (km) west of Johannesburg, 14km South East from Krugersdorp, 15km south west of Randfontein and 9km north of Soweto.

Introduction to West Wits

West Wits Mining Limited is an Australian listed exploration and development company. The directors include the Executive Chairman (Michael Quinert) and Non-executive Directors Hulme Scholes, Daniel Pretorius, Vincent Savage, Dr Andrew Tunks. Through its listing it is owned by a number of shareholders across the globe.

The South African subsidiary of the company is West Wits MLI (Pty) Ltd (West Wits). West Wits is 26% empowered. The empowerment company is Lilitha Resources Proprietary Limited, previously referred to as Witpoortjie Resources Investments Proprietary Limited.



2. Contact Person and correspondence address

a) Details of: DuToit Wilken

i) The EAP who prepared the report

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ii) The reviewers

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iii) Expertise of the EAP and reviewer

(1) The qualifications of the EAP

(With evidence attached as Appendix A)

	DuToit Wilken	Catherine Da Camara
Qualification	<ul style="list-style-type: none">○ University of Pretoria, MSc Geography – 2015○ University of Pretoria, BSc Hon Environmental Science – 2010○ University of Pretoria, BSc Environmental Science – 2009	<ul style="list-style-type: none">○ BSc. Hons (Animal, Plants and Environmental Sciences)
Registration	<ul style="list-style-type: none">● Pr.Sci.Nat (Environmental Science) – 118911	<ul style="list-style-type: none">● Pr.Sci.Nat (Environmental Science)● Environmental Assessment Practitioner

(2) Summary of the EAP’s past experience.

(Attached the EAP and reviewer’s Curriculum Vitae (CV) as Appendix B)

DuToit Wilken is the Environmental Assessment Practitioner (EAP) for the project. He has more than 8 years of experience in applying the principles of Integrated Environmental Management, and in applying the Environmental Legislation to a number of development projects and initiatives in Southern Africa. DuToit Wilken holds an MSc degree in Geography (Coal Mine Rehabilitation) and is registered as a professional natural scientist (Environmental Science) with the SACNASP.

Mrs Catherine Da Camara started her career as an Environmental Assessment Practitioner in 2002 and is registered with SACNASP as a Professional Natural Scientist. She received her BSc Honours Degree (Animal, Plants and Environmental Sciences) from the University of the Witwatersrand in 1999. Projects she has worked on include Environmental Impact Assessments for the mining sector, residential and industrial developments. She has experience in compiling Environmental Management Plans, Waste License Applications, Water Use License Applications, Environmental Risk Assessments, Environmental Legal Compliance Audits and is well experienced in the front-end loading (FEL 1-3) study requirements (SSD). Catherine is qualified as a Carbon Footprint Analyst and is experienced in Geographic Information systems (GIS), public participation and general project management of environmental projects.

3. Location of the overall Activity

Table 3: Location of the Overall Activity

Farm Name:	The mining permit will be located on a portion of Portion 408 of the Farm Roodepoort 237 IQ and a section of the access/haul road will be located on a portion of Portion 407 of the Farm Roodepoort 237 IQ
Application area (Ha)	4.9428 Ha – Mining Permit Area. 6.56 ha – total area
Magisterial district:	Magisterial District of Roodepoort
Distance and direction from nearest town	Creswell park mining permit is located adjacent to the Creswell Residential area, approximately 750m east from the edge of Roodepoort and approximately 4km west from Florida. The proposed areas is approximately 17 kilometres (km) west of Johannesburg, 14km South East from Krugersdorp, 15km south west from Randfontein and 9km north of Soweto.
21 digit Surveyor General Code for each farm portion	T0IQ0000000023700007 & T0IQ0000000023700008

4. Locality map

*(Show nearest town, scale not smaller than 1:250000) - Refer to **Appendix C** for the locality map.*

5. Description of the scope of the proposed overall activity

(Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities).

See **Figure 3** for an indication of the layout plan with areas of all listed activities.

Summary of Environmental Authorisation Required

Prior to the commencement of the proposed project environmental authorisations are required from the following competent authorities:

- Environmental authorisation from the DMR in terms of the NEMA. The proposed project incorporates several activities listed in Government Notice Regulation (GNR) 983, 984 and 985 of 4 December 2014, as amended. The EIA regulations being followed in this study are GNR 983 of 4 December 2014, as amended (EIA Regulations).

- A waste management license (WML) from the DMR in terms of the NEM:WA. The proposed project incorporates waste management activities listed in GNR 921 of 29 November 2013, as amended.
- A water use license (WUL) from the Department of Water and Sanitation (DWS) in terms of the National Water Act (No. 36 of 1998) (NWA). The proposed project incorporates water uses in terms of Section 21 of the NWA.

The applicable listed activities and water uses are listed in (Table 4 - 6) of this report. A mining permit application and integrated NEMA and NEM:WA application were lodged by West Wits with the DMR on 10 April 2018. The WUL application will be submitted to the DWS towards the end of the EIA process. Additional permits or licenses that may be required for the project include:

- Approval from the relevant Department of Roads and Transport for upgrading any roads or intersections
- Permit in terms of the National Heritage Act, 25 of 1999, the Ordinance on Exhumations, 12 of 1980, and/or the Human Tissues Act, 65 of 1983 if any heritage sites (including graves) are damaged or removed (No grave relocation or demolished will take place as a result of the mining activities)
- Certificate of registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material.
- SAHRA Permits. Permit in terms of the National Heritage Act, 25 of 1999, Section 34(1). Permit for the alteration or demolish any structure or part of a structure which is older than 60 years. (No structures will be altered or demolish as a result of the mining activities. No permit is required).
- SAHRA Permit. Permit in terms of the National Heritage Act, 25 of 1999, Section 35(4). Permit for the destruction, damage, excavation, alter or otherwise disturb any archaeological or palaeontological site.

As the proposed activity is a mining permit, Section 17.6(a) of the Mine Health and Safety Act requires the employer to ensure that no mining operations are carried out under or within a horizontal distance of 100m from buildings, roads, railways, reserves, boundaries, any structure whatsoever or any surface, which it may be necessary to protect, unless a shorter distance has been determined safe by risk assessment and all restrictions and conditions determined in terms of the risk assessment are complied with. Reduction of this distance can only be approved by the DMR.

(i) Listed and specified activities

Table 4: Listed and specified activities

Description of activity	Extent of activity (ha)	Listed activity and/or water use
Site preparation and construction activities		
Selective clearing of vegetation	6.56 ha	Listing Notice 1: GNR 983 Activity 27
Stripping, handling and stockpiling of topsoil (in line with a soil management plan to be developed)	6.56 ha	Listing Notice 1: GNR 983 Activity 27
Cleaning, grubbing and bulldozing activities.	6.56 ha	Listing Notice 1: GNR 983 Activity 27
Establishing storm water controls (in line with a Regulation 704 compliant storm water management plan to be developed for the project).		Not Applicable
Bulk earthworks including trenches, berms. Establishing access and internal haul roads		Not Applicable
Establishing and using mine access roads mainly from the existing road networks.	0.66 ha	Not Applicable
Open pit Mining		
Mining comprising: - Establishing storm water controls (in line with a GN704 compliant storm water management plan to be developed for the project) - Clearing of vegetation (in line with a biodiversity management plan to be developed for the project) ahead of mining. - Stripping, handling and stockpiling of topsoil (in line with a soil management plan to be developed for the project) ahead of mining. - Bulldozing of illegally dumped general and hazardous waste material. - Establishing access and internal haul roads ahead of mining - Breaking of Rock (Xcentric Ripper)	4.9428 ha mining permit with a 3.5 ha open pit	Listing Notice 1: GNR 983 Activity 21 and 27. NWA 21(a),(c), (g) and (i)

- Excavating waste rock and mineral resource - Stockpiling of run-of-mine (RoM) - Crushing of ore to size - Loading RoM onto tipper trucks.		
Transportation		
Vehicle, machinery and/or material movement within the site boundary.		Not applicable
Use of access road and public roads for transporting staff, general/industrial waste and RoM.		Not applicable
Waste Rock Management		
Temporary storage/stockpiling of waste rock material (to be used to backfill pits)		NEM:WA GNR 921 A(15) NWA 21(c), (g), (i)
Waste Management		
Removal of waste by contractor for final disposal at permitted waste disposal facilities		Not applicable.
General Site Management		
Appointment of contractors		Not applicable
Site management (monitoring, inspections, maintenance, security and access control)	6.56 ha	Not applicable
Environmental awareness training and emergency response		Not applicable
Implementing and maintaining management plan	6.56 ha	Not applicable
Rehabilitation		
Backfill waste rock material into open pit (as part of rehabilitation)	4.9428 ha mining permit with a 3.5 ha open pit	Listing Notice 1: GNR 983 Activity 21 NEM:WA GNR 921 A(15); NWA 21(g).
Ripping compacted areas and replacing soil resources.	6.56 ha	Not applicable
Slope stabilisation and erosion control.	6.56 ha	Not applicable
Landscaping	6.56 ha	Not applicable
Alien invasive management.	6.56 ha	Not applicable
Restoration of natural drainage patterns as far as practically possible.	6.56 ha	Not applicable
Re-vegetation of disturbed areas.	6.56 ha	Not applicable

Maintenance and Aftercare		
Maintenance and Aftercare	6.56 ha	Not applicable

Table 5: Description of the EIA Regulations Listed Activities

Activity No	Listed activity	Applicability of the activity
NEMA Listing Notice 1 (GNR 983)		
21	Any activity including the operation of that activity which requires a mining permit in terms of section 27 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	A mining permit is required for the project in terms of the MPRDA (Act 28 of 2002)
27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation	Mining activities will require clearance of indigenous vegetation. The project footprint could trigger this activity.
NEM:WA Listed Activities (GNR 921)		
Category A (15)	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining permit in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	The project will require the establishment of waste rock dumps and re-use of waste rock to backfill open pits.

Table 6: Section 21 Water Uses that apply to the proposed project

NEMA Listing Notice 1 (GNR 983)		Applicability of the water use
21 (a)	Taking water from a water resource	Dewatering of the open pits may be required.
21 (c)	Impeding or diverting the flow of water in a watercourse	Mining activities may occur within regulated zones of a watercourse.
21 (i)	Altering the bed, banks, course or characteristics of a watercourse	
21 (g)	Disposing of waste in a manner which may detrimentally impact on a water resource	The project will use waste rock storage/stockpiling facilities and backfilling of open pits voids with waste rock.

(ii) Description of the activities to be undertaken

(Describe Methodology or technology to be employed, including the type of commodity to be prospected/mined and for a linear activity, a description of the route of the activity)

Background

West Wits Mining MLI (Proprietary) Limited (West Wits) was originally formed to explore, evaluate and extract gold and uranium from project areas situated in the Witwatersrand Basin, South Africa. The company is focused on developing its Soweto Cluster Project situated on previous mine lease areas between Soweto's borders and those of Roodepoort. The mining area consists of two historic mining centres, the Durban Roodepoort Deep (DRD) and the Rand Leases on the Northern Edge of the Witwatersrand Basin in the Central Rand Goldfield, immediately south west of the City of Johannesburg.

The area has a long-standing history, with mining activities having begun since the discovery of gold in 1886. During that time up to six different gold-bearing conglomerate horizons have been mined from surface down to a depth of 3100 metres. The mining targets are the auriferous conglomerates of the Central Rand Group, Witwatersrand Supergroup. These are the North Reef, Main Reef, Main Reef Leader, South Reef, Livingstone Reef, Bird Reef, Monarch Reefs, Kimberley Reefs, and Ventersdorp Contact Reef. The latter is situated at the base of the Ventersdorp Supergroup within the Venterspost Conglomerate Formation. The Central Rand Group is subdivided into the older Johannesburg (containing the Main, Randfontein, Luipaardsvlei, Krugersdorp, and Booyens formations) and the younger Turffontein (containing the Kimberley, Elsburg and Mondeor formations) subgroups.

West Wits applied for a mining permit in terms of the Mineral and Petroleum Resources Development Act (MPRDA) (No. 28 of 2002) for gold, uranium and silver over the West Wits prospecting right area (GP 30/5/1/1/2/10035 PR). Consent in terms of Section 11(2) of the MPRDA to cede a renewed prospecting right MPT No. 29/2016 from Mintails SA Soweto Cluster (Proprietary) Limited to West Wits was granted by the Department of Mineral Resources (DMR) in 2018. The West Wits Mining Permit (i.e. Creswell Park) will be located on a portion of Portion 408 of the Farm Roodepoort 237 IQ, a section of the access /haul road will be located on a portion of Portion 407 of the Roodepoort 237 IQ, Gauteng Province.

Construction phase

Establishment of the facilities required for the opencast mining activities will take place during the construction phase. It should be noted that the construction activities will also form part of the mining

(operational) phase of the project and will include establishment of the following: Clearing of vegetation and removal of overburden. Vegetation will initially be removed, and topsoil will be excavated and hauled to an identified topsoil stockpile for used during rehabilitation. Access to the proposed site will be from the existing road network and internal haul roads will be linked up with access roads. Clearing and removal of rubble and rubbish illegally dumped on the proposed site will take place. Waste will be transported to identified waste disposal facilities.

Managerial and supervision during the construction and operational phase will be performed from the existing Sol Plaaityje operation site. No additional infrastructure is therefore required. No processing infrastructure will be constructed as the ore will be transported to an offsite processing facility.

Access Control

During the construction phase the area will be fenced off and access control will be established on the access/haul road. Access control will be performed in accordance with the Mine Health and Safety Act. The waste rock dump and topsoil stockpile will be utilised as safety berms for the opencast area.

Operational phase

Opencast mining activities would include the following: Topsoil will be excavated and hauled to an identified topsoil stockpile. Waste material below the topsoil will also be excavated and hauled to the identified waste rock dump. Ore will be excavated and hauled to an ore stockpile for initial crushing before transportation to the processing plant. Crushing of the ore will take place to a maximum lump size (P100) of 200mm. Breakage of any material that is not susceptible to free-dig excavation will be enabled through excavators fitted with modern rock breaking technology and it is expected that no blasting will be required at the open pit target.

Rock breaking will be done through the utilisation of Xcentric Rippers. The technology provides a safe alternative in the working field, without any of the environmental hazardous associated with blasting. The risk of rock fly and structural damage to houses are reduce to almost negligible levels as a result of the use of the alternative technology. The resources at the open pit targets are generally outcropping and production can commence at the onset of mining activities. Open pit mining activities will be performed by a mining contractor and production rate of approximately 15 000 tonnes per month is anticipated.

The conceptual flow diagram associated with the proposed project is illustrated below in Figure 2.

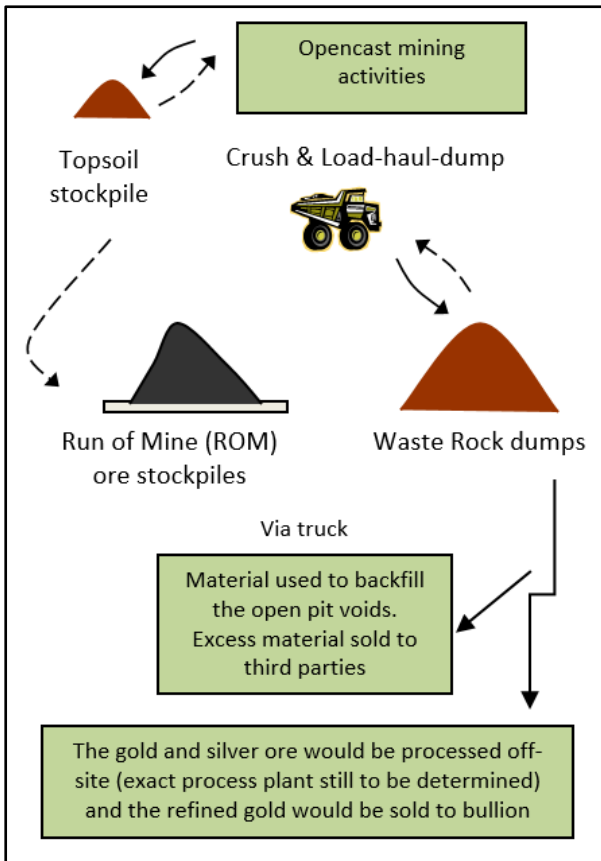


Figure 2: Conceptual flow diagram

The area demarcated for the mining permit of gold, uranium and silver covers an area of approximately 4.9428 ha (refer to Table 7 and Figure 3) and a total area of 6.56ha.

Table 7: Property name & coordinates

Property	Portion	Coordinates
Roodepoort 237 IQ	A portion of Portion 407	26°10'12.54"S 27°52'25.24"E
Roodepoort 237 IQ	A portion of Portion 408	26°10'13.76"S 27°52'38.35"E

Mining Schedule

The schedule stretches over a period of 3 to 4 months at a ROM production rate of approximately 15 000 ton per month. Rehabilitation of opencast area will be concurrent with mining and final rehabilitation will be completed within 5 to 6 months (See Table 8).

Table 8: Mining Schedule

Pit	Mining	Rehab
Creswell Park	4 to 5 months	5 to 6 months

Mining Areas

The proposed opencast mining area will consist out of a single cut as presented in Figure 3. The proposed opencast area will target the auriferous conglomerates reef of the Kimberley subgroup located within the Central Rand Group, Witwatersrand Supergroup. The topsoil stockpile will be establish to the North of the proposed opencast area, with the waste rock dump to be establish to the South. The proposed layout has been established through consultation with landowners, stakeholders, specialist inputs and the availability of the resource. As discussed in the section regarding alternatives a number of alternative layouts have been investigated.

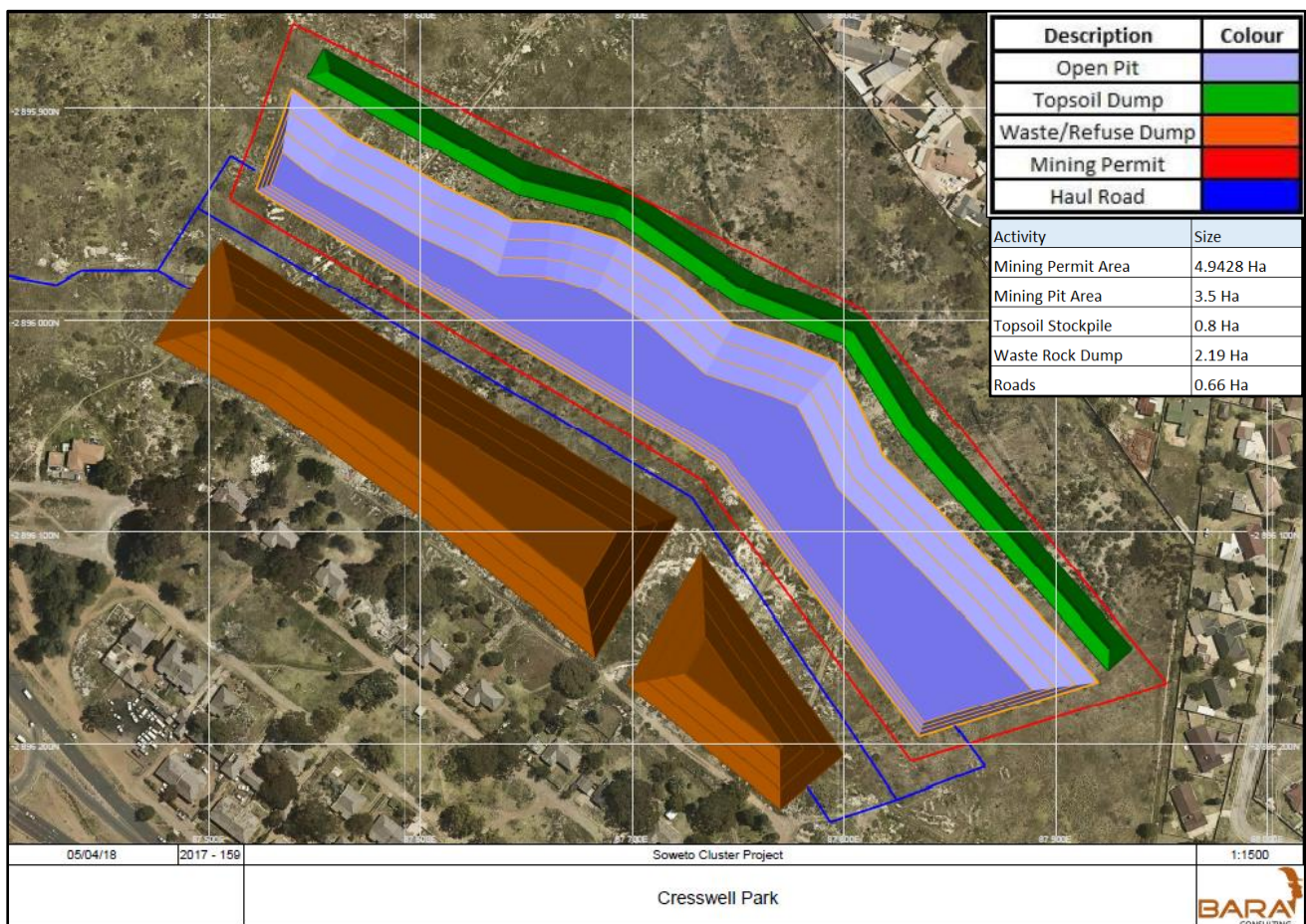


Figure 3: Proposed Mine Area Layout

Data on the proposed opencast with specific reference location, duration of operation and rehabilitation is provided in Table 9.

Table 9: Data on the proposed Mining Operation

Data on the Proposed Mining Operation	
Target commodities	Gold, uranium and silver
Employment	Opencast mining operations: Contractor would require between 40 and 50 employees.
Operating hours	Opencast mining activities: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday
Open pits	
Open pits	Creswell Park – Mining permit
Location	See Appendix C
Size of mining permit area	4.9428 ha
Total Area	6.56 ha
Mining rate (per month)	15 000 tonnes
Pit depth	0 – 15m
Mineable resource (tonnes)	67 200 tonnes ore
Mining duration (including concurrent rehabilitation, season dependent)	~ 4 months
Concurrent Rehabilitation	~ 4 months
Final rehabilitation duration	~ 2 months
Waste rock dump volume	353 908m ³
Waste rock dump height	10 to 15 m

Equipment

Table 10 illustrates the basic fleet of equipment recommended for the Creswell Park opencast mining permit project.

Table 10: Basic Mining Equipment Fleet

Names	Number of Equipment
Bulldozers	2
Excavators	7
ADT's	8
Crusher	1
Tipper Trucks	2
Front Loaders	2
Water Trucks	2
LDV	6

Waste Stockpiles

No processing of any ore will take place on site, no tailings storage facility will be established. No residual waste stockpile will remain after rehabilitation. The only waste material that will be produced during the mining process are subsoil and waste rock. Waste stockpiles are listed in the list of waste activities published in GN. No. R. 632 of 24 July 2015 in accordance with the National Environmental Management: Waste Act 59 of 2008. The area in **Figure 3** indicated the location of the waste rock stockpile. The material will be utilised during the rehabilitation/decommissioning phase of the project to backfill the opencast area. No residual stockpile will remain after rehabilitation.

In terms of the regulations, mine waste residue stockpiles must comply with landfill requirements. Stockpiles must also comply with the National Norms and Standards for the Assessment of Waste for Landfill Disposal, 2013; and National Norms and Standards for Disposal of Waste to Landfill, 2013.

The waste classified as Type 3, thus requiring a Class C engineered barrier system. However, none of the constituents in the leach test exceeded the regulatory guideline values. In addition, the geochemical model indicated that the waste rock is comprised of minerals which are very stable in the specific mining environment being considered. In addition, the waste rock itself as well as the secondary mineral products forming very slowly as the waste rock minerals weather have the capacity to remove contaminants from solution through the process of adsorption.

The waste rock material contains no iron sulphide minerals. Therefore, the risk of the formation of acid mine drainage conditions from the waste rock material is negligible. The results indicate that the significance of both potential impacts rate as Very Low. The cumulative impacts of the impacts rate as Low. This is predominantly because of the fact that the development of AMD conditions as well as the leaching of contaminants from the waste rock is unlikely. The waste rock material is classified as Type 3 according to NEMWA Regulation 635. It is however recommended by the specialist, based on the results of the assessment, that the waste material class be reduced to Class 4.

Waste Management

Clearing and removal of rubble and rubbish illegally dumped on the proposed site will be undertaken before any activities are commenced. Waste will be transported to identified waste disposal facilities. Any hazardous or general waste generated on the site will be collected and taken to the existing Sol Plaatjies facility from where the waste will be removed by a contractor to a waste disposal facility. No waste will be stored on site.

Crushing Area

As presented in the preferred layout plan (Figure 3) a crushing area will be established from where the RoM will be loaded onto trucks to be transported to the process facility. The area will be rehabilitated during the closure phase.

Stormwater Management

A stormwater management plan will be developed for the mining area before commencement of the operation. The stormwater management will be in accordance with the requirements as set out in GNR 704 (NWA). Clean and dirty water separation will take place through the installation of cut off trenches and berms. No contaminated stormwater will be discharged from the mining area without the required approval from the Department of Water Sanitation.

Decommissioning phase:

Concurrent rehabilitation of the proposed opencast mining area to be undertaken with final rehabilitation taking place after the operational phase has been completed. Backfilling of the final mining void when the Western portion has been mined out, is to utilise the adjacent overburden stockpile to construct a free draining post mining landform. Generally, backfilling is likely to be with a large tracked dozer – pushing/dozing the waste rock / overburden material over the highwall edge, into the worked out mine void.

Rollover dozing and backfill with waste rock, as an unconsolidated fill is likely to provide a variable foundation bearing capacity and result in non-uniform settlement. Any heavy or structural foundations on unconsolidated fills should be subjected to detailed geotechnical investigations, prior to determining their suitability for supporting any rigid or large structures. The final rehabilitation requirements will be established through consultation with landowners.

The closure of the opencast mining will occur with the decommissioning of the mine in accordance with an applicable EMPR as part of a closure Environmental Impact Assessment to be conducted and also in accordance with any other closure plans pertaining to mining area. This phase starts at the end of the operational phase of the project and ends when the site obtains a Closure Certificate from the regulatory authorities, but may include a period where there is no activity on the site other than monitoring prior to closure being completed.

The schedule closure cost calculated for the proposed Creswell Park opencast pit are R 5 467 758.04 this cost includes post closure aspects:

- Surface water monitoring for 5 years

- Groundwater monitoring for 5 years
- Rehabilitation monitoring for 3 years
- Care and maintenance for 3 years; and
- Contingencies for post closure aspects

The cost also included the following additional allowances

- Preliminary and general (10%)
- Contingencies (10%); and
- Additional Studies.

Post closure phase

During the post closure phase of the project monitoring of aspect such as water quality, soil erosion and establishment of vegetation will be conducted. The requirements will be establish in the final closure plan.

6. Policy and Legislative Context

(a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)

Table 11: Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
Constitution of South Africa, 1996 (Act No. 108 of 1996) [as amended] <ul style="list-style-type: none"> • <i>Section 24: Environment.-Everyone has the right-</i> <ul style="list-style-type: none"> <i>(a) to an environment that is not harmful to their health or well-being; and</i> <i>(b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that-</i> <ul style="list-style-type: none"> <i>i) prevent pollution and ecological degradation;</i> <i>ii) promote conservation; and</i> <i>Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.</i>	The proposed activity has the potential to harm the environment and poses a risk to the health and wellbeing of people. The Applicant has the overall responsibility to ensure that the rights of people in terms of Section 24 of the Constitution is protected in terms of the proposed Mining activity.
National Environmental Management Act (No. 107 of 1998) [as amended] <ul style="list-style-type: none"> • <i>Section 24: Environmental Authorisations</i> • <i>Section 28 (1): Duty of Care and responsibilities to minimise and remediate environmental degradation.</i> 	The proposed activity is a listed activity in terms of the EIA Regulations and requires environmental authorisation.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
	Overall responsibility of the mining rests with the Applicant, especially in terms of liabilities associated with the operational and closure phase
<p>EIA Regulations, 2014 (Government Notices 982 - 984) [as amended in 2017]</p> <p><i>Chapter 2: Timeframes for EIA processes</i></p> <p><i>Chapter 3: Duties of proponent</i></p> <p><i>Chapter 4: Application for Environmental Authorisation: Part 2: Basic Assessment</i></p> <p><i>Part 4: Environmental Authorisation</i></p> <p><i>Chapter 6: Regulation 39 to 44: Public Participation</i></p> <p><i>Appendix 1: Basic Assessment Report</i></p> <p><i>Appendix 4: Environmental Management Programme</i></p> <p><i>Appendix 6: Specialist Reports</i></p>	<p>The EIA Regulations, 2014 [as amended] prescribes <i>inter alia</i>:</p> <ul style="list-style-type: none"> - The manner in which public participation needs to be conducted - The requirements of a basic assessment process and content of a basic assessment report, Environmental Management Programme - The requirements and content of specialist reports. <p>The regulations outlining the procedures required for authorisation are published in GNR 982 [Environmental Impact Assessment Regulations (EIA)] (4 December 2014). Listing Notice 1 identifies activities that require a Basic Assessment (BA) process to be undertaken, in terms of the EIA Regulations,</p> <p>Listed activities (Listing Notice 1) will be triggered by the proposed activity:</p> <ul style="list-style-type: none"> - Activity 21: Any activity including the operation of that activity which requires a mining permit in terms of section 27 of the MPRDA (Act 28 of 2002) - Activity 27: The clearance of an area of 1 ha or more, but less than 20 ha of indigenous vegetation.
<p>Mineral and Petroleum Resources Development Act, 2002 (Act. 28 of 2002) [as amended]:</p> <p><i>Chapter 2 (5): Legal nature of right holders;</i></p> <p><i>Chapter 4: Mineral and Environmental Regulation</i></p> <p><i>(9) Order of processing of applications</i></p> <p><i>(10) Consultation with Interested and Affected Parties;</i></p> <p><i>(11) Transferability and encumbrance of rights;</i></p> <p><i>(27) Mining permit application.</i></p> <p><i>(37) Environmental Management Principles</i></p> <p><i>(38) Integrated environmental management and responsibility to remedy</i></p> <p><i>(48) Restriction or prohibition of prospecting and mining on certain land</i></p>	<p>The application is for a mining permit and therefore all regulations pertaining to the application process of a mining permit and environmental management is applicable to this application.</p>
<p>The National Environmental Management: Waste Act (Act No 59 of 2008) (NEM:WA) [as amended]</p> <ul style="list-style-type: none"> • <i>Section 16: General duty in respect of waste management;</i> 	<p>The proposed activities will produce general and hazardous waste which need to be managed and disposed of according to best practices such as recycling, safe storage, etc.</p>

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<ul style="list-style-type: none"> • <i>Section 17: Reduction, re-use, recycling and recovery of waste;</i> • <i>Section 21: General requirements for storage of hazardous and general waste.</i> 	
<p>National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended].</p> <p>List of Waste Management Activities that have, or are likely to have a detrimental effect on the environment as promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended]</p> <p>Residue stockpiles or deposit areas:</p> <p><i>Mining, exploration or production operation, resulting in the development of residue stockpiles and residue deposits"</i></p> <p><i>Prospecting, mining, exploration or production operation, resulting in development of residue stockpiles and residue deposits. The management and control of these wastes must take place in accordance with the regulations for management and control of residue deposits and residue stockpiles or an integrated environmental authorization as provided for in terms of NEMA.</i></p>	<p>Residue stockpile or deposit area</p> <p>Category A: - Activity 15:</p> <p>The establishment or reclamation of a residue stockpile or residue deposit resulting for activities which required a prospecting right or mining permit in terms of the Mineral and Petroleum Resources Development Act (Act No 28 of 2002).</p>
<p>National Water Act, 1998 (Act No. 36 of 1998) [as amended]</p> <ul style="list-style-type: none"> • <i>Section 3: Regulation of flow and control of all water</i> • <i>Section 19: Prevention of pollution to watercourses</i> • <i>Section 21: Water Use Activities</i> <p><i>The water use activities associated with the proposed development requires compliance with the requirements of the NWA as listed under GN No. 19182. An application for an integrated water use license is lodged in terms of Section 21 of the National Water Act, 1998 (Act 36 of 1998) [as amended].</i></p>	<p>Stormwater management to be in line with the requirements of the Act, in order to achieve prevention of pollution and hazards.</p> <p>Water Use License application to be submitted to the competent authority (DWS) for section 21 water use activities trigger by the proposed activities</p>
<p>National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) [as amended]</p> <ul style="list-style-type: none"> • <i>Section 32: Control of dust</i> • <i>Section 34: Control of noise</i> 	<p>Impacts on surrounding landowners need to be managed through dust and noise monitoring and mitigation measures as presented in the Noise impact assessment (Airshed) and the Air Impact Assessment (Airshed).</p>
<p>National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) [as amended]</p> <p>In terms of section 21 of the NEM:AQA a list of scheduled processes were published in GNR893 (November 2013).</p>	<p>None of the listed scheduled processes as public in GNR 893 are trigger by the mining permit application.</p>
<p>National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended]</p> <ul style="list-style-type: none"> • <i>Section 9: Norms and standards</i> • <i>Section 27: Delegation of power and duties</i> 	<p>The management of sensitive indigenous vegetation is of the utmost importance. A Terrestrial Ecology Assessment undertaken in May 2018 by a competent specialist from SAS Environmental Group observed that</p>

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<ul style="list-style-type: none"> • <i>Section 30: Financial accountability</i> • <i>Section 43: Biodiversity management plans.</i> 	<p>no sensitive vegetation is located on the proposed area. Management measures set out in the management plans developed for the proposed activity to be implemented. No offset or biodiversity management plan is required for the activity and for this reason the Draft National Biodiversity Offset Policy, 2017 is not applicable to the propose mining area.</p>
<p>Mine Health and Safety Act, 1996 (Act No. 29 of 1996) [as amended] and associated regulations</p> <ul style="list-style-type: none"> • <i>Chapter 2, Sections 2 – 4: Responsibilities of owner</i> • <i>Chapter 2, Sections 5– 13: Responsibilities of manager;</i> • <i>Chapter 2, Sections 14 – 18: Documentation requirements;</i> • <i>Chapter 2, Section 19 – 20 and 22 to 24: Employee’s rights and duties; and</i> • <i>Chapter 2, Section 21: Manufacturer’s and supplier’s duty for health and safety.</i> 	<p>The development activities will create an environment that may not be safe and healthy for workers or visitors to the site. The act provides for measures to prevent threats to the health and safety of humans in the mining area.</p> <p><i>The Act will apply during the construction, operational and closure phase of the proposed project.</i></p> <p>Section 17.6(a) <i>“The employer must ensure that - no mining operations are carried out under or within a horizontal distance of 100 (one hundred) metres from buildings, roads, railways, reserves, mine boundaries, any structure whatsoever or any surface, which it may be necessary to protect, unless a shorter distance has been determined safe by risk assessment and all restrictions and conditions determined in terms of the risk assessment are complied with”</i></p> <p>The activity will be within the 100m zone and approval to be obtained from the Chief Inspector of Mines.</p>
<p>National Environmental Management Protected Areas Act, 2003 (No 57 of 2003) [as amended]</p> <p>The act aims to provide for the protection and conservation of ecological viable areas representative of South Africa’s biodiversity diversity and its natural landscape and seascape.</p> <p><i>(48) Prospecting and mining activities in protected area</i></p>	<p>No person may conduct commercial prospecting, mining exploration, production or related activities in special nature reserve, national parks or nature reserves. In protected environments, declared in terms of section 28. In a protected area referred to in section 9(b), (c) or (d). No protected areas in terms of section 9(b), (c), (d) or section 28 are present in the Creswell Park mine area.</p>
<p>National Heritage Resources Act, 1999 (Act No. 25 of 1999)</p> <ul style="list-style-type: none"> • <i>Section 34(1): Protection of structures older than 60 years</i> • <i>Section 38: Statutory Comments to be obtained from the South African Heritage Resources Agency (SAHRA)</i> • <i>Section 44 (1); Preservation and protection of heritage resources;</i> • <i>Section 3 Types and ranges of heritage resources (i);</i> 	<p>A heritage impact assessment was completed by heritage specialist from PSG Heritage in May 2018. No heritage resources were identified within the Creswell Park opencast footprint area, the overall impact of the development on heritage resources is regarded as LOW to negligible and no mitigation measures are required for the footprint area. However, the indirect impact of the proposed project unmitigated on the heritage resources identified in the immediate vicinity of the footprint will be MEDIUM and will require a certain amount of mitigation.</p>

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<p><i>Objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens.</i></p>	<p>It is the considered opinion of the Heritage specialist that the overall direct impact on heritage resources is acceptably low although the indirect impact on heritage resources is Medium before mitigation.</p>
<p>Conservation of Agricultural Resources Act (no. 43 of 1983)</p> <ul style="list-style-type: none"> • <i>Section 5: Prohibition of spreading of weeds</i> • <i>Section 12: Maintenance of soil conservation works and maintenance of certain states of affairs</i> • <i>Section 16: Regional Conservation Committees</i> 	<p>Listed invader/alien plants occurring on site which requires management measures to be implemented. No agricultural activities are taking place on the site or area.</p>
<p>National Nuclear Regulator Act (No. 47 of 1999) (NNR)</p> <ul style="list-style-type: none"> • <i>Section 22: Certificate of registration, for the handling and management of gold and uranium containing material.</i> 	<p>Activities that require a Certificate of registration in terms of the NNR. Handling, transport and management of gold and uranium containing material.</p> <p>The mine will apply for a licence for the handling, transport and management of gold and uranium containing material after the environmental impact assessment process has been completed.</p>
<p>Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) [as amended]</p> <ul style="list-style-type: none"> • <i>Section 12 (1): Duty of the landowner to prevent fire from spreading to neighbouring properties.</i> 	<p>Cautionary steps in avoiding the spread of fires to and from neighbouring properties.</p>
<p>Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended]</p> <ul style="list-style-type: none"> • <i>Section 2: Declaration of grouped hazardous substances;</i> • <i>Section 4: Licensing;</i> • <i>Section 16: Liability of employer or principle</i> • <i>Section 9 (1): Storage and handling of hazardous chemical substances;</i> • <i>Section 18: Offences</i> 	<p>The Applicant must ensure the safety of people working with hazardous chemicals (specifically fuels), as well as safe storage, use and disposal of containers during the on-site operational phase together with the associated liability should non-compliance be at the order of the day.</p> <p>No hazardous chemicals will be stored on the site.</p>
<p>Gauteng Transport Infrastructure Act, 2001 (Act No. 8 of 2001) [as amended];</p> <p>Where mining operations are to be undertaken, Section 49 of the Gauteng Transport Infrastructure Act, 2001 (Act No 8 of 2001) shall apply.</p>	<p>An application must be submitted to the Department for a way leave if any part of a proposed service falls within 95m (measured from the centreline of any of the Department's existing or future road(s)/railway line or within a 500 m radius of any intersection on said road(s)/railway line</p>
<p>Restitution of Land Rights Amendment Act, 2014 (Act 15 of 2014). The act deals with Land claims.</p> <p>The validity of the amendment Act was challenged in the Constitutional Court. The Constitutional Court found the Amendment Act to be invalid because of the failure of</p>	<p>A land claim was lodged in term of the Restitution of Land Rights Amendment Act, 2014 on portion 407 and 408 of the Farm Roodepoort 237 IQ. The mining permit area will be located on a portion of portion 408 and the access/haul road will be located on a portion of portion 407 of the Farm Roodepoort 237 IQ.</p>

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<p>Parliament to facilitate public involvement as required by the Constitution. The Amendment Act ceased to be law on 28 July 2018. The Constitutional Court ordered that the claims that were lodged between 1 July 2014 and 27 July 2016 are validly lodge, but it interdicted the Commission from processing those claims until the Commission has finalised the claims lodged by 31 December 1998 or until Parliament passes a new law providing for the re-opening of lodgement of land claims. It is important to note that the provisions of section 11(7) of the Restitution of land Rights Amendment Act, 1994 do not apply until after the Commission has accepted the claim for investigation and published its details in the Government Gazette.</p>	<p>Where section 11(7) of Restitution of land Rights Amendment Act, 1994 applies, the land claim commission will be inform a month before any activity is undertake on the property.</p>
<p>Guideline on the need and desirability in terms of the Impact Assessment (EIA) Regulations, 2010, Notice 891 of 2014</p>	<p>This guideline has been taken into account as part of project planning.</p>
<p>Public Participation 2010, Integrated Environmental Management Guideline Series 7, DEA</p>	<p>This guideline has informed the public participation process for the project.</p>
<p>Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations, 2015 (Notice 1147 of 2015)</p> <ul style="list-style-type: none"> • <i>Regulation 5: Scope of financial provision</i> • <i>Regulation 6: Method for determining financial provision</i> • <i>Regulation 12: Preparation and submission of plans and reports</i> 	<p>An applicant must determine the financial provision through a detailed itemisation of all activities and cost, calculated based on the actual cost of implementation of the measures required. The Regulation require the development of a number of documents.</p>
<p>Waste Classification and Management Regulations and Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended]; and Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015)</p>	<p>The construction and operational activities associated with the proposed activities shall be in accordance with the regulations and Norms and Standards. The waste rock need to be classified to determine the type of waste in order to establish which type of lining the required, if any. Waste classification was performed as part of the Geo-chemical assessment (GeoDyn Systems, 2018), the specialist recommended that the waste rock be re-classified as Type 4, which is inert. The waste rock dumps need to be planned and managed in terms of GN R.632 of 2015.</p>
<p>Regulations on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources, 1999 (Notice 704 of 1999).</p> <ul style="list-style-type: none"> • <i>Regulation 4: Restrictions on location of mining activities</i> • <i>Regulation 7: Protection of water resources</i> • <i>Regulation 12: Technical investigation and monitoring.</i> 	<p>Every person in control of a mine or activity must take measures to manage water in an effective manner as prescribe by the regulation.</p>

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<p>National Dust Control Regulations, 2013 (Government Notice 827 of 2013)</p> <ul style="list-style-type: none"> • <i>Section 3: Dust fall standard</i> • <i>Section 4: Dust fall monitoring program</i> • <i>Section 6: Measures for control of dust</i> • <i>Section 7: Ambient air quality monitoring (PM10)</i> • <i>Section 8: Offences</i> • <i>Section 9: Penalties</i> 	<p>Air quality monitored in accordance to the standards set out in the monitoring programme with the specified measures. This is a result of the Applicant being liable to offences and penalties associated with non-conformance to dust which may influence employees and surrounding landowners. Air quality monitoring to be undertaken as recommended by the Air quality specialist study (Airshed, 2018)</p>
<p>(Government Notice 609 of 2017) Notice of the List of Protected Tree Species under the National Forests Act, 1998 (Act No. 84 of 1998).</p>	<p>It is the responsibility of the Applicant to avoid unnecessary removal of protected tree species. Should protected tree species need to be removed, a permit must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF). No protected tree species were identified by SAS Environmental during the Terrestrial Ecology Assessment.</p>
<p>Alien and Invasive Species Regulations (Government Notice 598 of 2014) and Alien and Invasive Species List, 2016 in terms of NEMBA (Government Notice 864 of 2016)</p> <ul style="list-style-type: none"> • <i>Notice 2: Exempted Alien Species in terms of Section 66 (1)</i> • <i>Notice 3: National Lists of Invasive Species in terms of Section 70(1) – List 1, 3-6 8 & 11</i> • <i>Notice 4: Prohibited Alien Species in terms of Section 67 (1) – List 1, 3-6, 9 & 12</i> 	<p>It is the responsibility of the Applicant to ensure that all prohibited plant and animal species are eradicated as far as possible.</p> <p>During rehabilitation and aftercare the site should be inspected on a regular basis to ensure that no alien vegetation establishment takes place on the disturbed areas.</p>
<p>NWA: Government Notice 509 General authorisation for water use as defined in Section 21(c) and 21(i), July 2016.</p>	<p>The outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; In the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or A 500 m radius from the delineated boundary (extent) of any wetland or pan.</p> <p>A wetland area has been identified within the 500m zone. However it is considered unlikely that the proposed mining activities will pose a risk to the wetland more than 480m away.</p>
<p>Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995)</p> <ul style="list-style-type: none"> • <i>Section 4: Duties of persons who may be exposed to hazardous chemical substances</i> 	<p>No Hazardous substances will be stored on the site.</p>

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<ul style="list-style-type: none"> Section 9A (1): Penalties 	
Deeds Registries, 1937 (Act No. 47 of 1937) [as amended]	Registration of servitudes and deed titles.
NEMA: Government Notice. 805 Companion Guideline on the Implantation of the Environmental Impact Assessment Regulations, 2010, October 2012.	The application for Environmental Authorisation is submitted in terms of the EIA Regulations.
NEMA: GN. 807 Public Participation Guideline, October 2012.	Consultation with Interested and Affected Parties and Communities.
<p>NEM:AQA : GNR 283. National Atmospheric Emissions Reporting Regulations, 2015.</p> <p><i>For purposes of these Regulations, emission sources and data providers are classified according to groups A to D listed in Annexure 1 to these Regulations.</i></p> <p>Section 5(3): <i>For purposes of these Regulations, emission sources and data providers are classified according to groups A to D listed in Annexure 1 to these Regulations.</i></p>	<p>Mines are classified under Group C of Annexure 1 of the regulations.</p> <p>Any person, that holds a mining right or permit in terms of the MPRDA. Emissions report must be made in the format required for NAEIS to the relevant air quality officer.</p>
<p>NEM:AQA: GNR 6. Declaration of greenhouse gases as priority air pollutants.</p> <p>A list of persons that is required to submit a pollution prevent plan is provided in Annexure 1 of the regulation.</p>	Gold mining is not listed under Annexure 1 of the regulation. The mining is not required to submit a pollution prevention plan in terms of these regulations.
National Development Plan 2030 (2012)	Land use planning
National Framework for Sustainable Development (2008)	Land use planning
National Strategy for Sustainable Development and Action Plan 2011 – 2014 (NSSD 1) (2011)	Land use planning
Gauteng Spatial Development Framework (SDF)	Land use planning activities within the Gauteng area
Gauteng Spatial Development Plan (SDP)	Land use planning activities within the Gauteng area
<p>Gauteng Province Environmental Management Framework, 2014 (GPEMF)</p> <p><i>Zone 1</i></p>	<p>The study area where the mining activity is proposed, is located within the Gauteng Province and falls within Control Zones 1 of the GEMF. The General Guidelines for this zones should be applied to the proposed mining activity. The guidelines should be implemented through the EIA process. According to the GEMF, the proposed activity or land use is in line with Zone 1. The intention with this zone is to streamline urban development activities in it and to promote development infill, densification and concentration of urban development, in order to establish a more effective and efficient city region that will minimise urban sprawl into rural areas.</p>
Department of Mineral Resources Guidelines for the compilation of a Scoping Report with due regard to consultation with communities and Interested and Affected Parties.	Consultation with Interested and Affected Parties and Communities.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector (2013) (Department of Environmental Affairs, Department of Mineral Resources, Chamber of Mines, South African Mining and Biodiversity Forum, and South African National Biodiversity Institute.	The Guideline provides guidance on the impacts on biodiversity typically associated with mining as well as mitigation measures and strategies. The guideline is taken into consideration in this BAR and the development of the Environmental Management Programme.
Development Guidelines for Ridges (GDARD)	Ridges have been identified and delineated within the Gauteng Province by GDARD. No identified ridges are location on the proposed mining area.
SANS 10103:2008 The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, and Annoyance and to Speech Communication.	Impacts on surrounding landowners need to be managed through noise mitigation measures.
National Ambient Air Quality Standard (NAAQS) (29 June 2012 (No. 35463)).	Standard for ambient air quality in South Africa. Monitoring requirements, limits and standards.
Vaal Triangle Priority Area (21 April 2006).	The location of the proposed Creswell Park operations within the Vaal Triangle Priority area might have several important implications for these operations. New developments which are associated with atmospheric emissions and hence the potential for contributing to air pollutant concentrations are being subject to intense scrutiny by national air pollution control officers. Emphasis is being placed on ensuring that best practice control measures are being proposed for implementation and that the development will not substantially add to the existing air pollution burden in the region.
SANS 1929: Ambient Air Quality – Limits for Common Pollutants	Impacts on surrounding landowners need to be managed through dust mitigation measures.
SANS 1137: Standard test method for the collection and measurement of dust fall (settleable particulate matter).	Impacts on surrounding landowners need to be managed through dust mitigation measures.
ASTM d 1739, 1970 or equivalent approved protocol for dust monitoring.	Impacts on surrounding landowners need to be managed through dust mitigation measures.
SANS 10228:2006 The Identification and Classification of Dangerous Goods for Transport	All dangerous goods to be transported to and from the site need to be managed according to these standards.
Gauteng Conservation Plan: Version 3.3	Identifies Critical Biodiversity Areas, Ecological Support Areas, and irreplaceable, protected and important areas.
All other relevant national, provincial, district and local municipality legislation and guidelines that may be applicable to the application.	

7. Need and desirability of the proposed activities

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

The Need and desirability of the project is described below in table 12 in accordance with the Guideline on Need and Desirability (GNR 891 of 2011).

Table 12: Need and desirability considerations

NEED (TIMING)		
QUESTION A1: Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority?	YES	The project is aligned with the objectives of the municipal Spatial Development Framework (SDF) and Integrated Development Plan (IDP). The rehabilitated mining belt will free up land for housing developments. The proposed development will not compromise the integrity of these respective forward planning documents.
	NO	
QUESTION A2: Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	YES	Thought the proposed mining activity a known resources will be mined and rehabilitated, the rehabilitated land will be made available for housing developments. The DMR will not provide consent for housing development in an area where a known resources is present.
	NO	
QUESTION A3: Does the community/area need the activity and the associated land use concerned (is it a societal priority)?	YES	The mine can contribute to the LED projects in the area through the Social and Labour plan. Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees
	NO	
QUESTION A4: Are the necessary services with the adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	YES	The required services are in place and has capacity to accommodate the proposed development if all mitigation and management measures are implemented. Road upgrades are required without the implementation of the proposed mining activity to accommodate peak time traffic loads. The proposed project needs to be establish a road maintenance plan in conjunction with the relevant road authority on public roads where trucks will operate.
	NO	
QUESTION A5: Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)?	YES	The propose project is not included in the infrastructure planning of the municipality. Road upgrades are required without the implementation of the proposed mining activity by the municipality. The proposed project needs to be establish a road maintenance plan in conjunction with the relevant road authority on public roads where trucks will operate.
	NO	
QUESTION A6: Is this project part of a national programme to address an issue of national concern or importance?	YES	Although the project is not part of a national programme to address an issue/concern the proposed mining activity will assist with eradication of illegal mining on the project area.
	NO	
DESIRABILITY (PLACING)		
QUESTION B1: Is the development the best practicable environmental option for this land/site?	YES	The study area has been transformed by anthropological (historical mining, illegal mining and illegal dumping of waste), the biodiversity present on the site is of low significant and alien vegetation establishment has taken place across the site. The impact on the
	NO	

		surrounding community can be significant if not managed correctly. Through implementing good practice environmental management measures and mitigation measures, it will ensure that the impact is kept within acceptable levels for both human and environment. The rehabilitated area will be made available for residential development.
QUESTION B2: Would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF as agreed to by the relevant authorities?	YES	The rehabilitated land will be freed up for housing developments. The activity will not compromise the integrity of IDP and SDF.
	NO	
QUESTION B3: Would the approval of this application compromise the integrity of the existing environmental management priorities of the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	YES	The proposed development is not within any conservation or protected areas as identified in the EMF. There are no Critical Biodiversity Areas (CBAs) nor Ecological Support Areas (ESAs) associated with the Creswell Park Mining Permit area according to the Gauteng Conservation Plan. A biodiversity impact assessment has been completed for the proposed development and in terms of biodiversity and conservation this proposed area is of low significant.
	NO	
QUESTION B4: Do location factors favour this land use (associated with the activity applied for) at this place, etc.)?	YES	No site alternatives for the mining activity are applicable. The resources has been establish during the prospecting phase of the process. The area has a strong mining and industrial character, with a number of historical, current mining activities and tailings storage dumps. The proposed mining activity is surrounded by residential developments.
	NO	
QUESTION B5: Will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	YES	An integrated sensitivity analysis was undertaken by the specialists. The biodiversity assessment indicated that the area is of low biodiversity significant with no protected species present on the site. A number of sensitive receptors in terms of air quality, noise pollution and visual impact has been identified. No heritage areas has been identified on the proposed area, however a number of heritage area have been identified in the surrounding area. The proposed activity will not have a significant impact on heritage. With mitigation measures the impact of the proposed development can be reduced to acceptable levels. Details of the prevention and mitigation measures is presented in the Environmental Management Plan (Part B) of this report.
	NO	
QUESTION B6: Will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?	YES	The noise and air quality impact assessment indicated that the activity will have an impact on the surrounding community with some increases in noise levels and dust pollution. With proper mitigation and good practice environmental management measures the impact is expected to be medium to low. The proposed activity will impact on the visual character of the area. The impact will be short term and the visual impact will be removed during rehabilitation.
	NO	
QUESTION B7: Will the proposed land use result in unacceptable cumulative impacts?	YES	Through the implementation of good practice environmental management measures as well as mitigation measures, all direct and cumulative impacts which may result from the proposed development can be addressed and ensure that the impact reduce to acceptable levels. A monitoring program will be implemented to establish if additional management and mitigation measures are required.
	NO	

The main benefits associated with the proposed project are:

- Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees;
- Implementation of the proposed project will result in skills development associated with the mining method;
- To mine an existing reserve resource and to thereafter rehabilitate;
- The improvement of historical impacted land and newly impacted areas through rehabilitation and removal of rubble and rubbish illegally dumped.
- The availability of the economically mined and rehabilitated land being freed up for housing developments earmarked for the area, that aims to reduce the housing backlog experienced by the City of Johannesburg, while at the same time creating employment and extracting mineral resources for the benefit of the economy;
- Mined and rehabilitation land holds opportunity for spatial integration by decreasing fragmentation and unlocking development potential in large areas;
- The eradication of access to dangerous historic workings targeted by informal miners (Zama Zama's), which are mainly illegal immigrants that pose a threat to the health and safety of the communities and themselves while mining illegally; and
- Short time period associated with the mining and rehabilitation of the area.

The project is aligned with the objectives of the MPRDA (Act 28 of 2002):

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

The net benefit to South Africa as a whole is a product produced for the world commodity market, earning South Africa the necessary foreign exchange and capital needed for a healthy economy and further capital investments in development projects for the long-term future of the country.

Gold is a unique metal, used as bullion and in jewellery, glass and electronics devices production. Thanks to its unique properties, gold has remained a critical material in the electronics sector. The quantity of gold utilised are significant, in 2016 more gold was used in technical applications than either platinum or palladium, two metals commonly associated with the industrial sector, while the

amount of gold used in technology was roughly equivalent to central bank gold purchases between 2010 and 2016. The geology of the area is known for gold bearing reefs, and from a mining perspective is ideal for the type of land use.

Illegal mining of gold resources are of significant concern. The illegal mining is a risk to the economy of the country and local area as no wages, taxes and profits are paid. No social economic benefit is gained from the illegal operations. The illegal mines also holds a significant risk to the local communities and the environment. The illegal mining results in un-rehabilitated and unstable land with significant environmental impacts. Blasting as a mining method is utilised by the illegal mines and can cause significant damage to infrastructure and fuel/gas pipelines located in the area.

On the 20 October 2014, the Department of Environmental Affairs published a Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010, in Government Notice 891 of 2014. The key components are listed and discussed below:

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

Ecological sustainable developments and use of natural resources

As a result of the nature of mining project, impacts on biodiversity areas including aquatic ecosystems, linkages between biodiversity areas and related species and the role that they play in the ecosystem probable.

The project area has been selected on the basis of the presence of economically mineable resources. The mining area would be located on land that has been impacted by historical and current mining activities, illegal dumping of waste and urbanisation. Sensitive ecological areas are associated with a wetland approximately 480 north of the study area (See Annexure E for Sensitivity Map). It is anticipated that the mine will have no impact on this water source. No other water sources are located within close proximity of the site.

The Transformed Grassland and Secondary Grassland Habitat Units as identified on the site have been significantly disturbed as a result of historic and on-going anthropogenic activities and the proliferation of alien and invasive plant species. The floral habitat within the Secondary Grassland Habitat Unit is already largely transformed and of decreased ecological integrity. The floral composition present within the Creswell Park Mining Permit Application Area is considered to be in a transition between a pioneer and sub-climax state as a result of anthropogenic activities including alien and invasive plant proliferation. This has resulted in a moderately low ecological importance and sensitivity rating. It is highly unlikely that this habitat unit will support any faunal or floral SCC. The

proposed mining and related activities are therefore unlikely to have a significant impact on this habitat unit or the ecological provisions therein.

Promoting justifiable economic and social development

Community/society priorities are officially expressed through public documents including the provincial growth and development strategy and spatial development framework documents. In this regard the West Wits mining right application falls within an area defined in the City of Johannesburg spatial development framework (SDF) 2040 as a Transformation Zone.

The project is in line with the objective of the Gauteng Spatial Development Framework (GSDF) and the Gauteng Provincial Environmental Management Framework (GPEMF). One of the opportunities as identified in the GSDF is that a rehabilitated mining belt holds opportunity for spatial integration. Mined and rehabilitated land being freed up for housing developments will decrease fragmentation, unlocking development potential in large areas that can be used for future urban development and infill. Where there is a mineral resource the DMR does not allow development that could result in sterilization of a mineral. Therefore if the mineral is mined it allows for the opportunity for development to take place.

The environmental management zone for the proposed area in terms of the GPEMF is zone 1. The intention with this zone is to streamline urban development activities and to promote development infill, densification and concentration of urban development, in order to establish a more effective and efficient city region that will minimise urban sprawl into rural areas. The proposed mining activity is in line with the GPEMF zone as the mined and rehabilitated land will be freed up for housing development.

The proposed project will benefit society and the surrounding communities both directly and indirectly by generating additional employment at the proposed operation and through the extraction of mineral resources and beneficiation of mineral resources within Gauteng. Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees.

Prevention and mitigation measures as recommended by the specialists, were included in this Basic Assessment Report (BAR) and the Environmental Management Programme (EMPR). The implementation of the EMPR will ensure that impacts are effectively managed and kept to a minimal. The potential cumulative impacts were also assessed and found to be of low significance after mitigation for the mining period.

8. Motivation for the overall preferred site, activities and technology alternative including a full description of the process followed to reach the proposed preferred alternatives within the site

(NB!! – This section is about the determination of the specific site layout and the location of infrastructure and activities on site, having taken into consideration the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout.)

The overall mining permit area is indicated in **Appendix C** and **Figure 3**, with locations of the individual activities on site. Areas to be avoided in terms of sensitivities are also indicated on the sensitivity maps in this report (**Appendix E**).

The following alternatives were investigated as feasible alternatives:

ii) Details of all alternatives considered

The overall mining permit area is indicated in Figure 3, with locations of the individual activities on site. Areas to be avoided in terms of sensitivities are also indicated on the sensitivity maps in this report (Appendix E).

The following alternatives were investigated as feasible alternatives. Analysis of the alternatives are presented below in Table 13. A full description is presented below in section f to j.

Table 13: Alternative Analysis

TYPE OF ALTERNATIVE: Location	ALTERNATIVE EXPLANATION: <i>Develop on an alternative property</i> <i>Develop on alternative sites on the same property/properties</i>
No location alternatives have been identified or are assessed as part of this application. See section f below.	
TYPE OF ALTERNATIVE: Activity	ALTERNATIVE EXPLANATION: <i>Develop an alternative activity e.g. Incineration of waste vs. landfill disposal, abstraction of water vs. re-use/recycling of water.</i>
Two mining method alternatives have been assessed in section G below. The two mining methods are: <ul style="list-style-type: none">- Drill and Blasting- Xcentric Rippers (preferred Alternative) The use of modern rock breaking technology (Xcentric Rippers) is the preferred alternative.	
TYPE OF ALTERNATIVE:	ALTERNATIVE EXPLANATION: <i>Adapt architectural and/or engineering designs.</i>

Design	
No design alternatives have been identified or are assessed as part of this application.	
TYPE OF ALTERNATIVE: Layout	ALTERNATIVE EXPLANATION: <i>Adapt spatial configurations of an activity on any particular site e.g. Locate manure dams away from water resources.</i>
Layout alternatives have been identified and assessed. The layout alternatives are presented in section H below.	
TYPE OF ALTERNATIVE: Technological	ALTERNATIVE EXPLANATION: <i>Adapt methods or processes that can be implemented to achieve the same goal e.g. Introduction of bacteria rather than chemicals to waste water.</i>
Technological alternatives are discussed as part of Activity alternatives.	
TYPE OF ALTERNATIVE: Demand	ALTERNATIVE EXPLANATION: <i>The demand for products and/or services can be met by other means e.g. The demand for paper can be met through deforestation or rather by efficient and viable recycling.</i>
No alternatives to meet demand were identified or are assessed in this application.	
TYPE OF ALTERNATIVE: Input	ALTERNATIVE EXPLANATION: <i>Implement different input materials and/or sources e.g. Utilisation of woodchips for fuelling boilers rather than electricity.</i>
No input alternatives were identified or are assessed in this application.	
TYPE OF ALTERNATIVE: Routing	ALTERNATIVE EXPLANATION: <i>Implement alternative routes for linear developments such as power line servitudes, transportation and pipeline routes e.g. Elongate and divert a railway line to exclude a sensitive environment.</i>
Routing alternatives has been identified by the Traffic Impact Assessment. The preferred alternative is discussed below in section G.	
TYPE OF ALTERNATIVE: Transport	ALTERNATIVE EXPLANATION: <i>Method of transportation of product or ore.</i>
No Transport alternatives were identified or are assessed in this application. The distance from the processing plant and the life of mine is of such nature that no transport alternatives (i.e. conveyer) can be considered.	
TYPE OF ALTERNATIVE:	ALTERNATIVE EXPLANATION:

Scheduling and Timing	<i>Adapt the order and/or scheduling of a number of measures which plays a part in a program as it will influence the overall effectiveness of the end result.</i>
The schedule of the proposed mining activity can be altered as required. The duration of the activity is determined by the production rate (15 000 tons/month) it is dependent on a number of factors. The availability of process capacity at the processing plant, geology and weather are some of the determining factors. Mining is schedule to take place within 3-4 months with final rehabilitation to take place within 2-3 months from completion of mining. The schedule can be altered based on stakeholder requirements. No alternative schedule is assessed in this report.	
TYPE OF ALTERNATIVE: Scale	ALTERNATIVE EXPLANATION: <i>Adapt the scale of an activity ex. 15 vs. 35 housing units, 12m² vs. 0.5km².</i> <u><i>P.S. Scale and magnitude is interrelated.</i></u>
At this stage, no alternatives in terms of scale have been identified or are assessed. The scale of the activity remain constant between the two layout alternatives.	
TYPE OF ALTERNATIVE: Magnitude	ALTERNATIVE EXPLANATION: <i>Adapt the magnitude which is directly related to the extent of an activity.</i> <u><i>P.S. Scale and magnitude is interrelated. An activity may be very small scale but can pose an extensive magnitude ex. Destroying an extremely sensitive wetland on a very small scale could result in a magnitude of such as destroying the whole wetland and/or ecological system.</i></u>
At this stage, no alternatives in terms of magnitude have been identified or are assessed. The magnitude and duration remain constant between the two layout alternatives.	
TYPE OF ALTERNATIVE: No-Go	ALTERNATIVE EXPLANATION: <i>The option of not undertaking and implementing the activity at all.</i>
See section J for discussion of the no-go alternative.	

f) Location Alternatives proposed and preferred option.

Mining is determined by the present and availability of minerals. Minerals can only be mined where they exist. The location of the open pit mining areas was informed by the presence of economically mineable resources to which West Wits would have access. Extensive prospecting has indicated the presence of gold bearing reef on these properties. Therefore, the specific locations and extent of the mining activity is relatively set. The layout of the open pit operation has been designed to optimise the extraction of mineral resources. The topsoil and waste rock dumps have been positioned to create

a safety, visual and/or noise berm between the mining operations and nearby receptors. Haul roads will be constructed, no other surface infrastructure is planned for the area.

The proposed property is in an area dominated by current and historical mining activities. The site is infested with alien vegetation, extensive illegal dumping of waste has taken place and illegal mining that is causing destabilisation of the area.

Minerals can only be mined where identified and economically viable, therefore it was not practical to select any other sites. No location alternatives was considered however a number of layout alternative and technology alternative were considered as described below.

g) The type of activity to be undertaken

The shallow ore reserves that were identified during prospecting would be developed in the form of open pit mining, as the area cannot be accessed using underground mining methods. The open pit mining area will consist out of a single cut and mining operations will be undertaken using a conventional excavate, load and haul mining cycle. A number of activity alternatives were investigated as listed below:

Mining method alternatives:

The following mining methods were investigated:

Alternative 1: Drill and Blasting

Drill and blasting as a mining method was investigated for the Creswell Park mining permit. The following risk associated with the method was identified.

- Dangerous rock
- High ground vibration
- Blasting Fumes (air and water pollution)
- High air pressure shock waves
- Damage to infrastructure

As a result of the close proximity of houses and other infrastructure to the mining area drill and blasting will not be considered as a mining method.

Preferred Alternative: Xcentric rippers

The use of modern rock breaking equipment (Xcentric Rippers) was investigated as a mining method to be utilised for the opencast mining at Creswell Park. The use of Xcentric Rippers was chosen as the preferred alternative over drill and blasting for the following beneficial reasons:

- Low ground vibration
- No air over-pressure shock waves
- No dangerous rock fly
- Low dust emissions
- No blasting fumes; and
- No leaching of chemicals to receiving environment

The preferred alternative will be assessed in this report.

Construction of Infrastructure

A number of layout alternatives were considered that included the placement of topsoil dumps, waste rock dumps and roads, the construction of infrastructure were also investigated. The preferred alternative regarding infrastructure is to utilise the existing infrastructure located at the Sol Plaatjie operation. No permanent infrastructure will be constructed on site. No processing plant or tailing storage facility will be constructed for the project. No infrastructure will remain on the mining area after rehabilitation of the area.

Ore Processing and transporting alternatives

A number of alternative were investigated for the processing of ore. The construction of a process facility were investigated and found not to be feasible for this operation. The preferred alternative will be processing of ore at an establish facility off site. This will ensure optimisation of the current process facility and that no tailing storage facility will be constructed and operated in the area. The utilisation of existing processing plants and tailing storage facilities will be beneficial to the project.

No transport alternatives were investigated as a result of the distance to the facility, route alternatives were investigated in the traffic impact assessment and the preferred route has been established. The ore will be transport by truck to the facility. West Wits has an existing toll agreement with Sibanye, alternative transport routes and toll treatment facilities are investigated by West Wits. For this application the transport and treatment alternatives are not assessed.

h) The design or layout of the activity

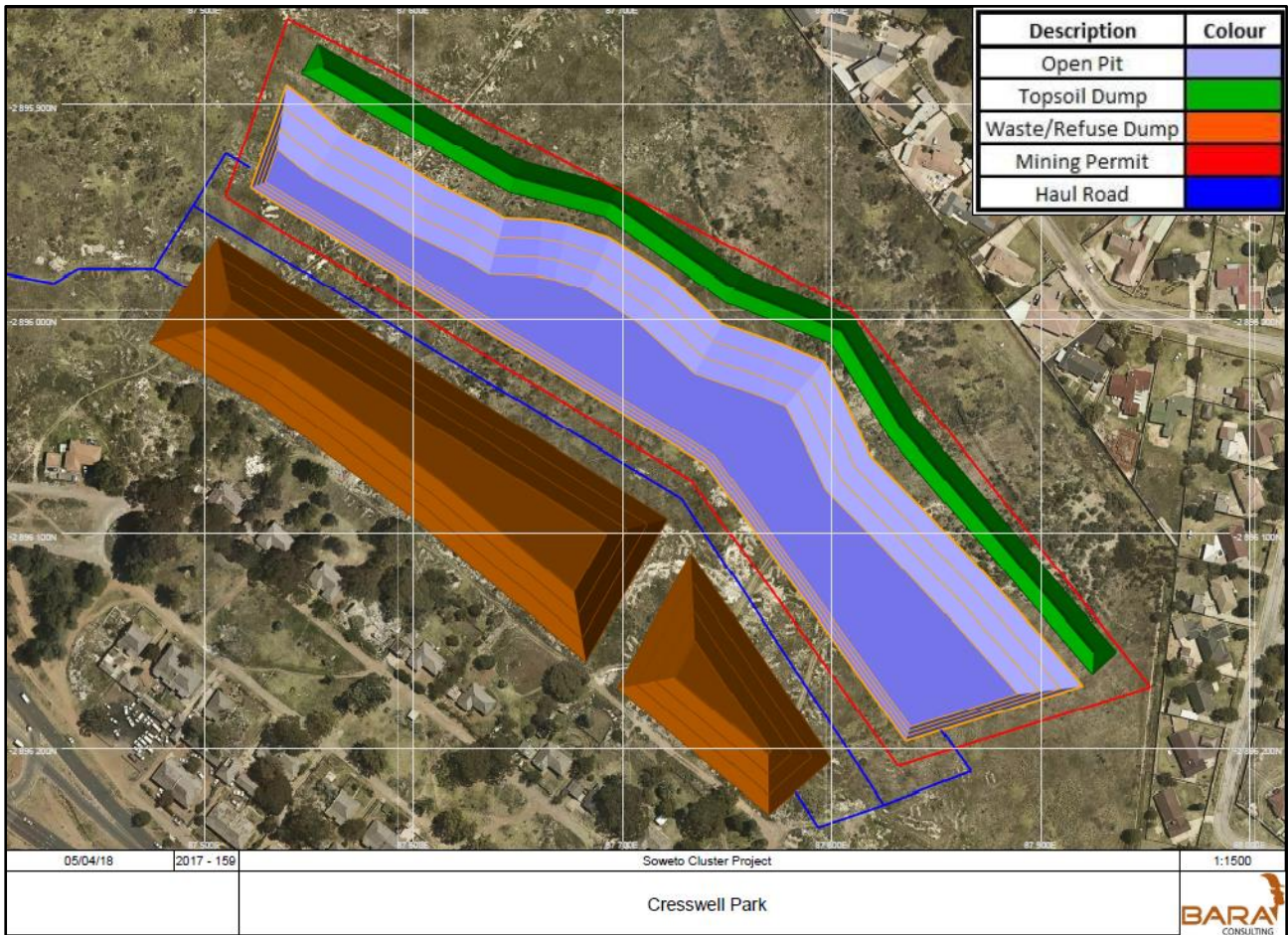
The design and layout of the mining activity is dependent on the mining plan. The mine planning is done in such a way to reduce the amount of material handling and to optimise the recovery of the resource. The topsoil and waste rock dumps have been positioned to create a safety, visual and/or noise berm between the mining operations and nearby receptors.

Various designs and layout for the mining operation has been considered and the final layout has been developed based on the availability of the gold reef as indicated by the prospecting conducted and inputs from specialist studies, stakeholders and landowners. A number of alternatives for the placement of waste rock dumps, topsoil stockpiles and road network was investigated. A sensitivity analysis (see Appendix E) was utilised to position the layout. The assessment of the environmental attributes (specialist areas) that informed the sensitivity analysis essentially determined the site layout. The attributes that were included in the sensitivity analysis are:

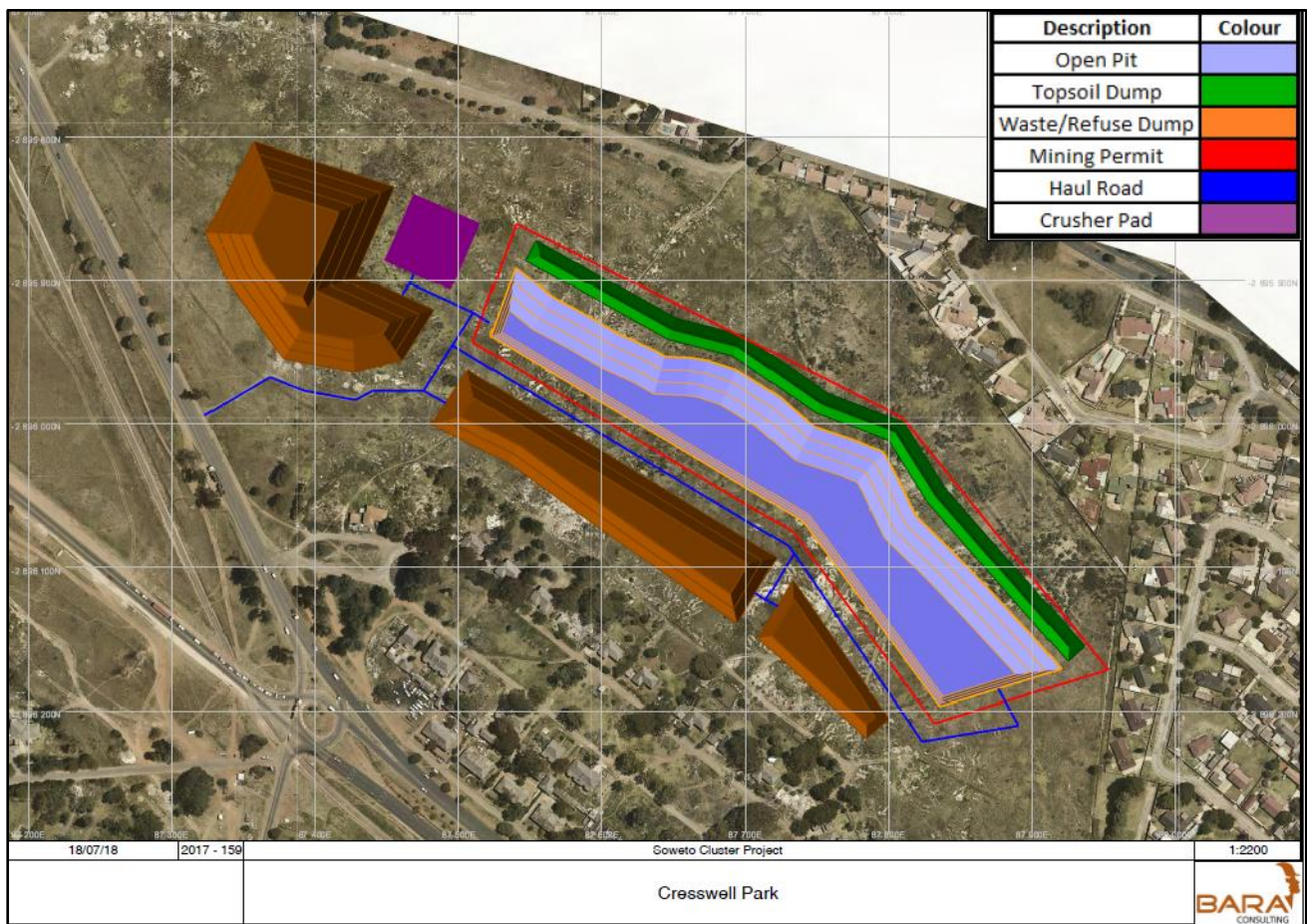
- Availability of the resource;
- Avoidance of Sensitive areas;
- Specialist Studies;
- Legislative requirements;
- Limiting material handling;
- Existing road network;
- Servitudes; and
- Comments from I&AP's and land owners.

The following two alternatives have been identified.

Alternative 1: Preferred Alternative



Alternative 2:



In both alternatives the mining area, topsoil stockpile area, the volume of waste rock and duration of the activity remain constant. For this reason it can be assume that the scale (extent), magnitude (intensity) and duration of the two alternatives are comparable. In alternative 1 the waste rock dump consist out of two areas. In alternative 2 the waste rock dumps consist out of three (3) waste rock dumps. The volume of waste rock remains constant between the two alternatives however in alternative 2 the height of the waste rock is reduce and a third waste rock dump areas is created west of the open pit area. This waste rock dump is utilised to create a visual barrier between the sensitive receptor located west of the proposed mining area.

In both alternatives the stockpile and waste rock dump areas will act as a visual barrier to the opencast area. No infrastructure will be constructed on the site as existing infrastructure will be utilised. The preferred alternative will be assessed in this report.

i) The operational aspects of the activity

No permanent services including water supply, electricity, or sewerage facilities are required. All infrastructure to be developed will be mobile and temporary including generators, portable toilets,

crushers and water tanks. Alternatives for layout, site location, mining activities and transportation, processing of ore are discussed above.

j) The option of not implementing the activity

The “no-go” alternative refer to the option of not going ahead with the proposed project. This would mean that there would be no change to the current status of the site and the positive social-economic and other benefits of the proposed project would not be realised. The “no-go” alternative will result in the sterilisation of the resource by leaving the valuable resource in the ground. It will restrict West Wits as the right holders to mine the area. Implementation of the “no-go” alternative will lead to the following potential positive impact not taking place.

- Direct economic benefits associated with wages, taxes and profits. Indirect economic benefits associated with the procurement of goods and services and the spending power of employees.
- The improvement of historical impacted land and newly impacted areas through rehabilitation and removal of rubble and rubbish illegally dumped.
- Freed up land for housing developments earmarked for the area, that aims to reduce the housing backlog experienced by the City of Johannesburg,
- Creating employment and extracting mineral resources for the benefit of the economy;
- Improving spatial integration by decrease fragmentation, unlocking development potential in large areas; and
- The eradication of access to dangerous historic workings targeted by informal miners (Zama Zama’s), which are mainly illegal immigrants that pose a threat to the health and safety of the communities and themselves while mining illegally.

If the “no-go” alternative if implemented the area will not be available for housing developments as a known mineral resources are present in the site and the DMR will not give consent for housing developments over a known resource. The applicant is in consultation with property developments/ landowners and the DMR to make the land available after rehabilitation of the area has taken place.

According to Section 24 of the Constitution, a development must be ecologically sustainable and also support socio-economic development. The proposed mining activities have the potential to have a positive and negative impact on the ecological environment as well as the social environment of the area. These impacts, however, can potentially be prevented, minimised, mitigated and managed to low levels, as shown through the impact assessment.

iii) Details of the Public Participation Process Followed

(Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land)

A joint Public Participation Process is being undertaken for the proposed mining permit. The process is undertaken to ensure compliance with regard to the requirements in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended] (MPRDA), the National Environmental Management Act, 1998 (Act No. 107 of 1998) [as amended] (NEMA), the National Environmental Management: Waste Act, 2008 (Act No 59 of 2008) [as amended] (NEMWA), the National Water Act, 1998 (Act No. 36 of 1998) [as amended] (NWA) and Environmental Impact Assessment Regulations (2014) [as amended].

Details of the Public Participation process followed

A Public Participation Process is undertaken for the Environmental Authorisation for the mining permits. The process is undertaken to ensure compliance with the requirements in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended] (MPRDA) and the Environmental Impact Assessment Regulations (2014) [as amended]. This section describes the public participation process (PPP) undertaken to date in line with Chapter 6 of the EIA Regulations (2014) [as amended]. The intention of the PPP was to inform Interested and Affected Parties (I&APs), in sufficient detail, of the proposed project in order that I&APs may contribute meaningfully to the EIA process. SLR Consulting (South Africa) (SLR) has been appointed to play a support role in the Public Participation Process.

The PPP to date has included notification of I&APs through distribution of a Background Information Document (BID), placement of newspaper advertisements, placement of site notices, distribution of flyers, radio announcements, focussed engagement and meetings with community structures and public open meetings. A key aspect of public consultation is the notification of landowners, occupier and users within and adjacent to the application area. More detail in this regard to the process followed is provided below.

Interested and affected party (I&AP) database

As part of the PPP an I&AP database has been developed for the project. I&APs identified for the project include:

- landowners, lawful occupiers and ward councillors within and adjacent to the mining permit application area
- ratepayer organisations, community leaders and community structures
- non-government organisations and associations working in the area
- mines, industry and businesses in the area
- parastatals
- commenting authorities:
 - Gauteng Department of Agriculture and Rural Development (GDARD)
 - Department of Water and Sanitation (DWS)
 - Department of Agriculture, Forestry and Fisheries (DAFF)
 - Department of Rural Development and Land Reform (DRDLR)
 - Department of Roads and Transport (DRT)
 - South Africa Heritage Resource Agency (SAHRA)
 - Provincial Heritage Resources Authority Gauteng (PHRAG)
 - Department of Economic Development
 - City of Johannesburg Health Department
 - City of Johannesburg Metropolitan Municipality
 - Roodepoort Magisterial District Municipality
 - Krugersdorp Magisterial District Municipality.

I&APs who attended meetings and /or submitted contact details have been registered on the I&AP database. The latest copy of the database is included in Appendix F-i. The database will be updated on an on-going basis throughout the process.

Mining Permit Applications: (namely Creswell Park opencast pit and Kimberley West opencast pit).

- Elemental-S is the lead EAP with SLR play a supporting role in the Public Participation Process
- The BARs have not yet been placed out for public review yet, as the independent specialists have not yet completed their assessments
- The review period for the Creswell Park permit application will be from 20 July 2018 and 20 August 2018.
- The review periods for the Kimberley West started 22 June and will end on 23 July 2018.
- Please send all comments to projects@malanscholesconsulting.co.za and/or to 720.13087.00001@slrconsulting.com

Mining Right Application:

- SLR is the lead EAP and is responsible for all Public Participation

- Please find the link to the Scoping Report for the West Wits Mining Project on SLR's website
- A copy of the scoping report has been made available for a 30-day review and comment period, was from 17 May 2018 to 17 June 2018
- Please send all comments to mmedallie@slrconsulting.co.za and/or 720.13087.00001@slrconsulting.com

Registration of any I&AP's can take place by registering on the I&AP's database, by sending details of the I&AP to MSC and or SLR. Please feel welcome to contact us should you have further queries or would need additional clarification.

Advertisements and site notices

During the initiation of the PPP, advertisements were placed in the following newspapers:

- Daily Sun on Thursday 22 March 2018 (national newspaper);
- Roodepoort Record on Friday 23 March 2018 (local newspaper);
- Dobsonville Urban News on Friday 30 March 2018 (local newspaper).

A copy advertisements placed are included in Appendix F-ii.

Site notices (400) in a mixture of English, Afrikaans, Zulu and Sotho were placed in key conspicuous positions in and adjacent to the greater mining right application area and mining permit area (between 23 and 28 March 2018). Where requested by ward councillors additional notices were provided as A4 handouts to the councillors for distribution in their wards. A copy of the site notices are presented in Appendix F-iii with the location of the notices presented in Appendix F-iv.

Additional Advertisements and site notices

In May, additional advertisements were placed in the following newspapers:

- Roodepoort Record on Friday 4 May 2018;
- Roodepoort Record on Friday 11 May 2018;
- Daily Sun on Friday 18 May 2018;
- Roodepoort Record on Friday 18 May 2018; and
- Soweto Urban Dobsonville on Friday 18 May 2018.

A copy of the additional newspaper advertisements are included in Appendix F-viii.

Additional site notices (in English) were placed at key locations in and adjacent to the mining right application area and mining permit area and flyers containing the same information were handed out

(between 11 and 17 May 2018). The following further site notice and flyers were distributed specifically for the Creswell Park mining permits.

- Georgia (Ward 84) 7x site notices and 50x flyers
- Hamberg (Ward 84) 3x site notices and 50x flyers
- Creswell Park (Ward 70) 13x site notices and 100x flyers
- DRD (Ward 127) 2x site notices

A copy of the site notices are presented in Appendix F-ix with the location of the notices presented in Appendix F-x. The flyers distributed are presented in Appendix F-xi. Additional Site Notices were placed and flyers were distributed for the mining right and mining permit as presented below.

Kimberley West

- Tshepisoong (Ward 128) 10x site notices and 200x flyers
- Leratong Village (Ward 127) 10x site notices and 200x flyers
- Bramfischerville (Ward 49) 15x site notices and 300x flyers
- Witpoortjie (Ward 71) 10x site notices and 200x flyers

16 May 2018

- Dobsonville Gardens (Ward 53) 10x site notices and 100x flyers
- Bambayi (Ward 50) 10x site notices and 100x flyers
- Thulani (Ward 129) 10x site notices and 100x flyers
- Emdeni (Ward 52) 10x site notices and 100x flyers
- Zola (Ward 51) 10x site notices and 50x flyers
- Zondi (Ward 46) 10x site notices and 100x flyers
- Tshepisoong (Ward 128) 5x site notices and 100x flyers

15 May 2018

- Meadowlands West (Ward 45) 10x site notices and 100x flyers
- Meadowlands West (Ward 43) 10x site notices and 100x flyers
- Meadowlands East (Ward 41) 10x site notices and 100x flyers
- Meadowlands East (Ward 40) 10x site notices and 100x flyers
- Bramfischerville (Ward 44) 10x site notices and 200x flyers
- Bramfischerville (Ward 49) 10x site notices and 200x flyers
- Dobsonville (Ward 47) 10x site notices and 150x flyers
- Dobsonville (Ward 48) 10x site notices and 100x flyers

14 May 2018

- Leratong (Ward 7) 50x flyers
- Goudrand/Matholesville/Sol Plaatjie /Leratong Village (Ward 127) 10x site notices and 100x flyers
- Florida/Fleurhof (Ward 70) 10x site notices and 150x flyers
- Witpoortjie/Davidsonville (Ward 71) 10x site notices and 100x flyers
- Roodepoort/Georginia/Hamberg (Ward 84) 10x site notices and 100x flyers

Radio Announcements

Radio announcements were also made on Jozi FM on Friday 18 May 2018.

Background Information Document (BID)

A BID document was compiled for the proposed project. The purpose of the BID was to inform I&APs about the proposed project, the EIA process, environmental attributes, possible impacts and means of providing input into the EIA process. The BID was made available in English and included details of the public scoping meetings. The BID was distributed by email, at the public scoping meetings and by hand (starting on 23 March 2018). Hand delivery of BID's were again undertaken on 11 April and 12 April 2018. The BID is presented in Appendix F-v and the proof of distribution are included in Appendix F-vi.

Public meetings

The purpose of holding the public scoping meetings was to:

- to provide an overview of the project and related EIA process
- to provide an overview of the social and labour plan (SLP);
- to provide I&APs with an opportunity to:
 - raise any issues and concerns (both positive or negative)
 - provide input on any environmental sensitivities and potential impacts
- to record issues within the formal assessment process so that they can be addressed during the course of the EIA
- to outline the way forward.

The date, venue and time of the public scoping meetings are provided in Table 14.

Table 14: Public Scoping meetings

Date	Venue	Time
Tuesday 3 April 2018	Sol Plaatjie Hall, Sol Plaatjie	11h00
	E-Hall, Matholesville	17h00
Wednesday 4 April 2018	NG Kerk, Witpoortjie	17h00
Thursday 5 April 2018	Multi-Purpose Centre, Bram Fischerville	17h00
Friday 6 April 2018	Moses Kotane Primary School, Bram Fischerville	17h00

The meetings were held in English due to the diversity of languages present at the meetings. However, attendees were informed that they could ask questions in any language with which they were comfortable. Copies of the BID were made available to attendees at the meetings. Maps indicating the local setting of the project were displayed on the walls at the meetings. Minutes of the meetings are included in Appendix F-vii.

Additional scoping meetings were held as presented below. Queries concerning the mining permits were also addressed at these meetings. The minutes of these meetings will be included in the final basic assessment report.

Table 15: Additional Public Meetings

Date	Venue	Time
Thursday 31 May 2018	Roodepoort City Hall, Roodepoort	18h00
Monday 4 June 2018	Tshepisoong Multi-Purpose Centre	16h00

Focus Group Meetings with Community Structures

A number of focus group meetings took place with individuals from municipal and community structures.

- Georgia South Residents Forum
- Maxam Dantex
- Rand Leases and
- Other land owners

Review of the Draft Basic Assessment

I&AP review of Draft Basic Assessment Report

The Draft BAR and EMPR are herewith released for a period of 30 days from 20 July 2018 to 20 August 2018. Hard copies of the Draft BAR and EMPR are herewith submitted to all organs of state and relevant authorities. In addition copies are placed at the following locations as presented below:

Table 16: Draft BAR for Public Review

Name and Location	Physical Address
Roodepoort Civic Centre	100 Christiaan de Wet Road, Florida Park, Roodepoort
Witpoortjie Library	22 Payne Street, Witpoortjie, Roodepoort
Solplaatjie Hall	1960 Motlaka Street, Solplaatjie
Leases Bowling Club	1724 Tornado Cres, Georgia, Roodepoort

An executive summary of the Draft Basic Assessment has been made available to I&APs:

- via email and post to registered I&APs on the I&AP database;
- via email to municipal structure; and
- hard copies were provided to ward councillors for distribution in their respective wards.

In addition, registered I&APs have been notified of the availability of the Draft Basic Assessment for review via SMS and E-mail notifications. Electronic copies of the Draft Basic Assessment will be made available on request. Where meetings take place during the review period, hard copies of the executive summary will be provided.

Next Phase - Way forward

All comments received from I&APs and organs of state and responses sent will be included in the final BAR and EMPR to be submitted to the Competent Authority (CA).

DMR review of scoping report - On completion of the 30-day review period, a Final BAR will be compiled which will include comments received during the I&AP review period. The report will be submitted to the DMR for its review via the online SAMRAD system (web portal).

Summary of Issues raised

A high level summary of the issues/concerns raised during the public meetings (see Table 14 and Table 15) are presented below (please refer to Appendix Fxii for detailed the comments and response report).

- Illegal mining
 - Safety concern
 - How will illegal mining be stopped by the legal mining
- Health issues
 - Air Pollution from dumps/ stockpiles
 - Air pollution from mining – dust
 - Noise impact
 - Radiation concerns
 - Water Quality – pollution of resource
- Jobs creation
 - Benefit to the community, Skills development
- Safety concern with mining
 - Open pits
 - Sink holes (not applicable to this application)
- Damage to Houses – Cracks
- Sasol /Transnet pipelines
- Relocation of communities (not applicable to this application)
- Rehabilitation of pits - Loss of biodiversity
- Traffic impacts
 - Capacity of roads
- Logistics (transportation, electrical, plumbing and building infrastructure).
- Procurement requirements of West Wits
- Employment and number of employees (Empowerment)

- **Summary of issues raised by I&APs**

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

PLEASE SEE APPENDIX F – Public Participation. A summary will be included after the 30 day public review period. Please refer to Appendix Fxii for detailed the comments and response report.

Table 17: Summary of issues raised

Interested and Affected Parties List the names of persons consulted in this column and mark with an X where those who must be consulted were in fact consulted.	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
AFFECTED PARTIES				
Landowner/s				
Lawful occupier/s of the land				
Landowners or lawful occupiers on adjacent properties				
Municipal councillor				
Local Municipality – City of Johannesburg				
District Municipality – Roodepoort				
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWS etc.)				

Interested and Affected Parties List the names of persons consulted in this column and mark with an X where those who must be consulted were in fact consulted.	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Communities				
Dept. Land Affairs				
Traditional Leaders				
Dept. Environmental Affairs				
Other Competent Authorities affected				
<u>OTHER AFFECTED PARTIES</u>				
<u>INTERESTED PARTIES</u>				

9. The Environmental attributes associated with the alternatives

(The environmental attributes described must include socio-economic, social, heritage, cultural, geographical, physical and biological aspects)

Baseline Environment

South Africa's gold mining industry commenced in the 1880s and played a strong role in creating some of the country's most important historical milestones, while shaping certain sectors of South African society. Mining in the Central Basin of the Witwatersrand Goldfields started 132 years ago after the discovery of gold in 1886. The Central Basin stretches approximately 47 km from Roodepoort in the west to Germiston in the east. The basin straddles the North West, Gauteng and the Free State Provinces and is of the same period as the Vredefort impact of 2.023 Ga ago, and the Bushveld Igneous Complex. The Witwatersrand Basin holds the world's largest known gold reserves with nearly half of all the gold ever mined has come from the extensive Witwatersrand Basin, The basin has produced over 1.5 billion ounces. The gold occurs in reefs, or thin bands, that are mined at depths of down to 4,000 metres (m). The Wits Basin gold occurs almost exclusively within quartz pebble conglomerates. Although many of the older mines are now exhausted, the Witwatersrand Basin still produces most of South Africa's gold and much of the total world output.

The study area (Creswell Park) is located within the City of Johannesburg Municipality and Roodepoort Magisterial district. Creswell park project area is located adjacent to the Creswell Residential area, approximately 750m east from the edge of Roodepoort and approximately 4km west from Florida. The proposed areas is approximately 17 kilometres (km) west of Johannesburg, 14km South East of Krugersdorp, 15km south west of Randfontein and 9km north of Soweto. The footprint area is also covered by extensive dumping of building rubble and general waste and illegal mining is taking place on the property (Figure 4 to Figure 7).



Figure 4: Pit area - General view of grass, from southern side of site



Figure 5: Historical mining houses to the south of the proposed mine area.



Figure 6: General Waste dumped on the area



Figure 7: Access road and waste dumping on the area

Opencast mining of gold, uranium and silver by West Wits is taking place in the existing Sol Plaaityje operation site. Operation of the proposed site will be undertaken from the existing infrastructure and no additional infrastructure is therefore required for the opencast mining area. The current surrounding land uses in the region includes mining, historical mine residue deposits and residential communities and industrial complexes.

Land Claims

According to the regional land claims commissioner (Gauteng) a land claims has been lodged in terms of the Restitution of Land Rights Amendment Act, 2014 (Act no 15 of 2014) against Portion 407 and Portion 408 of the Farm Roodepoort 237 IQ.

The validity of the amendment Act was challenged in the Constitutional Court. The Constitutional Court found the Amendment Act to be invalid because of the failure of Parliament to facilitate public involvement as required by the Constitution. The Amendment Act ceased to be law on 28 July 2018. The Constitutional Court ordered that the claims that were lodged between 1 July 2014 and 27 July 2016 are validly lodge, but it interdicted the Commission from processing those claims until the Commission has finalised the claims lodged by 31 December 1998 or until Parliament passes a new law providing for the re-opening of lodgement of land claims. It is important to note that the provisions of section 11(7) of the Restitution of land Rights Amendment Act, 1994 do not apply until after the Commission has accepted the claim for investigation and published its details in the Government Gazette.

Servitude

A servitude is located on the southern section of portion 407 and 408 of the Farm Roodepoort 237 IQ. No opencast mining activities will take place within a horizontal distance of 50m from the edge of the servitude. This buffer zone will be maintained as required for the servitude. From the vibration study (See Appendix G-viii) it has been establish that the vibration from the mining method (Xcentric Rippers) at distances greater than 50m will be negligible in this geological environment. The ground vibration levels recorded in close proximity (15m) from the equipment were not high enough to cause damage to structures.

No excavation or stripping of topsoil will be performed within the servitude. It is not anticipated that the placement of the waste rock dump will have an impact on the servitude and no damage is anticipated as a result of the mining and associated activities. The risks associated with mining activities taking place in close proximity to the servitude are Medium before mitigation measures are implemented and Low after implementation.

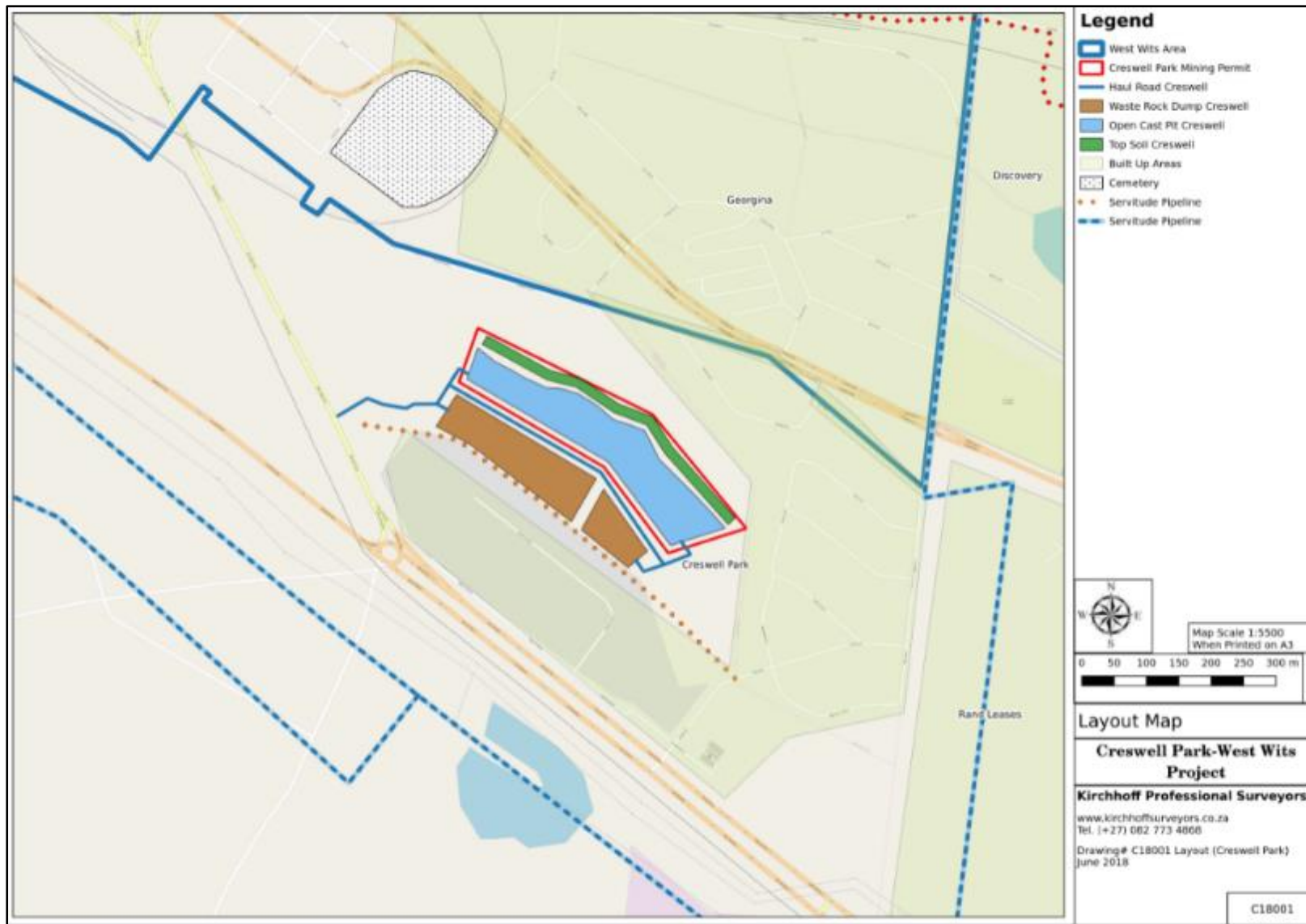


Figure 8: Servitude

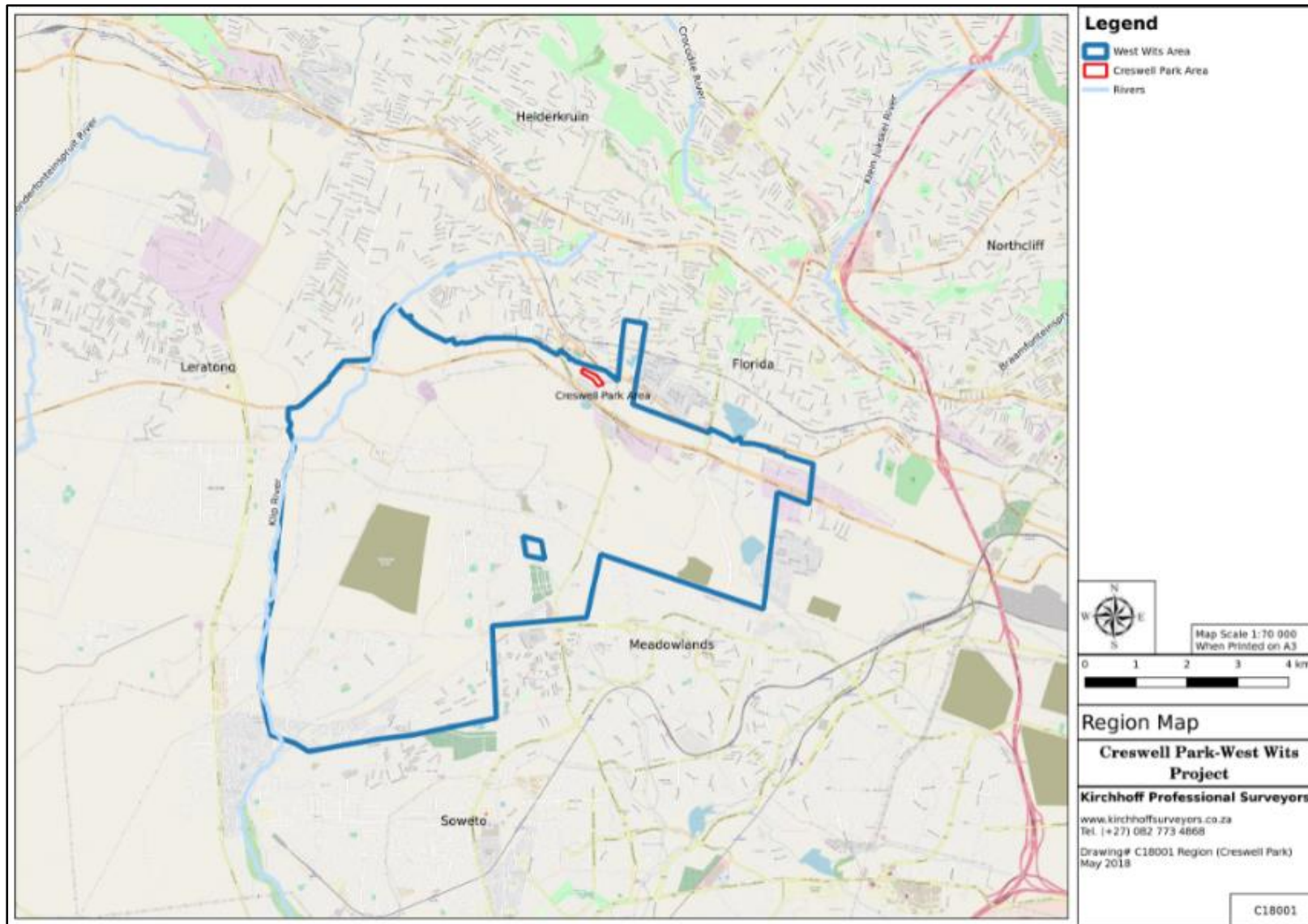


Figure 9: Regional Locality Map of the Study Area

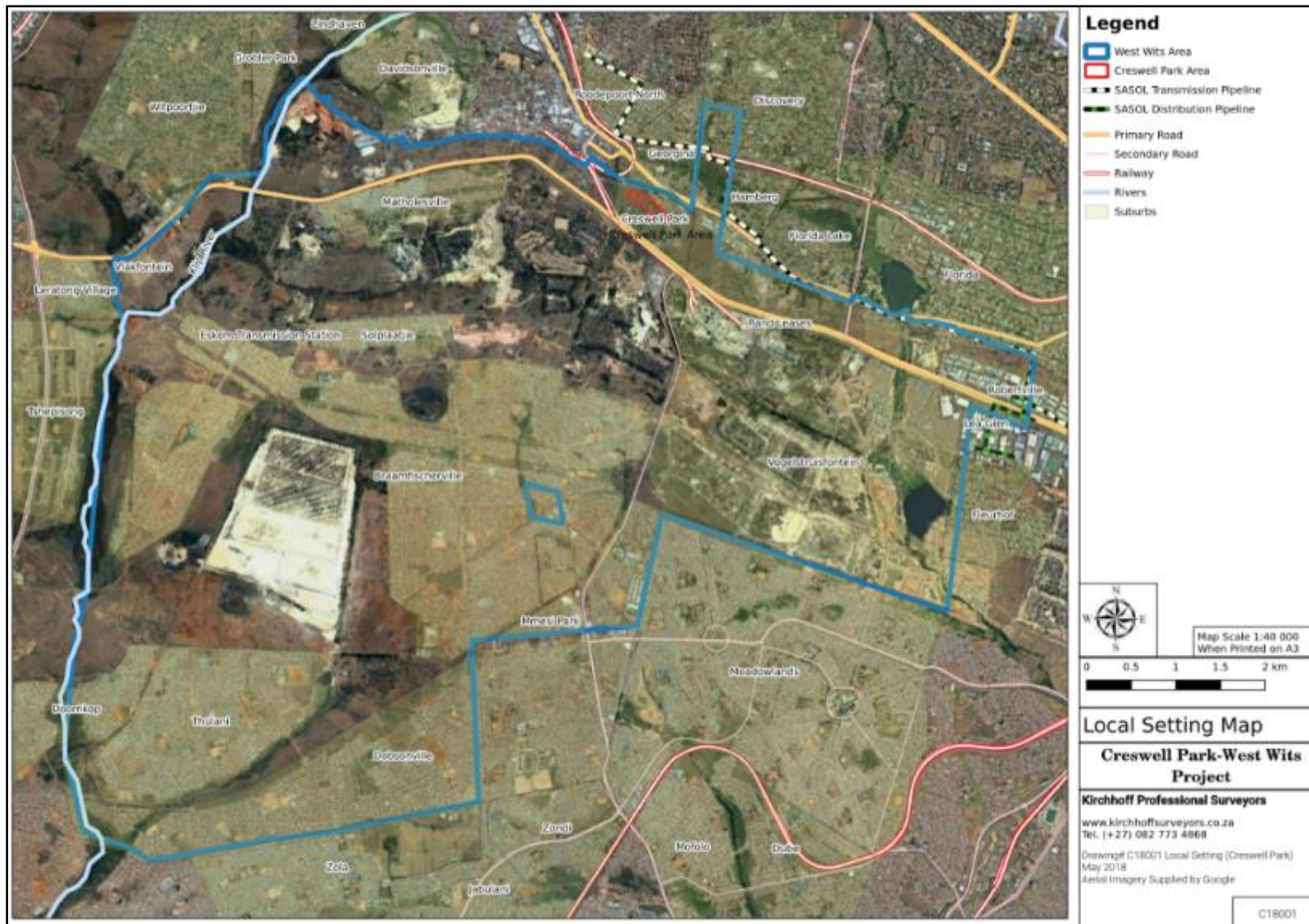


Figure 10: Locality Map of the Study Area

(a) Type of environment affected by the proposed activity.

(Its current geographical, physical, biological, socio- economic, and cultural character)

Climate

Regional Climate

The study area is characterised by a Highveld climate, with summer rainfall in the form of high intensity thunderstorms. The summer months (September to April) are characterised by hot days, summer thunderstorm activity and cool evenings. Winter (May to August) days are dry and nights are cold. Rain hardly falls in winter and the temperature occasionally drops to below zero at night, causing frost.

Ambient Temperature

Monthly mean, maximum and minimum temperatures are given in **Table 18**. Diurnal temperature variability is presented in Figure 11. Temperatures ranged between 2.7°C and 32.9°C. During the day, temperatures increase to reach maximum at about 15:00 in the late afternoon. Ambient air temperature decreases to reach a minimum at between 06:00 and 07:00.

Table 18: Monthly temperature summary (WRF data, January 2015 to December 2017)

Monthly Minimum, Maximum and Average Temperatures (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum	13.7	14.1	12.3	9.7	6.5	5.3	2.7	5.8	7.0	7.7	9.1	10.9
Average	21.7	22.0	21.1	18.4	15.2	12.7	12.1	14.5	16.9	18.9	20.5	22.1
Maximum	31.1	32.5	30.8	29.1	25.3	23.1	22.8	26.7	27.8	31.1	31.9	32.9

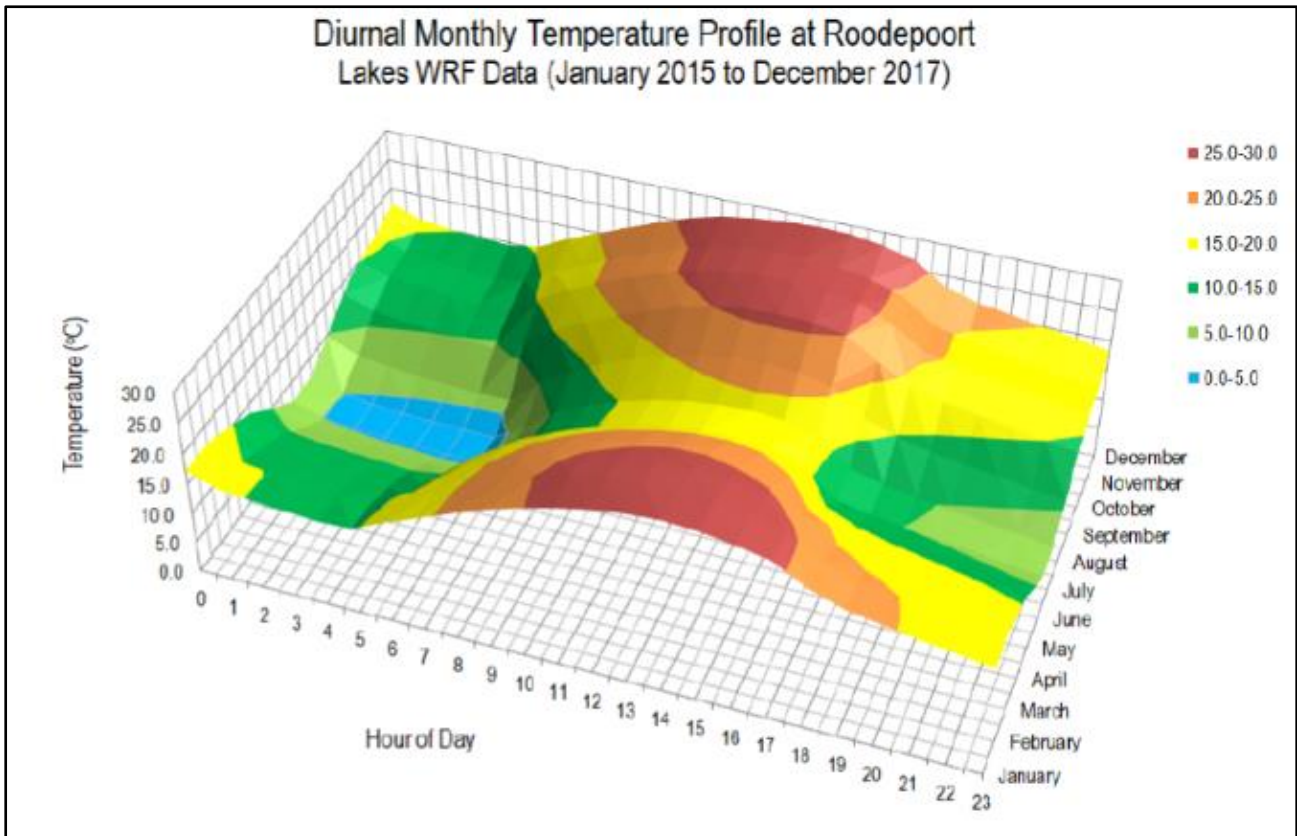


Figure 11: Diurnal temperature profile (WRF data, January 2015 to December 2017)

Local Wind Fields

The period wind field and diurnal variability in the wind field are shown in Figure 12, while the seasonal variations are shown in Figure 13. The wind regime for the area is dominated by north-north-easterly flow fields. The northerly wind flow is more dominant during day-time conditions, with north-north-easterly wind flow more dominant during the night. Calm conditions occurred 2 % of the period summarised.

During the summer and spring months, wind from the north sector dominates, with stronger winds of more than 6 m/s occurring. Infrequent winds occur from the southern sector. During autumn, the winds increase in frequency from the southern sector. Winter months reflect an increase in flow from the south.

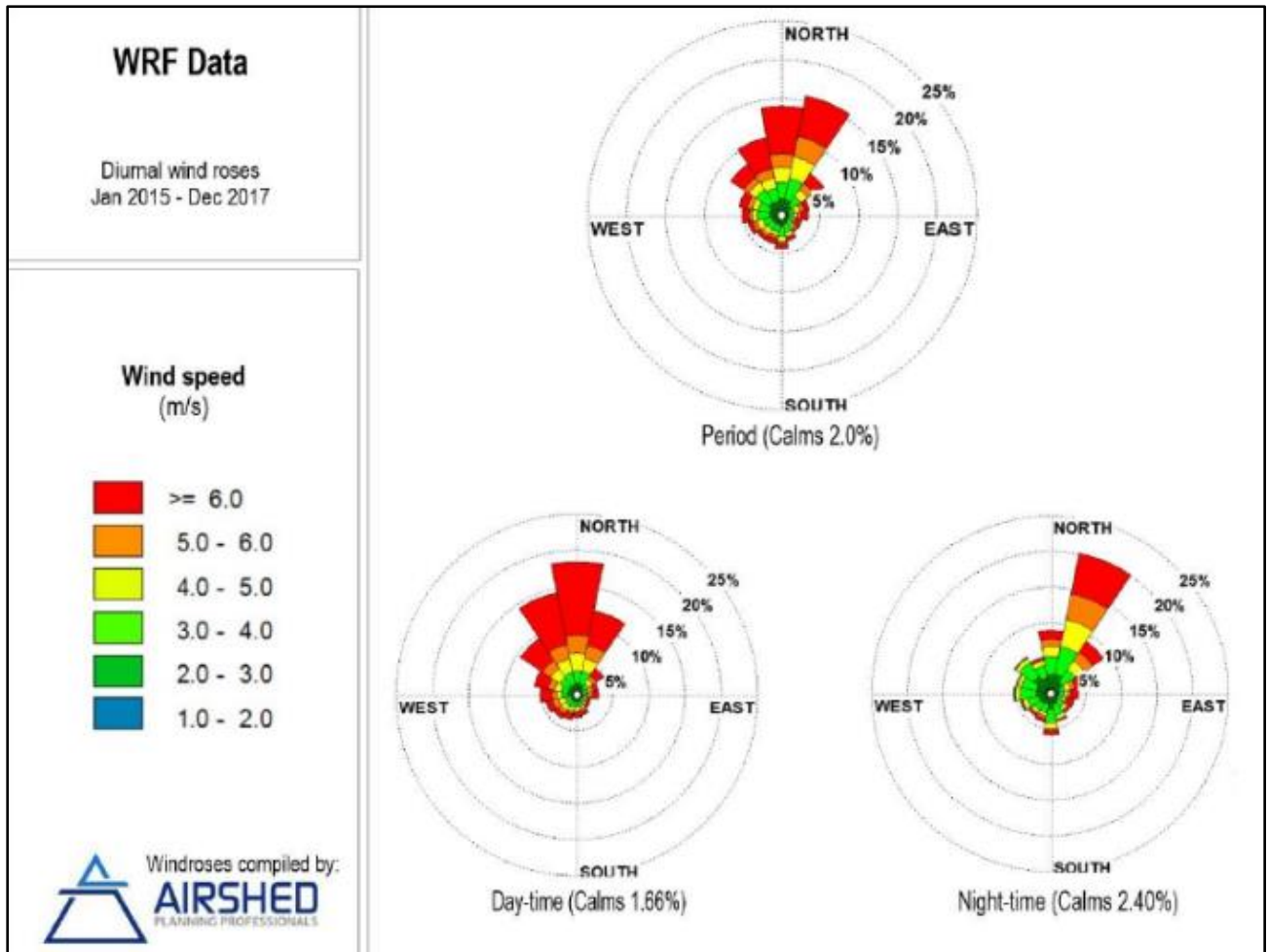


Figure 12: Period, day and night-time wind roses (WRF data, January 2015 to December 2017)

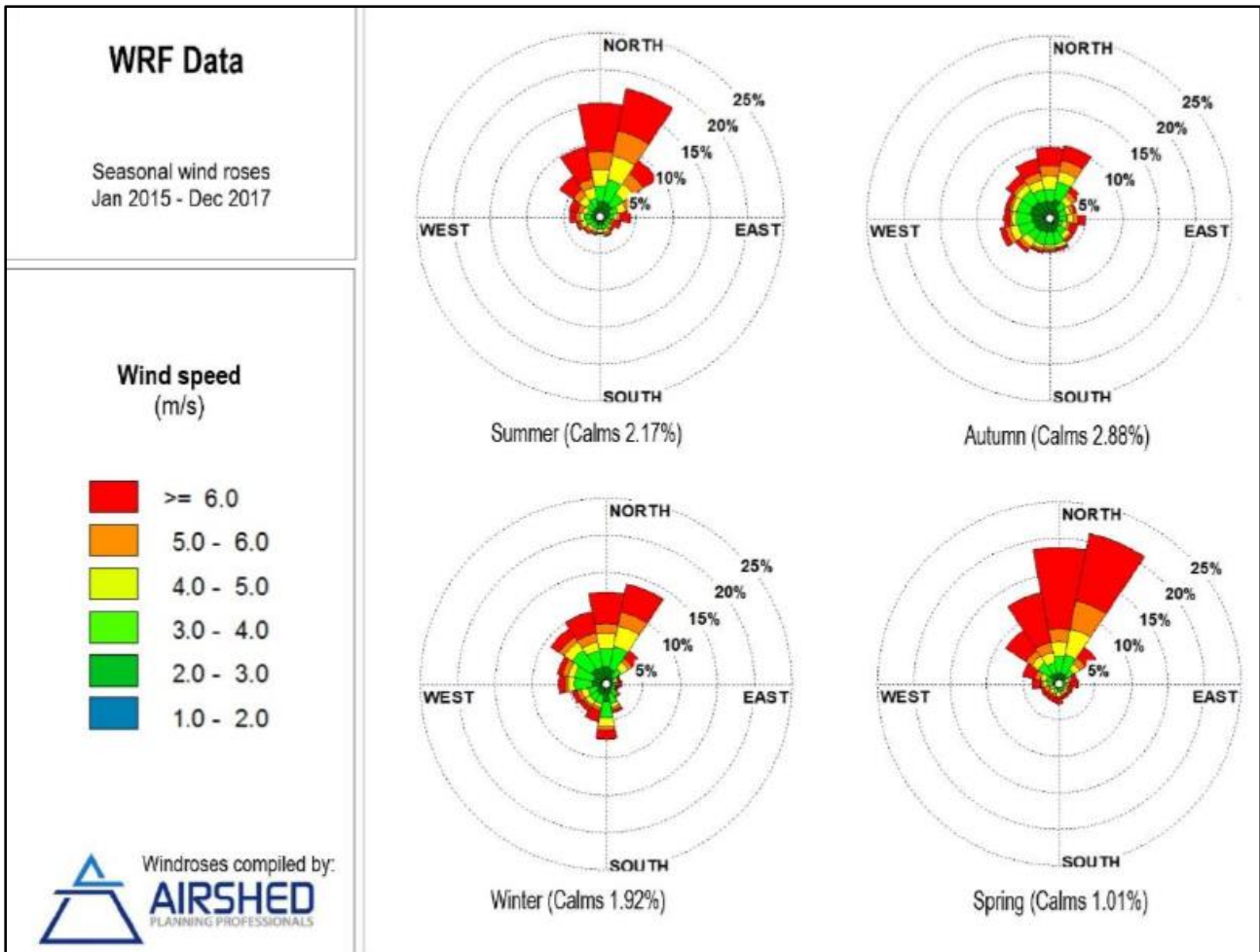


Figure 13: Seasonal wind roses (WRF data, January 2015 to December 2017)

Precipitation

Precipitation represents an effective removal mechanism of atmospheric pollutants. Precipitation reduces wind erosion potential by increasing the moisture content of materials. Rain-days are defined as days experiencing 0.1 mm or more rainfall. The rainfall provided by the WRF data set for the period 2015 to 2017 ranged between 1108 and 1474 mm per year.

Evaporation

The mean annual evaporation for the area is averaged at 1,650 mm.

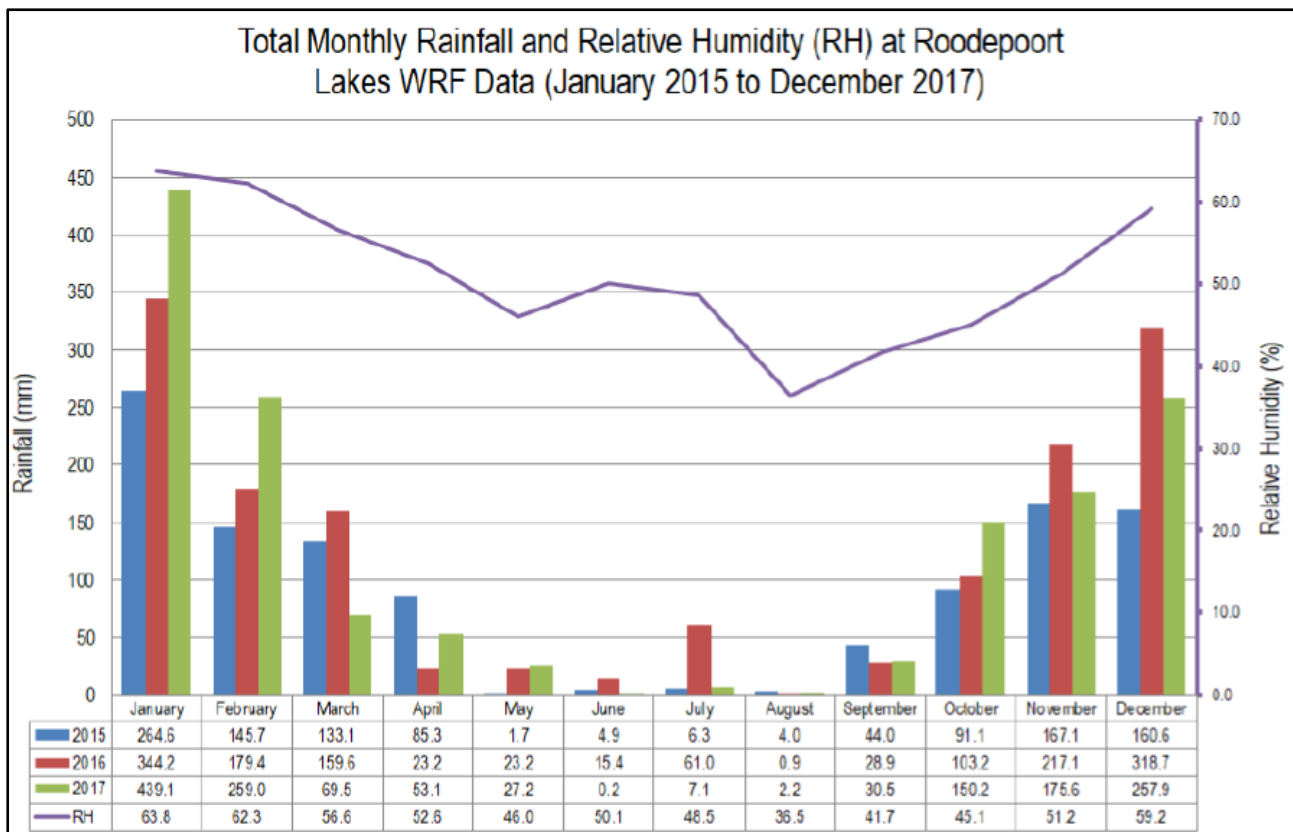


Figure 14: Monthly rainfall as obtained from the WRF data for the area (2015-2017)

Geology

Regional Geology

The mining targets are the auriferous conglomerates of the Central Rand Group, Witwatersrand Supergroup. These are the North Reef, Main Reef, Main Reef Leader, South Reef, Livingstone Reef, Bird Reef, Monarch Reefs, Kimberley Reefs, and Ventersdorp Contact Reef. The latter is situated at the base of the Ventersdorp Supergroup within the Venterspost Conglomerate Formation. The Central Rand Group is subdivided into the older Johannesburg (containing the Main, Randfontein, Luipaardsvlei, Krugersdorp, and Booyens formations) and the younger Turffontein (containing the Kimberley, Elsburg and Mondeor formations) subgroups.

The regional geology of the site and surrounding area is illustrated in **Figure 15**. To the north of the proposed mining area approximately follows the outcrop of the Johannesburg Subgroup, Central Rand Group. This package is overlain towards the south by strata of the Turffontein Subgroup. To the southwestern of the proposed mining area are volcanic rocks of the Ventersdorp Supergroup outcropping. A circular outcrop comprised of Transvaal Supergroup sedimentary rocks is found in to the south of the proposed mining area. These rocks predominantly consist of dolomite, with the Black Reef present at its base. Chert-rich dolomite have good groundwater potential, i.e. the Monte Christo

and Eccles Formations. Constant re-circulation of groundwater is also causing enlargement of fractures and cavities, thus enhancing groundwater potential.

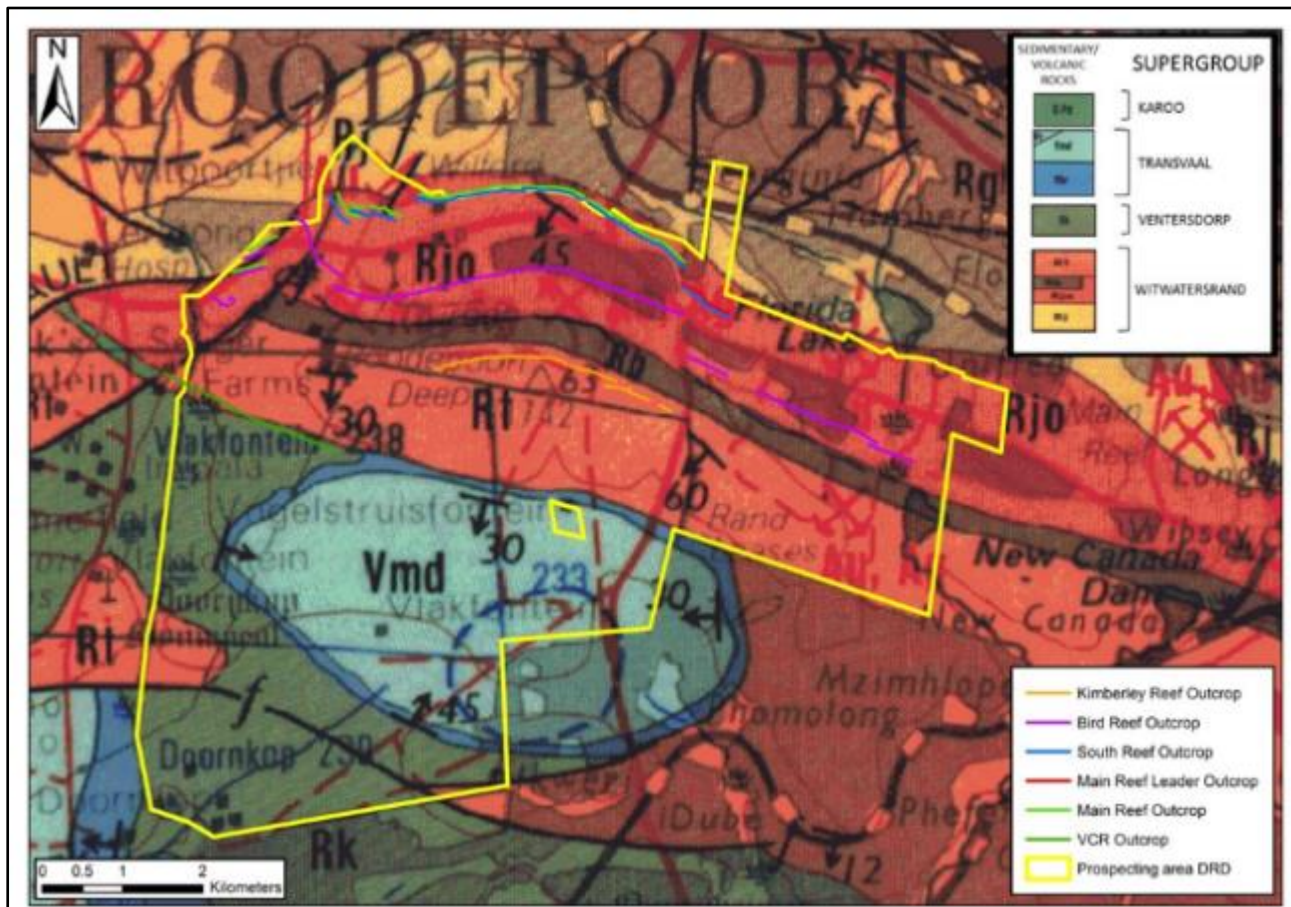


Figure 15: Regional Geology

The Wits Basin gold occurs almost exclusively within quartz pebble conglomerates. While the origins of the sedimentary layers of the Wits Basin are generally agreed upon, there remains much contention as to how the gold itself got there.

Dotted outside the basin are older Archaean granites of between 3 and 3.2 Ga, some of which are exposed while the much younger Karoo System cover others. The Witwatersrand System is a sequence of shale, quartzite and conglomerates ranging in age from 2.7 Ga for the Hospital Hill subgroup to 2.4 Ga for the Turffontein subgroup (Figure 16). The Lower Witwatersrand is composed mainly of argillaceous clays and shale with occasional banded ironstone, a tillite and an intercalated lava flow, while the Upper Witwatersrand consists almost entirely of quartzite and conglomerate, with its own volcanic horizon.

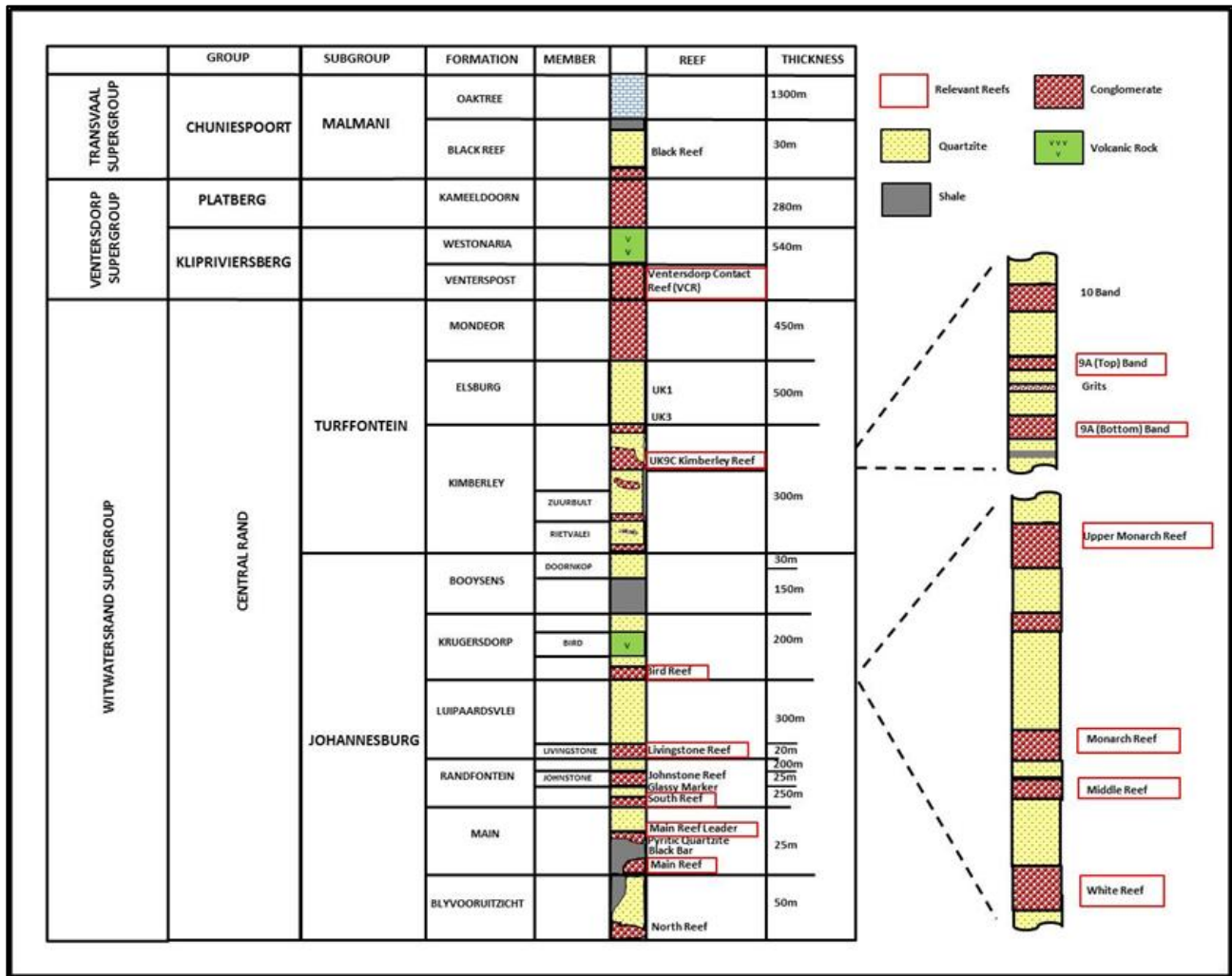


Figure 16 Stratigraphic column of the Central Rand Group in the Central Rand Goldfield

The dolomite within the regional geology and within the greater prospecting area of West Wits proposed area belongs to the Malmani Subgroup of the Transvaal Sequence. They comprise of four Formations, with the subdivision being based on chert content and presence/absence and type of algal structures. From a groundwater perspective, the chert content is the most important, with the chert-rich formations forming the main aquifers.

A characteristic of the area is a series of cross-cutting lineaments representing faults and dykes. The dykes are not 100% impermeable, but are at least several orders of magnitude less permeable than the dolomite. They therefore divide the dolomite into a series of characteristic compartments. Of relevance to the proposed mining area are the Zuurbekom and Upper Klip River dolomitic compartments. The Klip River dyke bisects the proposed mining area. It runs from the centre of Roodepoort, across the circular dolomitic deposit and down to the centre of Lenasia. The dolomite to the east of the dyke is known as the Upper Klip River Compartment and to the west as the Zuurbekom Compartment.

The dolomite owes its permeability mainly to secondary fissures such as faults, joints and bedding planes which have provided easy access to circulating groundwater, thus promoting deep weathering of the dolomite, largely by carbonate solution or karstification. The residues of this weathering are mainly brown clays and wad with chert rubble and boulders. The depth of weathering/superficial deposits varies up to approximately 150 m, but is very unpredictable and pinnacles of fresh dolomite are commonplace adjacent to deeply weathered zones. One of the most important controls on zones of deep weathering is tensional fractures.

These dykes are of diabase or composite syenite-diabase and are associated with the Pilansberg Dykes (Day, 1980). These N-S dykes occupy major tensional features. They form barriers to groundwater flow of varying effectiveness. A third structural feature controlling groundwater occurrence are axes of local folding. Flexure of the formations caused a network of fissures which radiate upwards from the axes of these distortions. Such localised folding is mainly detected from detailed exploration borehole records where the boreholes penetrate through the rock.

Regional Soils

Typical soils associated with regional geology and the area include Hutton, Bainsvlei, Avalon and Longsland soil types. Soils are red, yellow or greyish in colour with shallow horizons. These soil types are associated with a moderate arable land potential and a moderate to low grazing potential. The soils and land capability within the proposed project area have been influenced by residential activities, historical mining, historical residue mine dumps, illegal mining and dumping of waste. No agricultural activities are taking place on the site or surrounding area.

Topography

The greater West Wits area is dominated by rolling plains with interspersed hills, with a dominant hill crest in the north where previous mining activities have impacted on the outcrop. The average height above sea level for the area ranges from 1 650 – 1 850 m. Historical mining activities have altered the natural topography of the area. The Creswell Park opencast footprint area consists of relatively flat terrain covered with secondary grassland with an average elevation is 1746 mamsl. The natural high point (1754 mamsl) of site is located on south western boundary with the slope dipping towards the North. The lowest point (1736 mamsl) of the site is located on the north boundary.

Surface Hydrology

The proposed mining area is in the Upper Vaal Water Management Area (WMA 08), in quaternary catchment C22A which has a gross total catchment area of 548 km². The Klip River drains the catchment in a southerly direction and flows along the western boundary of the proposed mining area.

Several tributaries to the Klip River drain the area and include the Harringtonspruit that drains the Eldorado Park area and the Diepkloofspruit and Baileyspruit that drain the eastern portions of the sub-catchment. Along the Klip River are several wetland areas and dams. The Klip River drains the catchment in a southerly direction and is approximately 4km west of the site. A natural drainage line with man-made dams and associated wetlands are located approximately 480m north from the site. No significant slope is present on the proposed area and drainage will take place in a northerly direction and north westerly direction. Stormwater generated on the site will not negatively affect any water sources in the area.

The Klip River Forum is constituted in terms of the National Water Act, 1998 (Act 36 of 1998) and is a non-profit organisation consisting of stakeholders actively participating in sustainable water resource management of the Klip River Catchment and its associated tributaries. Under this Klip River Forum, there are in-stream water quality objectives (WQO) which have been set up to assist with water resources management.

The C22A quaternary catchment's climate and runoff parameters for have been extracted from the Water Research Commission (WRC) water resources studies and presented in Table 19 (WRC, 2005).

Table 19 Precipitation and Evaporation of the C22A Quaternary Catchment

Quaternary Catchment	Total Area (km ²)	MAP (mm)	MAE (mm)	Rainfall Zone	Evaporation Zone
C22A	548	695	1,650	C2B	11 A

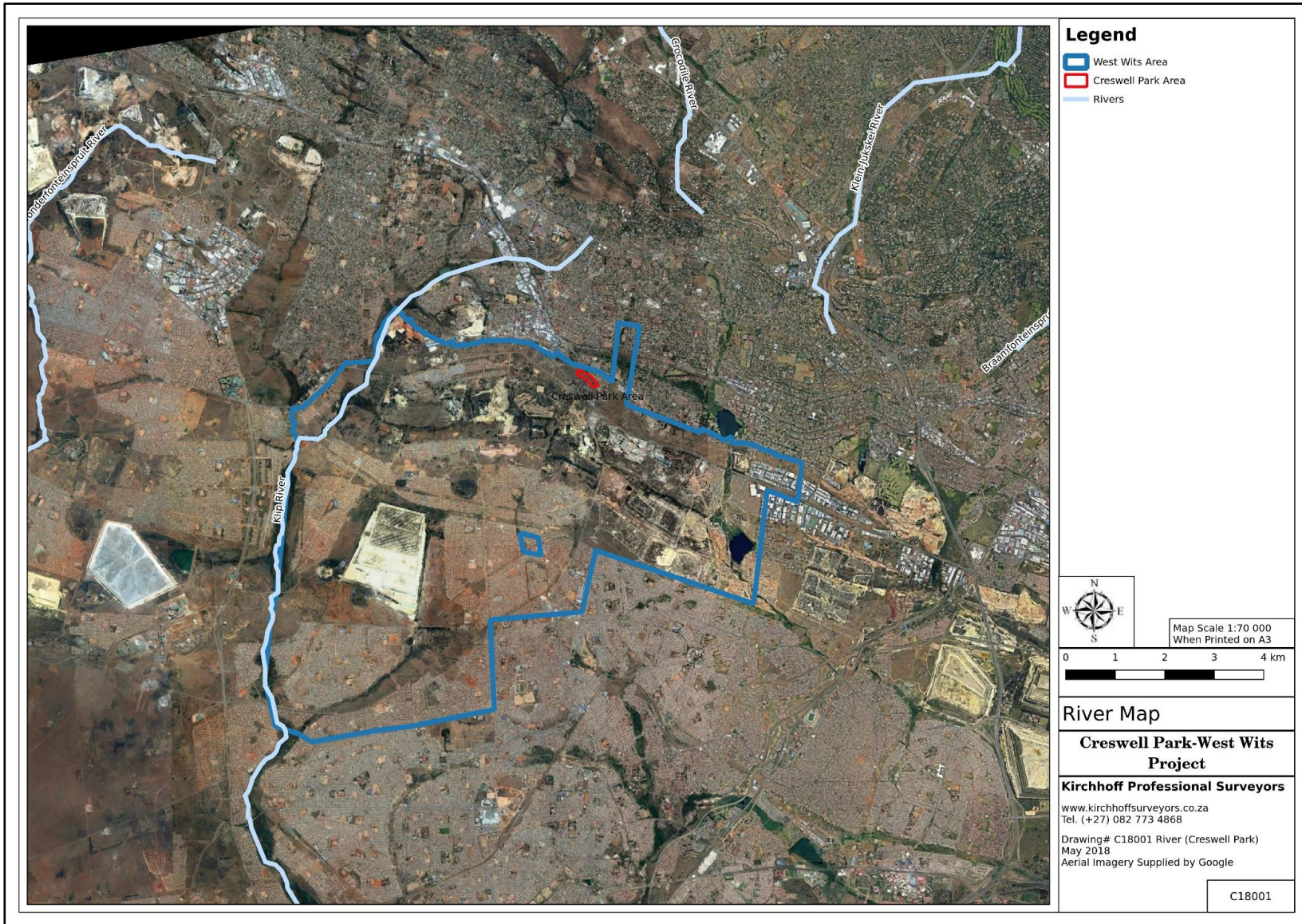


Figure 17: Drainage basins from hydrologic modelling

Hydrogeology Assessment

The information in this section has been obtained from the Groundwater Report (Noa Agencies (Pty) Ltd, May 2018). For full report please refer to Appendix G-i.

Regional Groundwater

Groundwater occurrence in the Witwatersrand and Ventersdorp rocks or the quartzite are generally associated with zones of deep weathering, or faulting and jointing. The depth of weathering is not known due to a lack of information. Groundwater is often encountered in both the saturated weathered material below the regional groundwater rest level and in the transition zone between weathered and fresh formations.

The local weathered aquifers generally support moderate yielding boreholes (less than 1 L/s). Most fault and joint zones in the deeper fractured aquifers are steeply dipping structures that tend to narrow and even pinch out at depth, with a corresponding decrease in permeability. The porosity is usually less than 1% while the fresh rock may be regarded as impermeable.

The groundwater table on site is located approximately 25 to 30 meters below ground level (mbgl). Groundwater movement often mimics the topography and generally flows towards the south; the Roodepoort residential areas are thus located upstream from the proposed mining areas and the Bram Fischerville, Soweto residential areas and the dolomites downstream.

The dolomitic zone is characterised by highly fractured chert layers. The dissolution of calcite along fractures, together with folding and faulting, resulted in well-developed aquifers in the dolomite, with a high transmissivity and large storativity.

Dolomite has a reputation for its excellent water bearing properties. The development of secondary porosity within the dolomite is largely responsible for the permeability that it possesses. Circulating groundwater has further developed fractures and solution features of structural origin by carbonate solution. Large scale leaching and karstification of dolomite can result in very substantial storage of groundwater. The dolomite boreholes are located in excess of 10km south of the proposed Creswell Park open pit.

Hydrocensus

A hydrocensus was conducted across the Project area during March 2018. The survey included the proposed mining footprint areas and adjacent properties and concentrated on identifying existing boreholes to enhance the knowledge of the groundwater systems and current groundwater use.

During the 2018 hydrocensus 13 boreholes were identified. Another 123 properties were assessed, but the land owners indicated no boreholes, most sites receive their water from municipal supply. Groundwater level measurements were possible from four boreholes. The 13 sites included:

- Three boreholes which are in use;
- One borehole where the equipment broke in 2000 and has not been used since;
- One open / capped borehole;
- One monitoring borehole;
- One borehole where the owner did not want to share the borehole information; and
- Six boreholes where access was not granted and information is thus unknown.

Groundwater levels

The groundwater level varied from 4.4 mbgl at borehole WITBH 6, to a maximum depth of 36.2 m bgl at borehole WITBH 1. The locations of the boreholes are presented in Figure 18. The hydrocensus data plus the information collected from the DWS's NGA indicate groundwater levels between 4.5 m and 12 m in the upgradient Roodepoort residential areas. Groundwater in the Klip River area can be divided into numerous small compartments based on groundwater levels. These compartments appear to be in connection with the Klip River. Gradients vary from approximately 0.1% to approximately 0.2% (DWS, 2006).

Groundwater level data was sourced for 18 monitoring sites – 4 boreholes are in the Upper Klip River compartment and 14 boreholes in the Zuurbekom compartment. In terms of the proposed mining project the Zuurbekom compartment would have reference. The closest dolomite monitoring point is C2N0023, located approximately 7.5 km southwest from the big TSF located in Bram Fischerville and approximately 2 km east of the Cooke Plant. These dolomite monitoring stations are far from the proposed development and should not be impacted by any of the proposed mining activities.

Groundwater Quality

Groundwater samples were collected from six boreholes and four streams during the 2018 hydrocensus survey. Water quality was compared against the SANS 241:2015 Drinking Water Standards as well as the Klip River WQO (For results refer to Appendix G-i– Groundwater Report).

Based on the water quality results the following conclusions were drawn:

- Groundwater sampled from 5 of the 6 boreholes are not suitable for human consumption. It was only WITBH 5 that presented element concentrations below the chronic / acute health

limits. Manganese was slightly elevated in borehole WITBH 5, but the concentration (0.12 mg/L) is only of aesthetic concern.

- Borehole WITBH 1 – this borehole is not currently in use. It was recently drilled for use at the Blueprint facility. The water quality does indicate high concentrations of sulphate, lead, manganese, nickel and dissolved uranium. These elements are present in concentrations exceeding the chronic / acute health limits. The pH was very low (3.4), with aluminium, calcium and ammonia also present in elevated concentrations.
- Borehole WITBH 2 – this borehole is used at the Golf Club as water supply to the toilets. The water quality does indicate high concentrations of sulphate, nickel and dissolved uranium. These elements are present in concentrations exceeding the chronic / acute health limits. The pH was near neutral (6.6) and calcium, magnesium, manganese and zinc were present in elevated concentrations. Poor water quality at boreholes WITBH 1 and WITBH 2 potentially reflects historical and current mining and industrial impacts.
- Borehole WITBH 3 – this borehole is currently the only source of water to this private property. The water quality does indicate very high concentrations of E. coli. The bacteria concentrations exceed the acute health limits. The rest of the elements were recorded in concentrations below the drinking water limits. The cause is unknown and could relate to the nearby stream and wetlands or septic tanks and sewage present in the local aquifers.
- Borehole WITBH 4 – the use of this borehole is currently not known as the owner of this private property did not want to share the information. The water quality does indicate very high concentrations of E. coli and nitrate. The bacteria concentrations exceed the acute health limits. The rest of the elements were recorded in concentrations below the drinking water limits. The borehole is located close to a local cemetery.
- Borehole WITBH 6 – this borehole is used for garden irrigation in the Hamburg residential area. The water quality does indicate high concentrations of dissolved uranium. The uranium is present in concentrations exceeding the chronic health limits. Calcium was also present in elevated concentrations.
- The four surface water samples indicate water that is not suitable for human consumption. Sampling point WITstream 2 indicates high E. coli, but the rest of the elements are within drinking water limits. This sampling points is along the upper reaches of the Klip River, where it passes under the R41, Randfontein Road.
 - Surface water WITstream 1 – this sampling point is in the tributary flowing westwards from the Golf Course area. The water quality does indicate high concentrations of

sulphate, manganese, nickel and dissolved uranium. These elements are present in concentrations exceeding the chronic / acute health limits. The pH was very low (4.5), with aluminium, calcium and ammonia also present in elevated concentrations.

- Surface water WITstream 3 – this sampling point is in a tributary flowing eastward through the Vogelstruisfontein area and draining the proposed mining area. The water quality does indicate high concentrations of sulphate, lead, manganese, nickel, nitrate and dissolved uranium. These elements are present in concentrations exceeding the chronic / acute health limits. The pH was very low (3.4), with aluminium, calcium, iron, magnesium, potassium and ammonia also present in elevated concentrations.
- Surface water WITstream 4 – this sampling point is in a tributary flowing eastward through the Vogelstruisfontein area and draining the proposed mining area. The sampling point is upstream from sampling point WITstream 3. The water quality does indicate high concentrations of sulphate, lead, manganese, nickel and dissolved uranium. These elements are present in concentrations exceeding the chronic / acute health limits. The pH was very low (3.3), with aluminium, calcium, iron, magnesium, potassium and ammonia also present in elevated concentrations.
- The two tributaries draining the proposed mining area are contaminated by historical and possibly current mining and industrial activities and the water must not be used unless treated. A possible source of the poor-quality water is the old tailings facilities in this area

Based on the SANS241 drinking water guideline the sampled groundwater and surface water is not fit for human consumption (unless treated). When the water quality is compared to the Klip River Water Quality Objectives standards the conclusions remain the same and highlights the poor quality of the water resources.

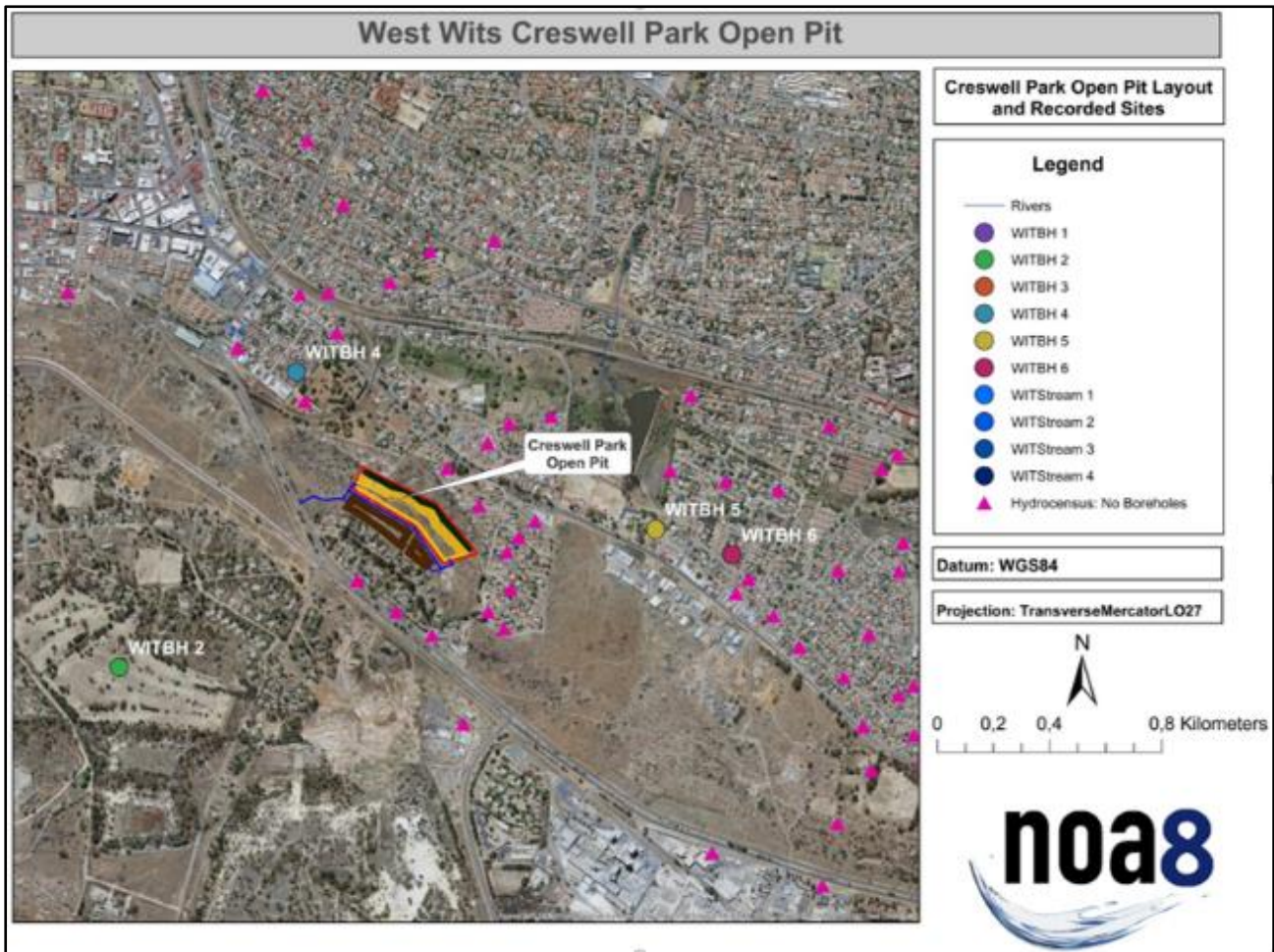


Figure 18: Creswell Park and recorded hydrocensus locations

Numerical Model

The numerical model was constructed as a 2D model to simulate the potential impact on the receiving environment associated with the open pit mining and the proposed Waste Rock Dump (WRD). The Creswell Park open pit is approximately 15 m deep and will be mined in 4 months, with rehabilitation scheduled to take another 6 months.

The closest borehole recorded with a water level is WitBH4, located 400 m North West of the open pit, with a recorded water level of 11.9 mbgl. The recorded water level elevation at WitBH4 i.e. 1728 mamsl is approximately 2 m below the bottom of the Creswell Park open pit. The recorded water levels to the east at WitBH5 and WitBH6 is shallower, at 7.7 and 4.46 mbgl respectively. These boreholes are located between 600 and 900 m east of the proposed open pit. The surface elevation at these boreholes are more than 35 m below the surface elevation of the open pit.

This indicated that zero inflows will occur from groundwater at the open pit, only from surface water runoff and recharge through the WRD during precipitation events. The water level in the vicinity of the open pit should be confirmed before mining commence by drilling monitoring boreholes.

The numerical mesh is shown in Figure 19 and the geological input and calibration boreholes used in Figure 20. The mesh was discretised such that the number of obtuse angles i.e. to ensure that violating Delauney criteria is less than 5% - assisting in mathematical and numerical computing and stability of the model.

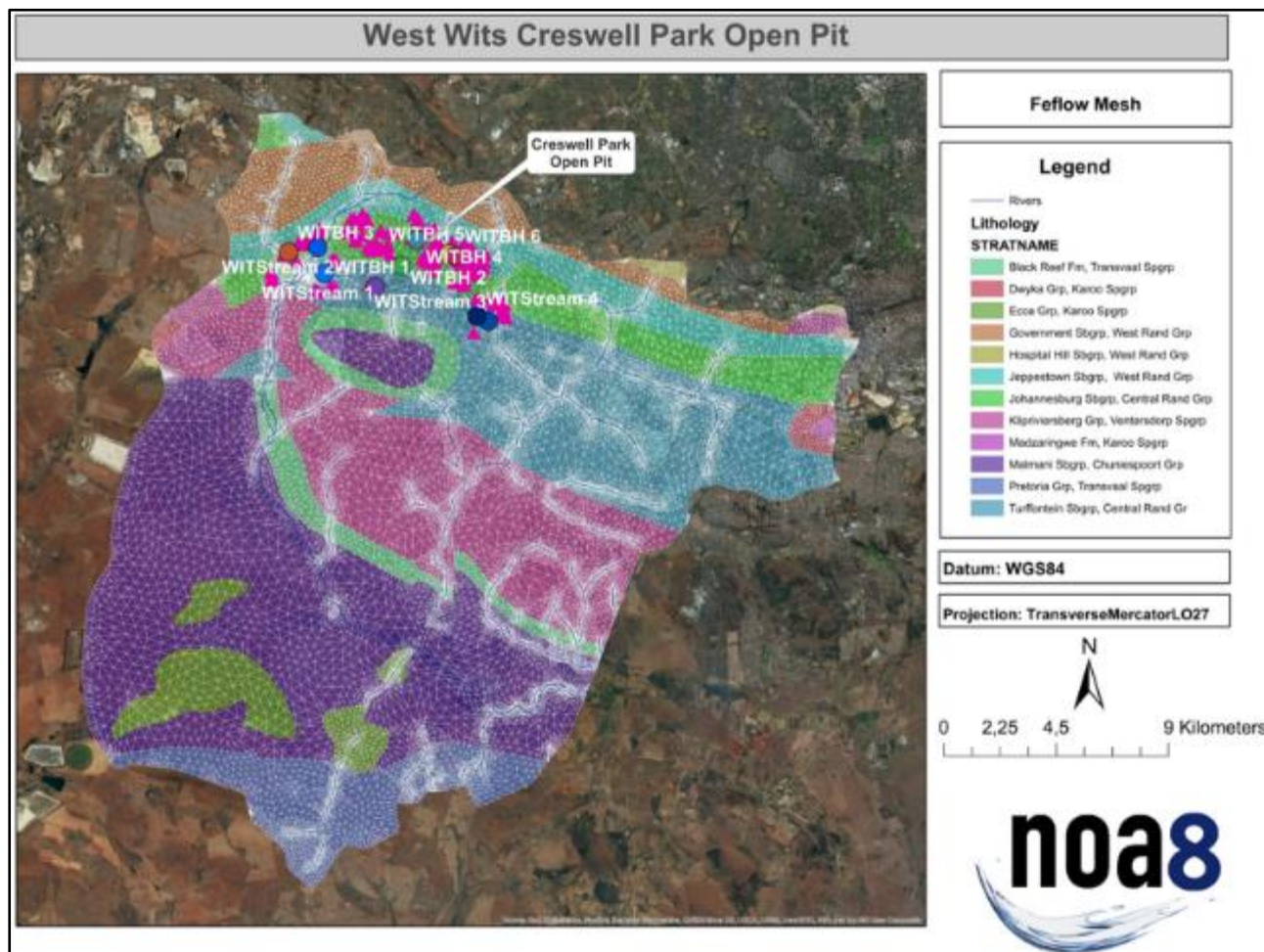


Figure 19: Model Mesh and boundary

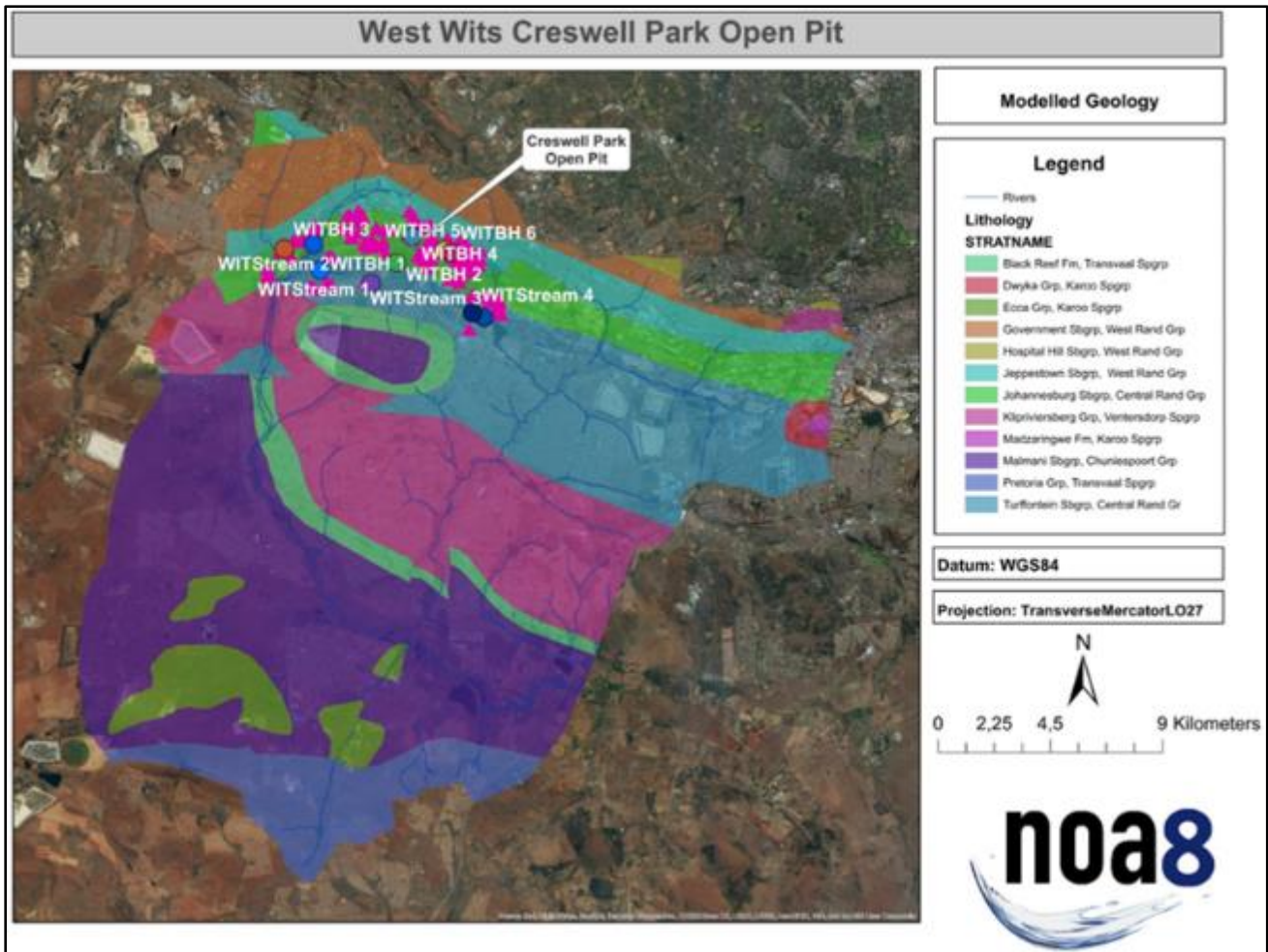


Figure 20: Modelled geology

Simulation scenarios

Various simulations are required to use the numerical flow model as a tool in water supply and potential impact assessments. The recent and historical data is used to calibrate the model, always an iterative process. The calibration process was completed in steady state (time independent and only hydraulic conductivity and recharge parameters adjusted).

The following scenarios were simulated and discussed next:

1. Steady state calibration: Status Quo groundwater flow
2. Predictive scenarios:
 - a. Mine dewatering from Creswell Park open pit and mass transport associated with the WRD for 4 months.
 - b. Post operation mass transport: 1 year, 5 years, 10 years and 100 years.

The objective of the steady state model calibration was to reproduce measured water levels at observed heads and generated piezometry. The steady state calibrated groundwater levels are presented in Figure 21.

The calibration focused on the 4 recorded water levels within the project area. The minimum calibration error is 1.48 m and the maximum error 6.97m. General standard practice for calibration evaluation is to obtain a Root Mean Square Error (RMSE) of such a value, that when compared with the head difference measured in the modelled area, should not exceed 5%. In this case, the RMSE correlates to approximately <5% measured against the water levels change over the model domain.

The groundwater flow model should be viewed as/at a conceptual level and qualified rather than calibrated due to the limited number of groundwater sites available to populate the numerical groundwater flow model, and the absences of local groundwater sites at the proposed Creswell Park open pit. The groundwater flow model should be updated once more data becomes available.

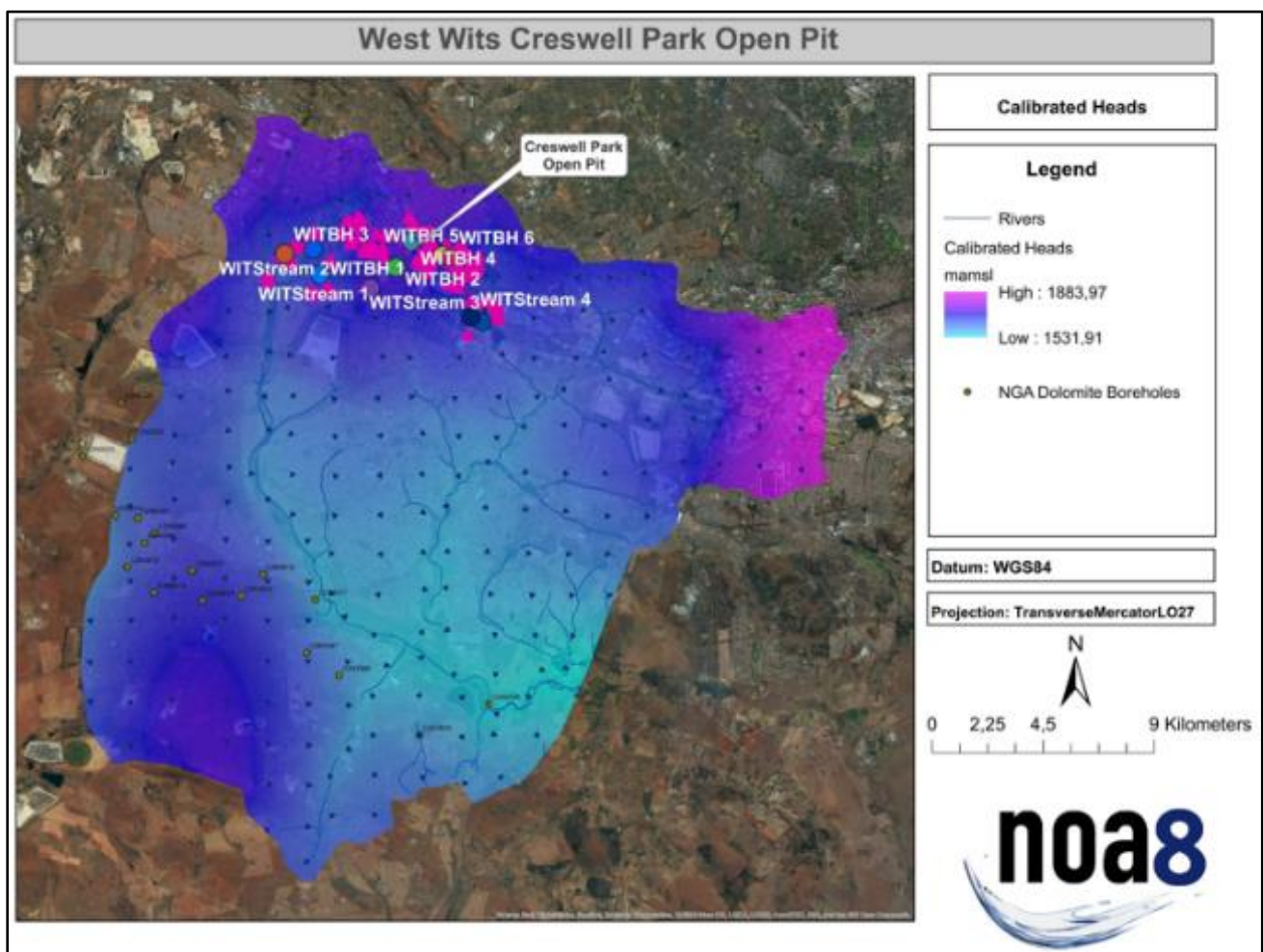


Figure 21: Steady State Calibration Groundwater Levels

Predictive Model

Mine dewatering and mass transport

The Creswell Park open pit was included as designed up to 15 m deep (below surface elevation). The mining sequence was activated for 120 days (approximately 4 months Life of Mine) and the simulated impact assessed. The potential dewatering volumes associated with the mining at Creswell Park open pit with time is provided in Figure 22.

The dewatering rates simulated during the numerical groundwater flow model is not subjected to evaporation, hence an envelope of inflows provided for management purposes. Between 150 m³/d and 325 m³/d could report to the open pit (with no mitigation measures installed) at the end of the 4-month mining cycle. It is possible that zero water accumulates in the open pit, especially during the dry seasons.

The model simulations indicated zero influence on the local groundwater regime due to mine dewatering or lowering of water levels. The local groundwater level should be confirmed by the monitoring boreholes to be installed before mining commence.

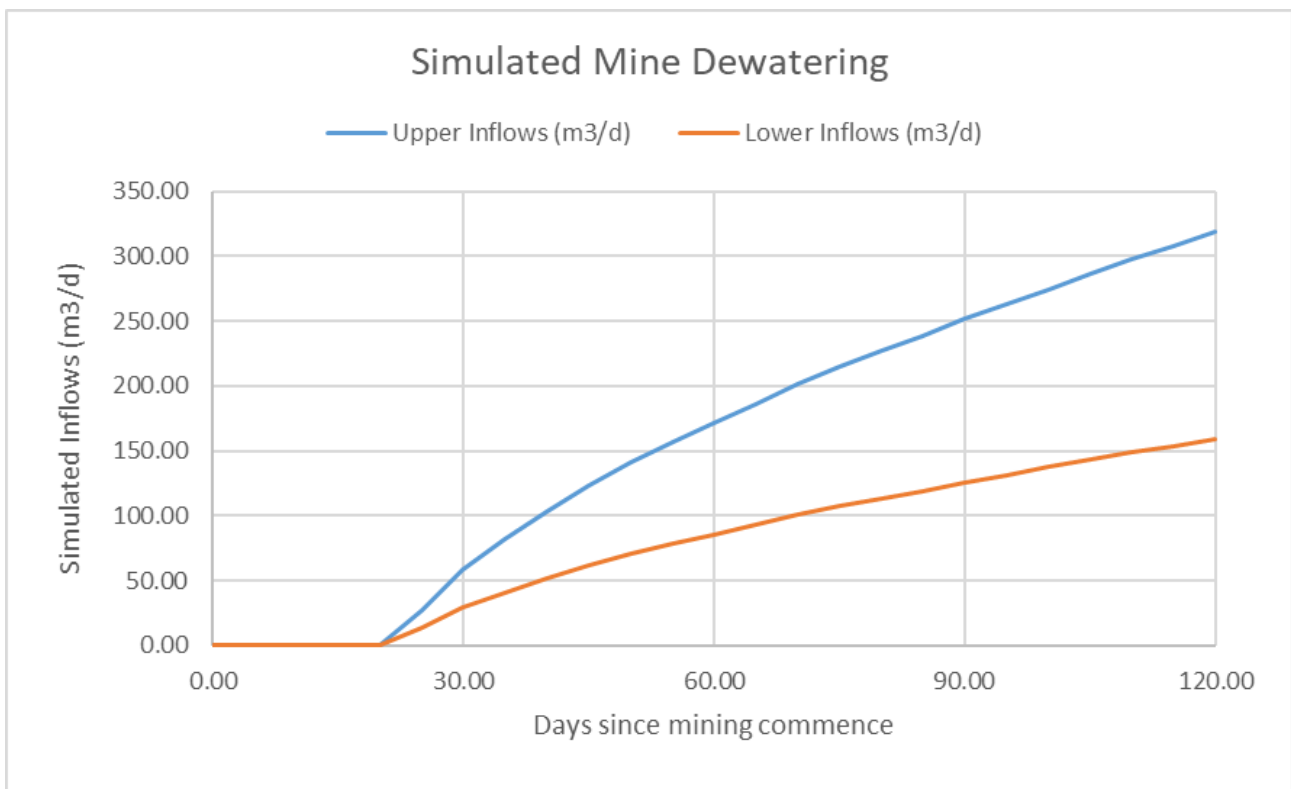


Figure 22: Simulated inflows reporting to the Creswell Park open pit during mining

The potential mass migration from the Waste Rock Dump (WRD) is provided in Figure 23. The potential mass distribution from the WRD during operations indicate a possible migration from the WRD south approximately 100 - 150 m during the 120 days LoM. Two monitoring points should be

installed: one south of the WRD between the WRD and the community and one to the north of the open pit. The monitoring points should confirm the geochemical results i.e. no leachate potential from the waste and no AMD formation. The monitoring should commence prior to any mining activities and continue in post operational phase during rehabilitation of the WRD and the open pit, at least 2 years post operation.

The post operations simulations indicated that by year 1 post operation with rehabilitation concluded, minimising the recharge on the open pit (revegetated) and no more WRD, a 20% chance of increased mass transport from the rehabilitated WRD area and backfilled open pit extends beyond the limits of these infrastructure footprints.

One should take note that the geochemical assessment concluded no leachate from the waste material analyse was deemed possible – this is for management and mitigations measure implementation to monitor and confirm the assessments. After 10 years post mining, the percentage possibility for leachate from the WRD and open pit exiting the facility boundaries decreased to less than 10% and increased in possible spread due to dilution and migration (Figure 24 and

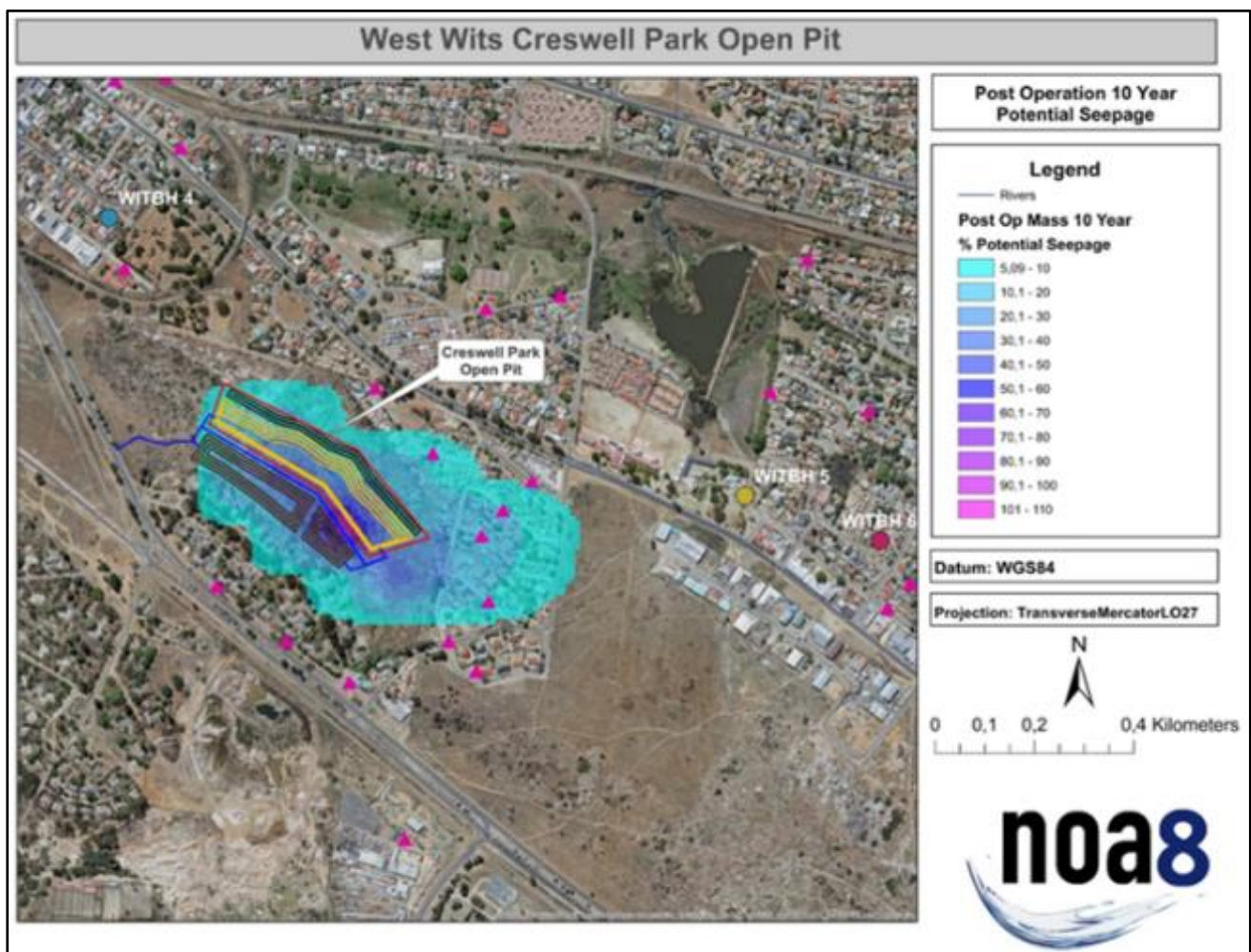


Figure 25). This confirms the mitigation need to monitor post closure to confirm the geochemical

assessment results of little to zero possible leachate from the sampled waste material used in the WRD and backfilled open pit.

Decanting of the backfilled open pit was assessed post closure. Since no influence was simulated during the operational phases, no decanting is expected. The rehabilitated open pit will be revegetated and ingress (recharge due to precipitation) is limited.

Water balance

The water balances associated with the simulated scenarios is provided below:

1. Steady State Qualification

- a. Recharge from precipitation accounts for 86 233 m³/d over the entire modelled domain, with in and outflows along rivers/drainages accounting for 6 151 m³/d and 92 384 m³/d respectively.
- b. No additional flow components focusing on the Creswell Park open pit area during steady state calibration

2. Operational Phase

- a. Potential recharge of 484 m³/d on the entire WRD footprint due to precipitation and increased recharge coefficients.
- b. Peak dewatering simulated at 325 m³/d during the open pit mining. The dewatering rates should still be subjected to evaporation which will decrease the volumes substantially.

3. Post Operational Phase

- a. The only additional flow component is the increased recharge simulated on the rehabilitated open pit footprint of 100 mm/a (approximately 15% of MAP). This amounts to 10 m³/d.

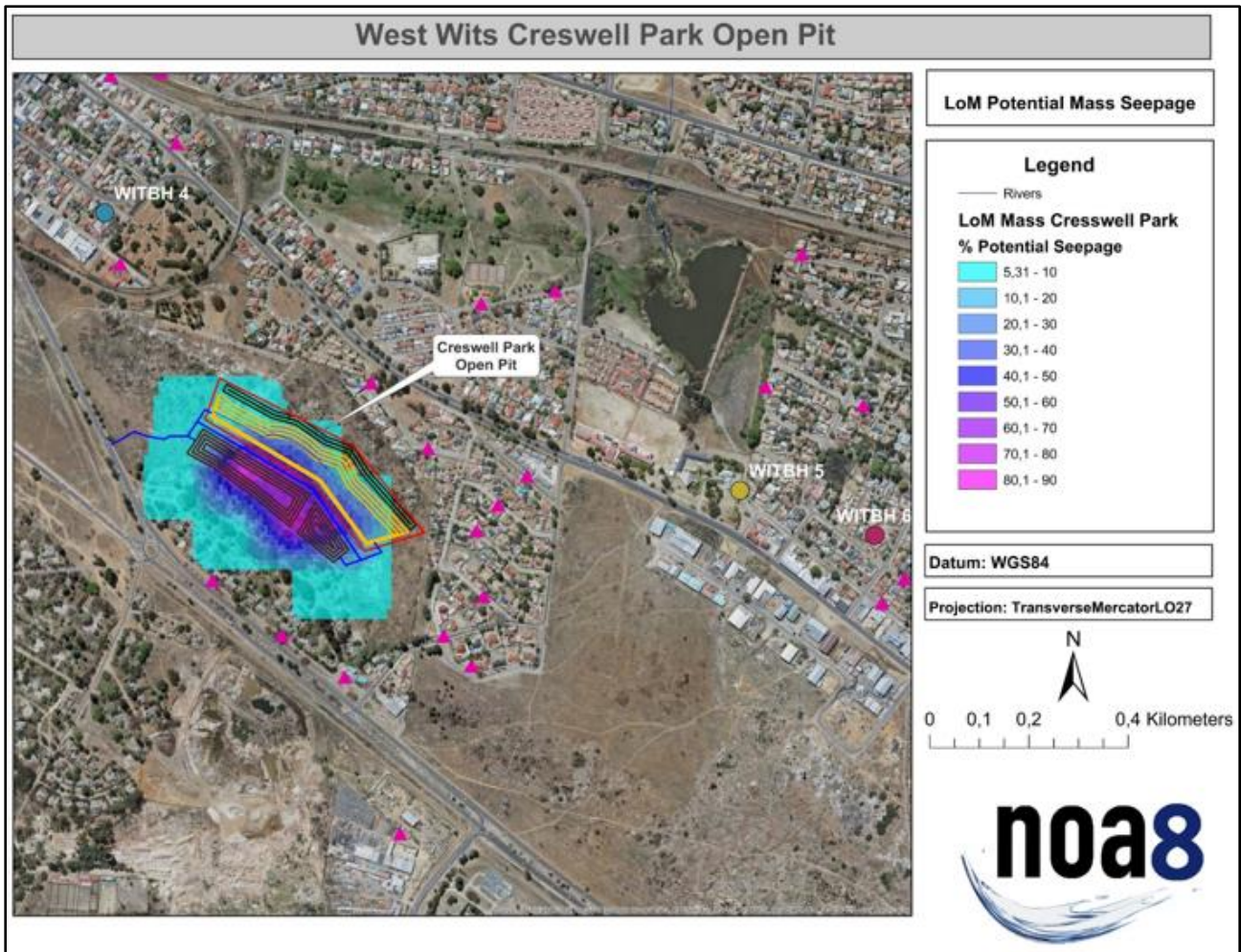


Figure 23: Potential mass migration from Waste Rock Dump (WRD) during operations

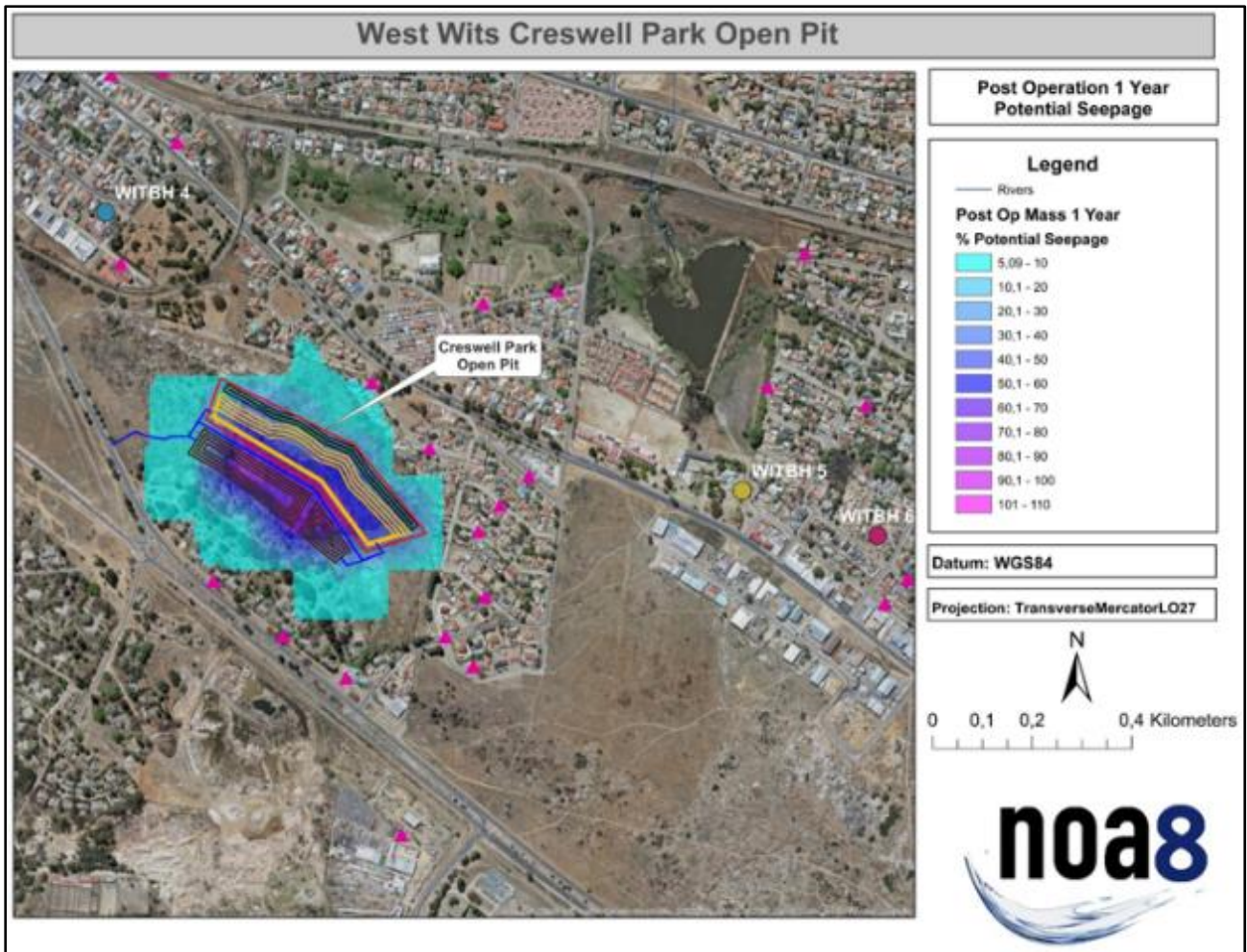


Figure 24: Post operation potential mass percentage migration: 1 year post mining

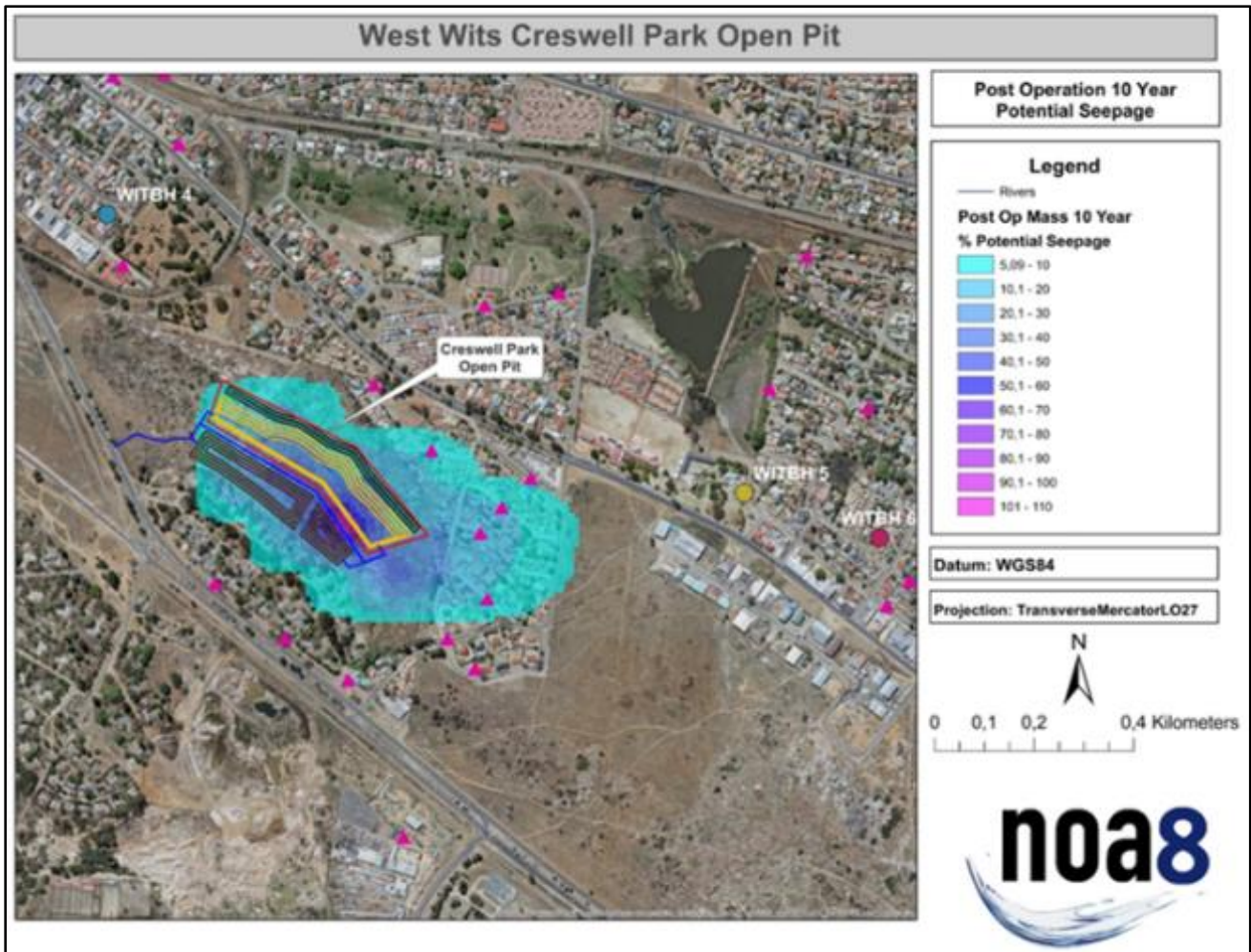


Figure 25: Post operation potential mass percentage migration: 10 years post mining

Identified Environmental Impact

Impact Identified: Zero influence on the local groundwater regime was simulated due to the shallow pit and deep groundwater levels. The onsite groundwater level should be confirmed prior to mining commence.

Impact Identified: The potential of the WRD to leach minerals into the receiving environment and negatively influencing the groundwater and surface water quality.

Impact Identified: The potential of the backfilled open pit to leach minerals into the receiving environment and negatively influencing the groundwater and surface water quality.

The results indicate that the significance of potential impacts rate as Very Low. The cumulative impacts of the impacts rate as Low. This is predominantly because the development of AMD conditions as well as the leaching of contaminants from the waste rock is unlikely and that no recorded groundwater users will be affected by the possible zone of influence due to mining. The dewatering

zone of influence indicates little to no impact on recorded users (to be updated with the hydrocensus before mining commences) and rate Very Low.

Conclusion

- Samples were taken at 6 boreholes and 4 surface water points. The majority of the samples indicated historical and present influences rendering the water unfit for human consumption. This indicated a high present impact on the baseline groundwater and surface water environments. Based on the SANS241 drinking water guideline the sampled groundwater and surface water is not fit for human consumption (unless treated).
- The groundwater flow model should be viewed as/at a conceptual level and qualified rather than calibrated due to the limited number of groundwater sites available to populate the numerical groundwater flow model, and the absences of local groundwater sites at the proposed Creswell Park open pit.
- The groundwater numerical model was used to simulate the potential impact of the open pit mine on the local groundwater regime and the WRD on the local groundwater quality.
- Mine dewatering is not foreseen due to the shallow open pit proposed (i.e. <15m deep). Minor seepage and dewatering could be required during the wet season and runoff from the WRD and local catchment.
- The geochemical analyses results indicated the waste associated with the Creswell Park open pit is benign. However, for management purposes, mass migration simulations for operational and post operational was simulated to assess possible migration pathways originating from the WRD. Simulated mass migration is low during operations and within 10 years the potential seepage from the WRD decreased to less than 20%.

Recommendations

- An updated hydrocensus should be completed in a 500m radius around the Creswell Park open pit project area. The data recorded should be used to update the monitoring protocol and the groundwater flow model and associated management scenarios.
- A detailed monitoring program should be initiated before mining commence:
 - Monitoring boreholes should be drilled between the WRD/open pit and the community to the south, east and north.
 - All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. The results should be recorded as the baseline against which all future possible impacts be measured and managed.

- Monitoring (water levels and quality) during mining should be performed monthly due to the short Life of Mine (4 months). Post operational monitoring should be conducted quarterly.
- A monitoring borehole should be drilled into the rehabilitated open pit and included in the post operational monitoring protocol. Water levels and water quality should be monitored on a quarterly basis.
- Monitoring should continue for at least 2 years post rehabilitation of the Creswell Park project area.
- Any water reporting to the open pit or storm water management areas should be kept in a closed system (classified as contact water) and not be discharged into the environment before treatment to the specific catchment Target Water Quality Guideline (TWQG) standards. Contact water can be recirculated and used in a closed system according to GN704 Best Practise Guideline.
- The back filled open pit should be covered with pre-stripped top soil and revegetated to decrease potential recharge from precipitation.
- The groundwater flow model should be updated once the hydrocensus and monitoring data is updated and monitoring points installed.

Geochemical – Waste Classification

The information in this section has been obtained from the Geochemical Specialist Study (GeoDyn Systems, May 2018) and from the Geo-chemical sampling and Lithological Statement (Shango Solutions, April 2018). For full specialist study and statement refer to Appendix G-ii and G-viii respectively.

A geochemical risk assessment for the proposed Kimberly West open pit gold mine waste rock material with the following objectives was completed by GeoDyn Systems (GeoDyn).

Objectives of the geochemical assessment:

- Conduct a waste classification of the waste rock.
- Determine the likelihood of the development of acid mine drainage (AMD) conditions from the waste material.
- Determine the likelihood of leaching of potential contaminants from the waste rock material.

The National Environmental Laws Amendment Act (NEMLAA, Act 25 of 2014) requires that waste from mining activities be classified according to Regulation 635 of NEMWA. To conduct the waste classification leach tests and a total analysis needs to be conducted. The leach test entails the leaching of a solid sample of waste with reagent water and the subsequent analysis of the leachate


for specific components. The total analysis entails the analysis of the solid material for the total concentration of specific components that are present in the waste sample. The results of these two tests are compared to regulatory criteria and a classification is done based on the results of this comparison.


As part of the waste classification and assessment of the risks from a particular waste, the DEA subscribes to the source-pathway-receptor analysis methodology, which is international best practice. The use of this assessment methodology allows the analysis of the full cycle of a potential contaminant to be evaluated within the proper scientific framework so that risks can be realistically assessed and proper mitigation measures proposed.

For the quantification of medium to long term geochemical risks associated with the waste material, i.e. mine tailings and overburden, numeric geochemical modelling is used as a tool. This modelling entails the use of established thermodynamic and kinetic principles to calculate risks over time. The internationally validated geochemical modelling software package PHREEQC is used for this purpose.

A total of 10 samples were collected for this study, which were composited into 2 representative samples for laboratory analysis and an accredited laboratory. These are Creswell Park Waste Rock 1 (Z8501) and Creswell Park Waste Rock 2 (Z8502). The sampling of the waste rock was conducted by Shango Solutions (Pty) Ltd. A detailed report is available on the site and sample selection for analyses compiled by Prof Sybrand A. de Waal i.e. Note on the lateral lithological continuity of the Upper Witwatersrand Supergroup rocks. The following key conclusion is worth noting:

- On the strength of historic knowledge, as supported by the findings reported above, and by considering that the proposed opencast – Creswell Park covers the same stratigraphic horizon as sample Z8501 and Z8502;
- Samples Z8501 and Z8502 are acceptable compositional estimates of the hanging wall composition of the Main Reef at opencast area Creswell Park

Planned Open pit	Reef to be mined	Sample Description	Sampling Coordinate (WGS 1984)		Sample No	Photograph
			Longitude	Latitude		
Creswell Park 1	Main Reef leader and Main Reef	Field sample of Main Reef hanging wall quartzite	27.895247	-26.181278	Z8502	

Creswell Park 2	Main Reef leader and Main Reef	Field sample of Main Reef hanging wall quartzite	27.863308	-26.164865	Z8501	
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The following laboratory analyses were conducted to for the waste classification, assessment of the likelihood of acid mine drainage (AMD) and the leach potential of contaminants from the waste rock dumps:

- Acid Base Accounting (ABA) analysis
- Net Acid Generation (NAG) analysis
- Sulphur speciation analysis
- Carbon speciation analysis
- Leach test according to R635
- Whole rock analysis (Aqua Regia) according to R635
- Mineralogical analysis (X-Ray Diffraction)

Waste Classification

Leachate analysis indicates that none of the parameters analysed is leached in concentrations that exceed the regulatory values of R635 indicates that arsenic concentrations in the Creswell Park waste rock samples 1 and 2 exceed the TCT0 value, but is less than the TCT1 value, of R635. Copper in Waste Rock sample 2 exceeds the TCT0 value of R635. Based on the criteria in Section 7 of R635, the Creswell Park waste rock is classified as Type 3, which according to R636 requires a Class C engineered barrier system.

Environmental Impacts

The acid base accounting and net acid generation tests confirm the above by indicating that the waste rock is not likely to generate acid mine drainage (AMD) conditions due to its insignificant acid generation potential.

The waste rock leachate model results are for the leachate are shown and for the predicted secondary mineral. The leachate results indicate that the material of which the waste rock consists is unreactive. This is due to the fact that the waste rock contains minerals which are stable at the Earth's surface. Iron sulphides, which have the potential to produce AMD, are absent from the waste rock material

The leach test indicated that all but three potential contaminants are below detection in the waste rock leachate and the three that are above detection have concentrations significantly below the regulatory values. The geochemical model, which was developed to evaluate the leach test, also shows that the

risk of leaching of contaminants, especially the metalloid arsenic, from the waste rock is negligible. This is also due to the absence of iron sulphide as well as the high stability of the minerals comprising the waste rock at the mining conditions

Conclusion and Recommendations of the Geochemical Assessment

The results of the assessment indicate that the significance of both potential impacts rate as Very Low. The cumulative impacts of the impacts rate as Low. This is predominantly because of the fact that the development of AMD conditions as well as the leaching of contaminants from the waste rock is unlikely.

The waste classified as Type 3, thus requiring a Class C engineered barrier system. However, none of the constituents in the leach test exceeded the regulatory guideline values. In addition, the geochemical model indicated that the waste rock is comprised of minerals which are very stable in the specific mining environment being considered. In addition, the waste rock itself as well as the secondary mineral products forming very slowly as the waste rock minerals weather have the capacity to remove contaminants from solution through the process of adsorption.

The waste rock material contains no iron sulphide minerals. Therefore, the risk of the formation of acid mine drainage conditions due to the waste rock material is negligible. The results indicate that the significance of both potential impacts rate as Very Low. The cumulative impacts of the impacts rate as Low. This is predominantly because of the fact that the development of AMD conditions as well as the leaching of contaminants from the waste rock is unlikely. The waste rock material is classified as Type 3 according to NEMWA Regulation 635. It is however recommended by the specialist, based on the results of the assessment, that the waste material class be reduced to Class 4.

Government Notice 634 – 635 of 2013

The Waste classification and Management Regulations were published in 2013 and prescribed the classification and liner requirements for solid waste to be disposed of. These regulations consist of the following GNR Notices:

- GNR 634 National Environmental Management Waste Act (59/2008): Waste Classification and Management Regulations;
- GNR 635 National Norms and Standards for the assessment of waste for landfill disposal; and
- GNR 636 National Norms and Standards for the Disposal of Waste to Landfill.

The results must be assessed against the four levels of thresholds for leachable and total concentrations, which in combination, determines the Risk Profile of the waste.

Table 20: Waste Classification Abbreviations

Abbr	Definition
LC	Leachable Concentration of a particular contaminant in a waste, expressed as mg/l.
TC	Total Concentration of a particular contaminant in a waste, expressed as mg/kg.
LCT	Leachable Concentration Thresholds for particular contaminants in a waste (LCT0, to LCT3).
TCT	Total Concentration Thresholds for particular contaminants in a waste (TCT0, TCT1 and TCT2).

Liner Requirements - GNR 636 National Norms and Standards

The standard containment barrier design and landfill disposal requirements for the different waste types as per the GNR. 635 of 2013 are presented in **Table 21**.

Table 21: Waste Types

Waste Type	Description
Type 0	The disposal of Type 0 waste to landfill is not allowed. The waste must be treated and reassessed in terms of the Standard for Assessment of Waste for Landfill Disposal to determine the level of risk associated with disposing the waste to landfill.
Type 1	Type 1 waste may only be disposed of at a Class A landfill designed in accordance with Section 3(1) and 3(2) of these Norms and Standards, or, subject to Section 3(4), of the Norms and Standards, may be disposed of at a landfill site designed and operated in accordance with the requirements for a H:h / H:H landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998).
Type 2	Type 2 waste may only be disposed of at a Class B landfill designed in accordance with Section 3(1) and 3(2) of these Norms and Standards, or, subject to Section 3(4), of the Norms and Standards, may be disposed of at a landfill site designed and operated in accordance with the requirements for a GLB+ landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998)
Type 3	Type 3 waste may only be disposed of at a Class C landfill designed in accordance with Section 3(1) and 3(2) of these Norms and Standards, or, subject to Section 3(4), of the Norms and Standards, may be disposed of at a landfill site designed and operated in accordance with the requirements for a GLB+ landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998) Liner requirements are shown in Figure 20.
Type 4	Disposal allowed at a landfill with a Class D landfill designed in accordance with Section 3(1) and 3(2) of these Norms and Standards or, subject to Section 3(4) of the Norms and Standards, may be disposed of at a landfill site designed and operated in accordance with the

Waste Type	Description
	requirements for a GSB- landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998).

A representation of a Class D liner is presented in Figure 26. The liner is based on the recommendation of the Geochemistry Assessment that the waste material class be reduced to Type 4 based on the results of the assessment.

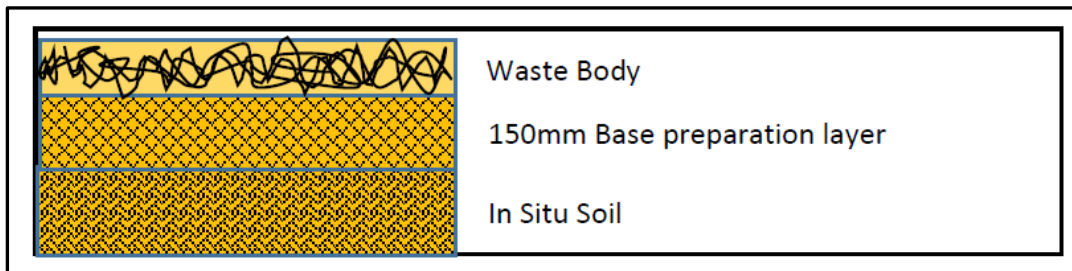


Figure 26: Proposed Class D landfill liner system

Terrestrial Ecology

The information in this section has been obtained from the Terrestrial Ecological Scan (Scientific Aquatic Services (SAS), May 2018). For full specialist study refer to Appendix G-iii.

The table below is a summary of the details of the study area in terms of Mucina and Rutherford (2012). It is important to note, that although all data sources used provide useful and often verifiable high-quality data, the various databases do not always provide an entirely accurate indication of the Creswell Park mining permit area actual biodiversity characteristics. For this reason a field assessment has been undertaken to confirm the assumptions made during consultation of maps and to determine the ecological status of the study area.

Table 22: Summary of the conservation characteristics of the study area

DETAILS OF THE STUDY AREA IN TERMS OF MUCINA & RUTHERFORD (2012)		
Biome	According to Mucina and Rutherford (2012), the Creswell Park Mining Permit Application Area is located in the Grassland Biome	
Bioregion	Creswell Park proposed open cast area is located in the Mesic Highveld Grassland Bioregion.	
Vegetation Type	The proposed Creswell Park open cast area is located in the Soweto Highveld Grassland Vegetation type.	
Climate Information	Summer-rainfall region	
	MAP* (mm)	662
	MAT* (°C)	14.8
	MFD* (Days)	41
	MAPE* (mm)	2060

	MASMS* (%)	75
Altitude (m)	1 420–1 760 m	
Distribution	Mpumalanga, Gauteng (and to a very small extent also in neighbouring Free State and North-West) Provinces	
Geology, Soils & Hydrology	Shale, sandstone or mudstone of the Madzaringwe Formation (Karoo Supergroup) or the intrusive Karoo Suite dolerites which feature prominently in the area. In the south, the Volksrust Formation (Karoo Supergroup) is found and in the west, the rocks of the older Transvaal, Ventersdorp and Witwatersrand Supergroups are most significant. Soils are deep, reddish on flat plains and are typically Ea, Ba and Bb land types.	
Conservation	Endangered. Target 24%. Only a handful of patches statutorily conserved (Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, and Rolfe's Pan Nature Reserves) or privately conserved (Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site).	
Vegetation & landscape features	Gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by <i>Themeda triandra</i> and accompanied by a variety of other grasses such as <i>Elionurus muticus</i> , <i>Eragrostis racemosa</i> , <i>Heteropogon contortus</i> and <i>Tristachya leucothrix</i> . In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.	
CONSERVATION DETAILS PERTAINING TO THE STUDY AREA (VARIOUS DATABASES)		
NBA (2011)	The proposed Creswell Park mining PERMIT area falls within an area that is currently not protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected and well protected based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act, and compared with the biodiversity target for that ecosystem type. Ecosystems not occurring within any protected area, or where less than 5% of the biodiversity target has been met, the area is considered not protected. The study area does not fall within a focus area as per the National Protected Areas Expansion Strategy (NPAES, 2009), and as such are not earmarked for conservation within the near future.	
Threatened Ecosystems (2011)	According to the National Threatened Ecosystem (2011) database, a few scattered patches on the northern and western portion of the Creswell Park Mining Permit Application Area falls within the remaining extent of the vulnerable Soweto Highveld Grassland Ecosystem.	
NPAES (2009) and SACAD (2018) -Figure 28	According to the NPAES (2009) dataset, the Kloofendal and Ruimsig Municipal Nature Reserves are situated approximately 3.4 km north and 10 km north northwest of the Creswell Park Mining Permit Application Area respectively. Both the NPAES (2009) and SACAD (2018) indicated the Walter Sisulu National Botanical Garden to be situated approximately 8 km northwest of the Creswell Park open cast area. There are no other protected or conservation areas situated within 10 km of the Mining Permit Application Area.	
IBA (2015)	There are no IBAs within 10 km of the open cast areas, with the nearest IBA situated \pm 11.5 km to the north, namely the Magaliesberg	
IMPORTANCE OF THE STUDY AREA ACCORDING TO THE MINING AND BIODIVERSITY GUIDELINES (2013) – Figure 29		
Highest Biodiversity Importance	<p>The Creswell Park Mining Permit Application Area falls within an area of High Biodiversity Importance.</p> <p>Biodiversity priority areas: Protected area buffers (including buffers around National Parks, World Heritage Sites* and Nature Reserves), Transfrontier Conservation Areas (remaining areas outside of formally proclaimed protected areas), other identified priorities from provincial spatial biodiversity plans, high water yield areas, Coastal Protection Zone, Estuarine functional zone.</p> <p>Risk for mining: High risk to mining.</p> <p>Implications for mining: These areas are important for conserving biodiversity, for supporting or buffering other biodiversity priority areas for maintaining important ecosystem services for particular communities or the country as a whole. An environmental impact assessment should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. Mining</p>	

options may be limited in these areas, and red flags for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.

GAUTENG CONSERVATION PLAN (C-PLAN V3.3, 2011)

There are no Critical Biodiversity Areas (CBAs) nor Ecological Support Areas (ESAs) associated with the Creswell Park Mining Permit Area according to the Gauteng Conservation Plan.

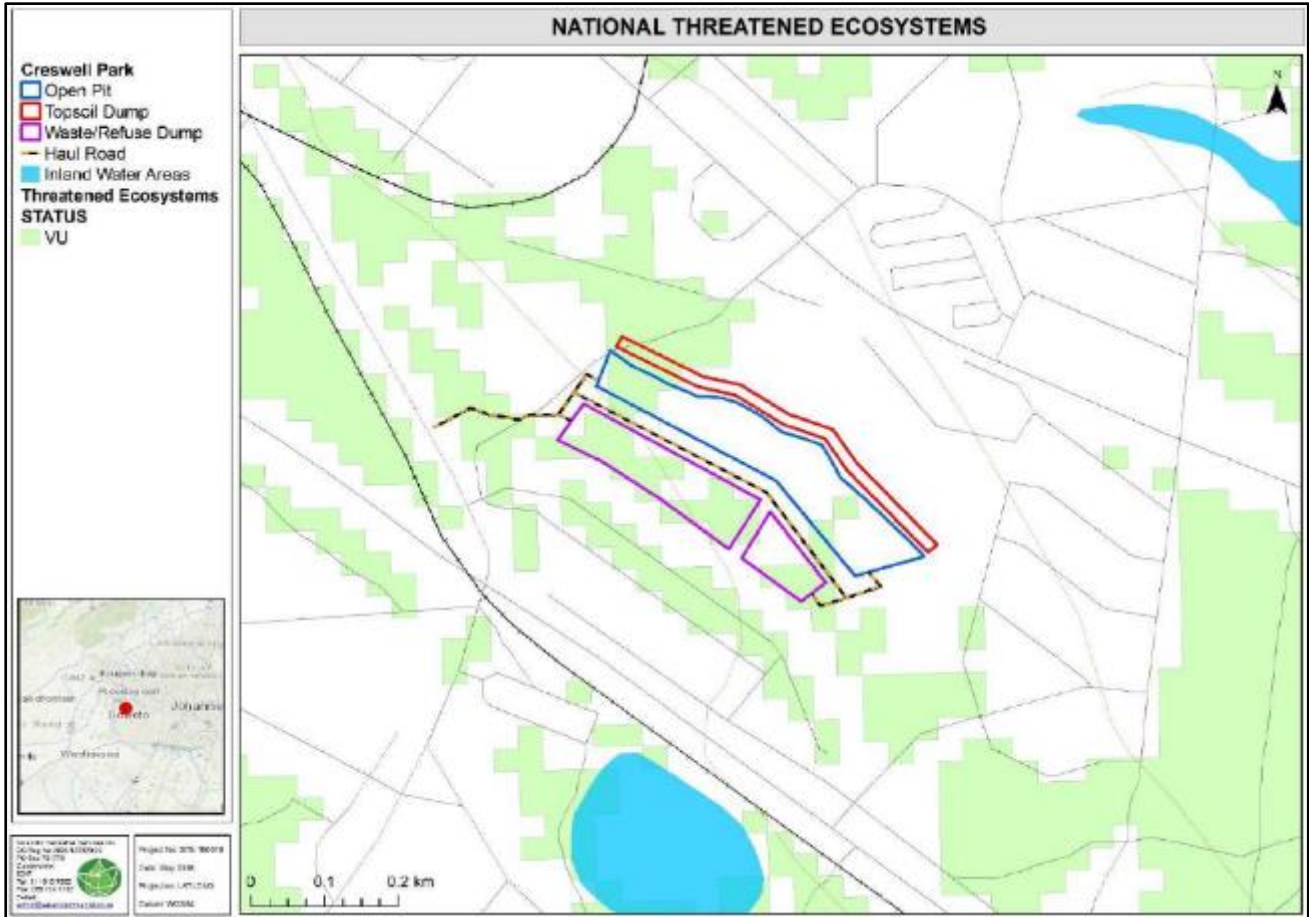


Figure 27: Endangered ecosystem associated with the Creswell Park Mining Permit Application Area according to the National Threatened Ecosystem Database (2011).

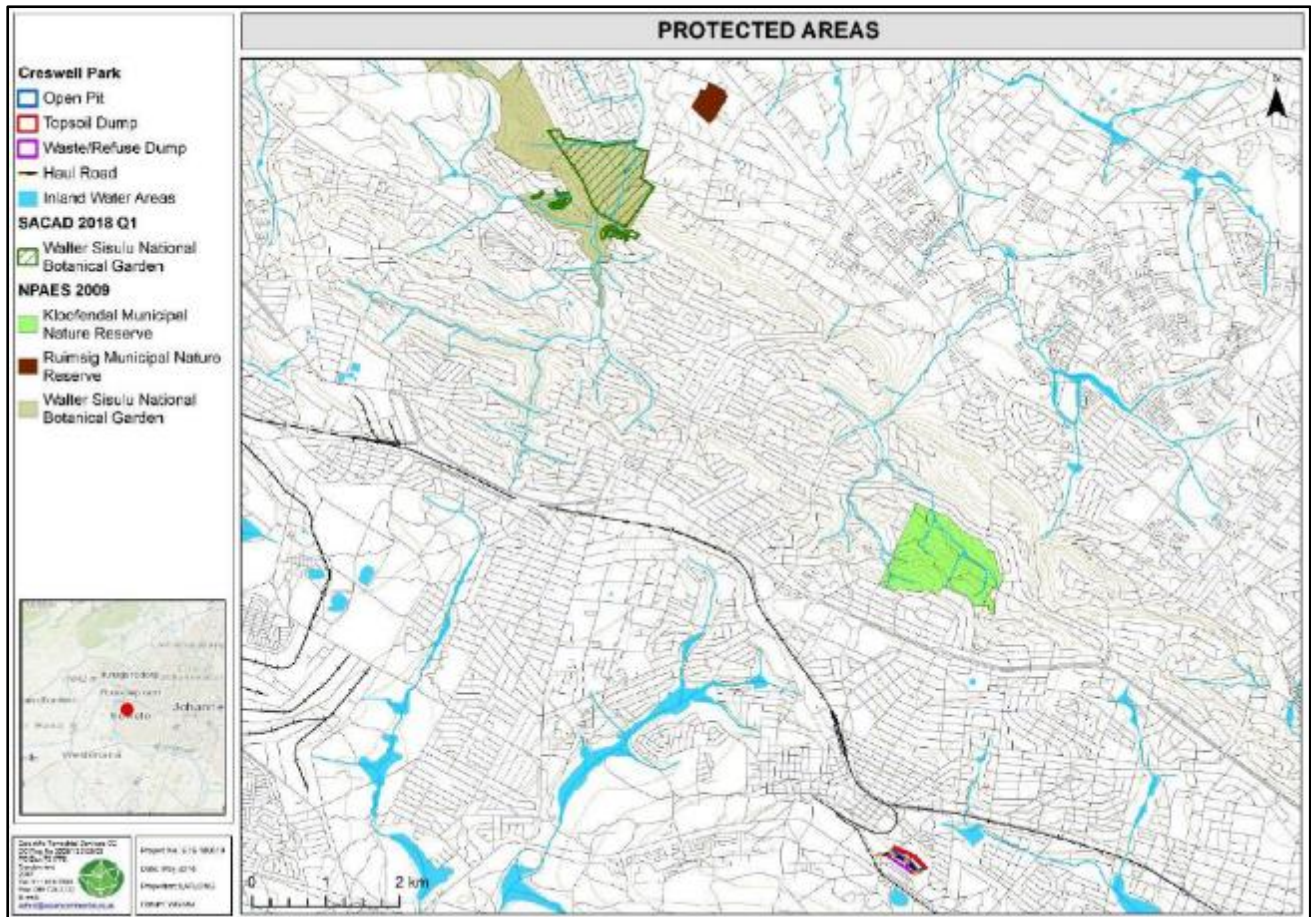


Figure 28: The location of the Creswell Park Mining Permit Application Area in relation to several protected areas identified in the SACAD, SAPAD (2018) and NPAES (2009) databases.

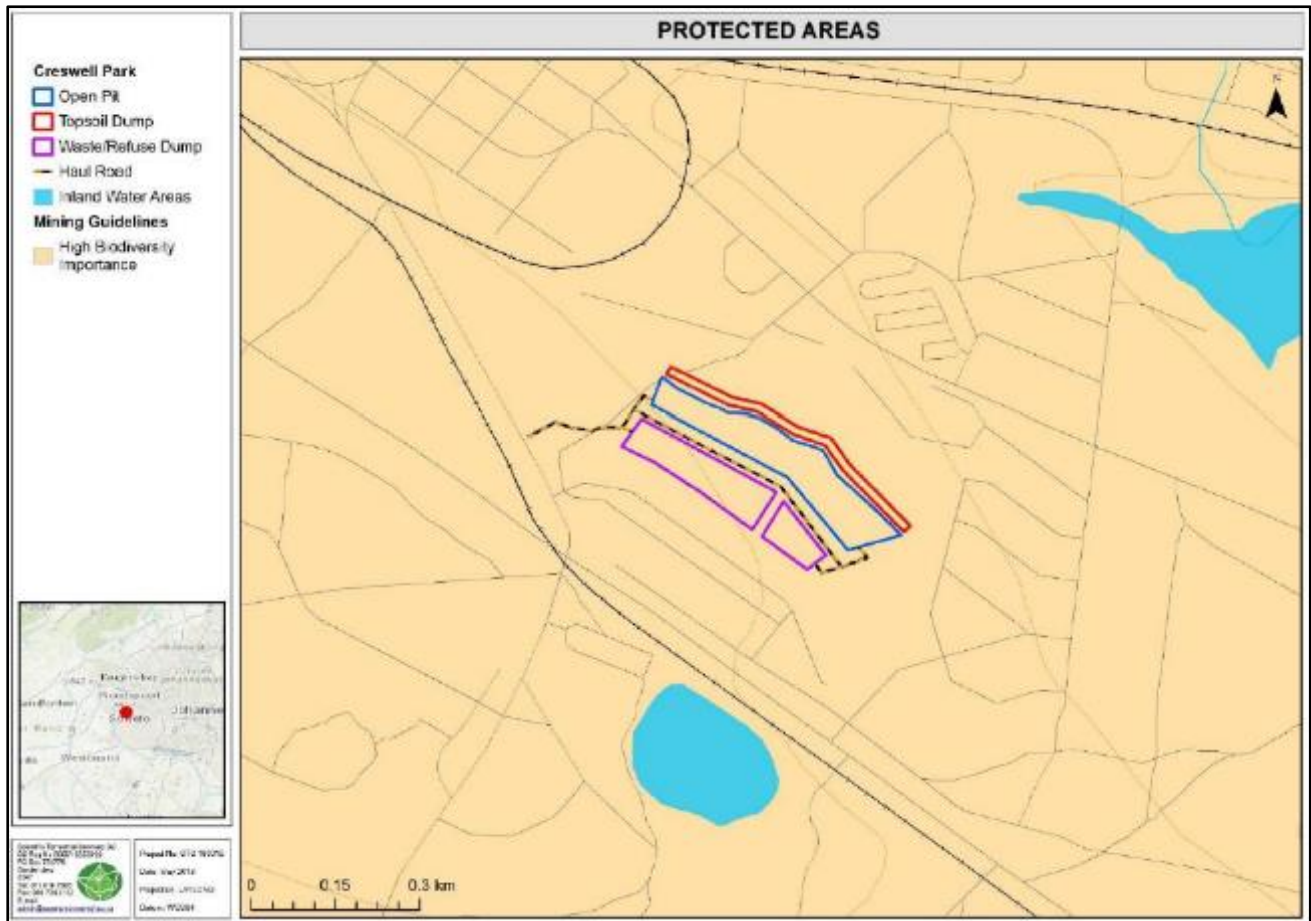


Figure 29: Importance of the Creswell Park Mining Permit Application Area according to the Mining and Biodiversity Guidelines (2013).

The data presented in the Terrestrial Ecological Scan are based on observations and findings made during a site visit undertaken on 6 and 7 of March 2018 (late summer). A summary of the observations and findings made during the site assessment is presented below.

Floral Scan

- Two habitat units (See Figure 30 below) were identified during the field assessment, namely Secondary Grassland Habitat and Transformed Habitat. The Secondary Grassland habitat unit comprises small pockets of modified grassland and stands of alien and invasive plant species resulting from historic and current anthropogenic activities. Edge effects from the surrounding residential developments, illegal dumping and ongoing illegal mining activities have further degraded the habitat unit. Due to the high levels of disturbance, only common floral species were noted within the mining permit area with not threatened species encountered;
- The Transformed Habitat Unit is considered to be in a significantly modified ecological condition, abundant in alien and invasive floral species such as *Tagetes minuta*, *Acacia*

mearnsii and Melia azedarach. The transformed areas also include existing illegal and historical mining areas. As a result of habitat degradation and alien and invasive plant proliferation, habitat suitability for faunal and floral species has been significantly compromised, notably for the Species of Conservation Concern (SCC);

- The Probability of Occurrence (POC) of all South African National Biodiversity Institute (SANBI) listed plants species for the Quarter Degree Square (QDS) 2629AB was calculated:
 - During the field assessment no floral SCC was observed and based on the results obtained *Hypoxis hemerocallidea* (Declining) and *Boophone disticha* (Declining) have a low probability to be present within the proposed Creswell Park MP and immediate surrounding areas, this can be attributed to the level of habitat transformation already associated with the study area and immediate surrounding area.
- Provided that all mitigation measures, stipulated in this report are adhered to, the proposed mining activity is deemed **unlikely** to pose a **conservation threat** to floral habitat and species in the immediate area

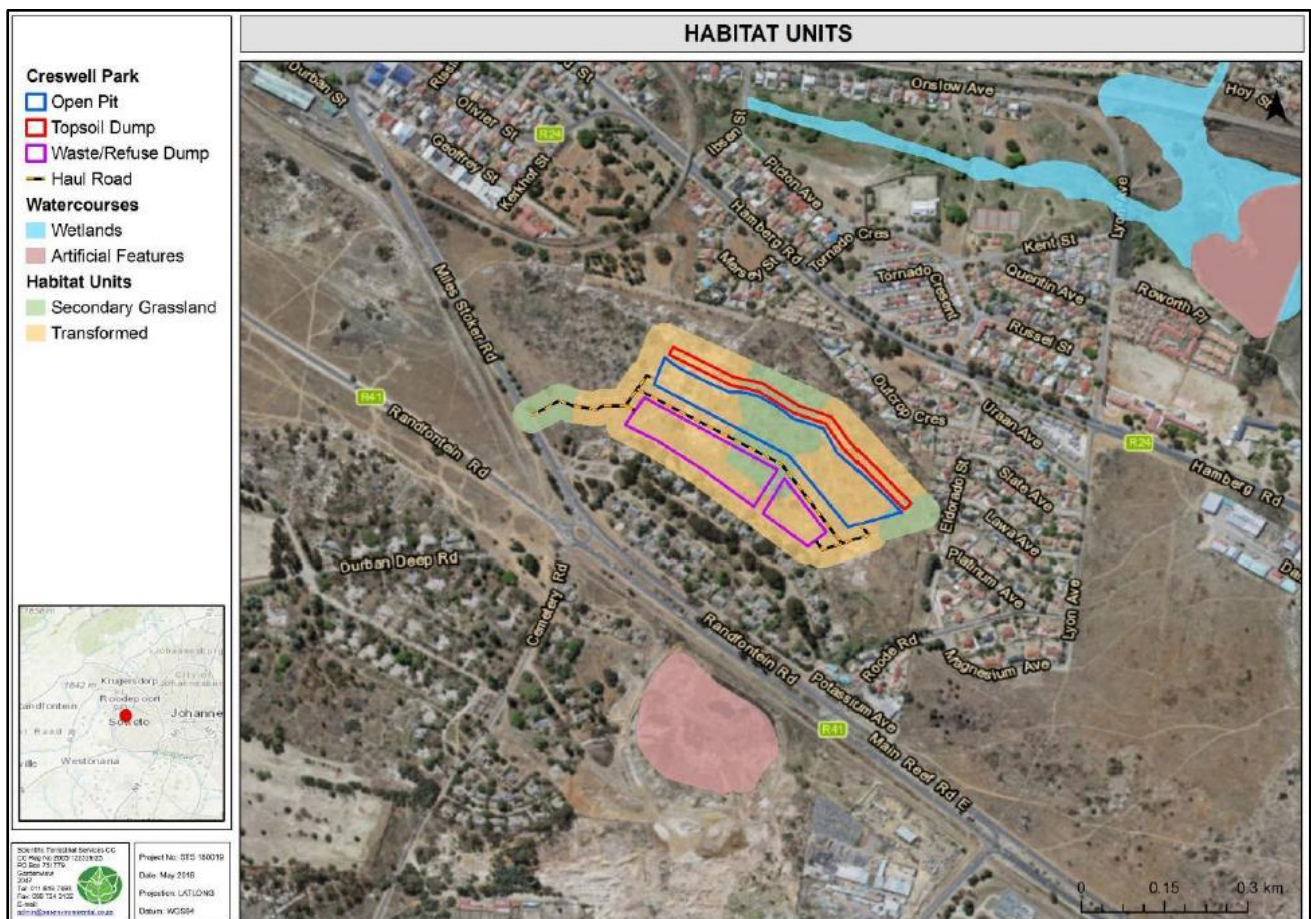


Figure 30: Habitat Units encountered within the Creswell Park MP area.

Faunal Scan

- The faunal habitat present within the Creswell Park Mining Permit Application Area, including the immediate surrounding area has been negatively affected by the aforementioned disturbance activities. These disturbances have resulted in a decreased availability and suitability of faunal habitat within the study area;
- Only commonly occurring faunal species, which are adapted to inhabiting disturbed areas, were observed within the proposed mining permit area;
- No faunal SCC were observed during the field assessment and none are likely to occur within the proposed Creswell Park Mining Permit Application Area. However, as a precaution, it is recommended that should any faunal SCC be encountered during the proposed mining activities, all operations must be stopped immediately, and a biodiversity specialist must be consulted in order to ascertain the best way forward; and;
- The proposed mining activity is thus deemed unlikely to pose a conservation threat to faunal species in the region should all proposed mitigation measures as set out in this report be adhered to.

Other Resources identified

- In order to identify possible sensitive habitat areas e.g. watercourses, that may potentially be impacted by the activities within the Creswell Park Mining Permit Application Area, a 500m “zone of investigation” was defined around the Mining Permit Application Area, in accordance with Regulation GN509 of the National Water Act, 1998 (Act 36 of 1998) as promulgated in 2016. Assessing the wetland conditions, state and sensitivity did not form part of the scope of work for this assessment report, however the proximity of wetland features were highlighted as potential sensitive habitat within the investigation area.
- Only a small portion of a wetland was identified within the Investigation Area around the Creswell Park Mining Permit Application Area, approximately 482m north of the Mining Permit Application Area. Due to the distance of this wetland from the Creswell Park Mining Permit Application Area and the fact that this wetland feature is upgradient of the Mining Permit Application Area and the fact that extensive urban infrastructure occurs between the feature and the proposed mining area, it is considered unlikely that the proposed mining activities within the Mining Permit Application Area will pose a risk to the wetland.

Sensitivity

The sensitivity of each habitat unit was determined in terms of the presence or potential for faunal and floral SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the

presence of unique landscapes and overall levels of diversity. The table below presents the sensitivity of each identified habitat units along with an associated conservation objective and implications for the proposed mining activities.

Table 23: A summary of sensitivity of each habitat unit and implications for the proposed mining activity.

Habitat Unit	Sensitivity	Conservation Objective	Development Implications
Secondary Grassland	Moderately Low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	The floral composition present within the Creswell Park Mining Permit Application Area is considered to be in a transition between a pioneer and sub-climax state as a result of anthropogenic activities including alien and invasive plant proliferation. This has resulted in a moderately low ecological importance and sensitivity rating. It is highly unlikely that this habitat unit will support any faunal or floral SCC. The proposed mining and related activities are therefore unlikely to have a significant impact on this habitat unit or the ecological provisions therein.
Transformed Grassland	Low	Optimise development potential.	No SCC were found, and none are likely to occur within the Creswell Park Mining Permit Application Area. Taking into consideration the existing urban surroundings, edge effects, low floral and faunal diversity and limited habitat, the proposed mining activities are likely to have a low impact on the ecological functioning and provisioning of this habitat unit.

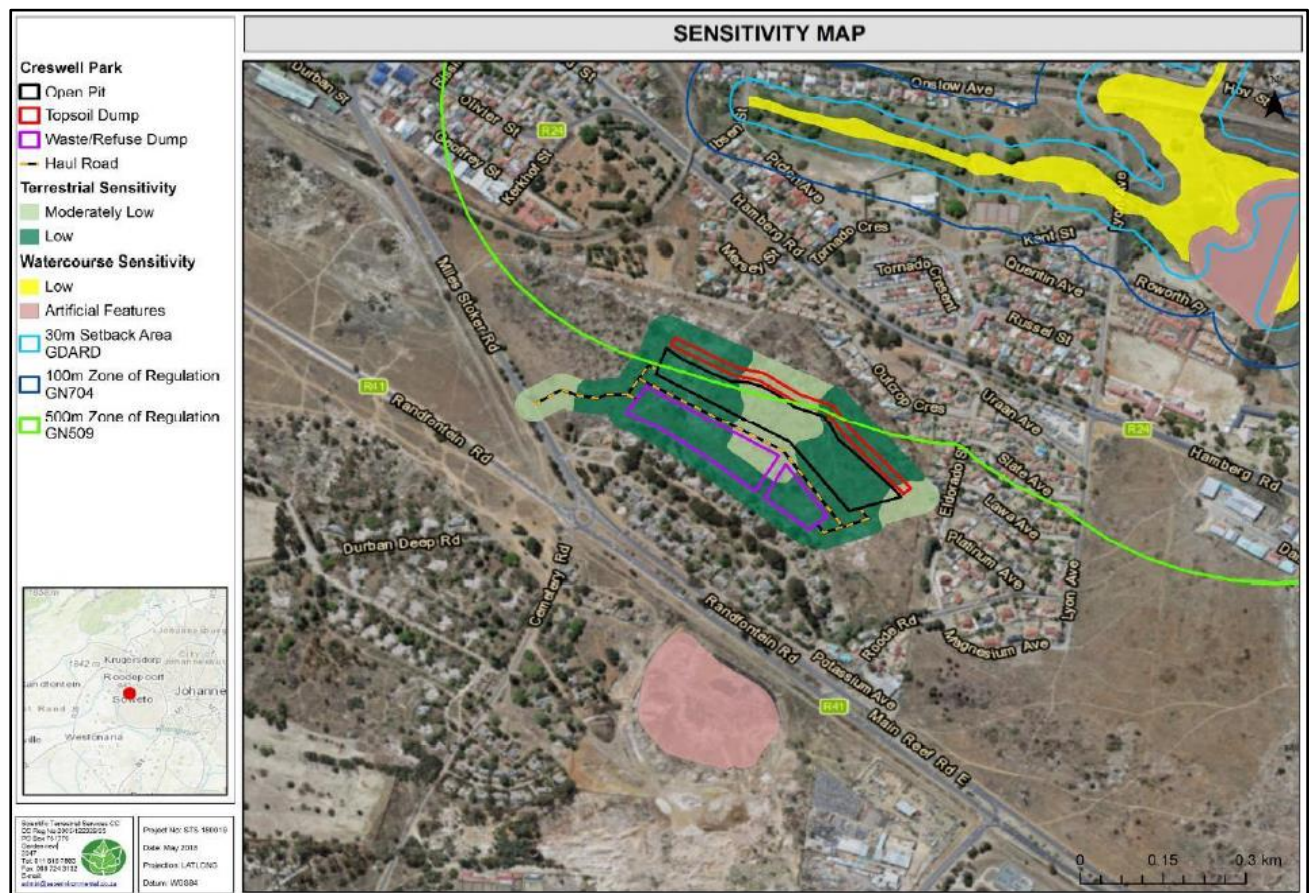


Figure 31: Ecological Sensitivity map of Creswell Park mining permit area

Conclusion of the Terrestrial Ecological Sensitivity Scan

The objective of this study was to provide sufficient information on the faunal and floral ecology of the area, together with other studies on the physical and socio-cultural environment for the Environmental Assessment Practitioner (EAP) and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable development. The need for conservation as well as the risks to other spheres of the physical and socio-cultural environment need to be compared and considered along with the need to ensure economic development of the country.

While the Soweto West Wits proposed mining project is still in the early stages of planning, the Creswell Park Mining Permit Application Area does not fall within any ESA, CBA or any other protected areas as defined by the relevant provincial or national databases. The field assessment has indicated that significant habitat loss has already occurred due to historic and current land changes such as urban development, mining activities, illegal dumping and soil clearance and disturbance. This has resulted in the transformation and degradation of suitable habitat for faunal and floral species. Mining activities within the Creswell Park mining permit area will contribute to the loss of habitat, decreased species abundance and decreased species diversity as is currently being experienced in the region.

Based on the findings of the ecological assessment, from a terrestrial ecological perspective, the proposed mining activity poses minimal risk to the faunal and floral resource management and conservation initiatives for the area, due to the significantly decreased ecological integrity and transformation of the area. However, in order that the significance of perceived impacts remain low, it is essential that the recommended mitigation measures for the identified impacts are adhered to so as to ensure that the ecology within the proposed Mining Permit Application Area along with the surrounding zone of influence is protected or adequately rehabilitated where necessary, in order to ensure that the intended post closure land use objectives are met.

Cultural and Heritage

The information in this section has been obtained from the Heritage Impact Assessment (PGS Heritage, May 2018) See Appendix G-iv for full report.

PGS Heritage conducted a Heritage Impact Assessment study of the proposed mining area. The aim of the study is to identify possible heritage sites and finds that may occur in the proposed mining permit area for the Creswell Park opencast area. The HIA aims to inform the Basic Assessment Reporting process (BAR) to assist the developer in managing any identified heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

The greater Roodepoort region has been extensively altered by historical mining activities since the farms Vogelstruisfontein, Roodepoort, Langlaagte and the two portions comprising Paardekraal (in Krugersdorp) were proclaimed as public diggings by the then Zuid-Afrikaansche Republiek (ZAR) government in 1886.

Present land uses associated with the general surrounds include a combination of informal settlements, low-cost and high-cost residential areas, industrial areas and manufacturing and distribution facilities, historical mine housing and historical mine infrastructure (tailings dams, shafts, derelict/abandoned buildings and water dams), powerlines and road infrastructure.

The Creswell Park opencast footprint area consists of relatively flat terrain covered with secondary grassland and khakibos. Historical mining activities and recent illegal informal mining activities have altered the natural topography of the area. The entire footprint area is also covered by extensive dumping of building rubble and general waste. An area of historical residential houses is located immediately south of the proposed opencast footprint area. The residential suburb of Creswell Park also bounds the footprint area to the north and east.

A scan of SAHRIS revealed several previous heritage studies conducted in the general region of Roodepoort, however, only a few studies have been undertaken in the immediate vicinity of the Creswell Park opencast footprint. These are summarised below.

- *Birkholtz. PD. 2008. Phase 1 Heritage Impact Assessment for the Proposed Development of Portions 407 and 408 of the Farm Roodepoort 237 IQ, City of Johannesburg Metropolitan Municipality, Roodepoort, Gauteng Province. Compiled for Marsh (Pty) Ltd by Archaeology Africa CC.*

This was a Phase 1 HIA for a proposed residential, commercial & business development on portions 407 and 408 of the farm Roodepoort 237 IQ. The developer for the project was Rand Leases Properties (Pty) Ltd. Sixteen heritage sites were located which were associated with historical gold mining activities. The sites included: eight abandoned mine shafts, five historic mine buildings and Infrastructure, one mine tram line, one old cemetery and one historic ash midden. This study area included the Creswell Park footprint area and the ash midden was the only site identified in the immediate area of the footprint, but it was located outside the northern boundary of the footprint (approx. 38m away from the northern boundary). Since both the satellite imagery and the field survey indicated that this area has been disturbed extensively by dumping and illegal mining excavations, it is highly likely that most of the site has been destroyed since it was identified. However, there may be subsurface material still present.

Palaeontology

A basic palaeontological sensitivity was determined using the SAHRIS database palaeosensitivity map (<http://www.sahra.org.za/sahris/map/palaeo>). As can be seen in Figure 32, the proposed route occurs in an area where palaeontology is assessed as being entirely of Low significance and no palaeontological studies are required. However, a finds protocol will be required.

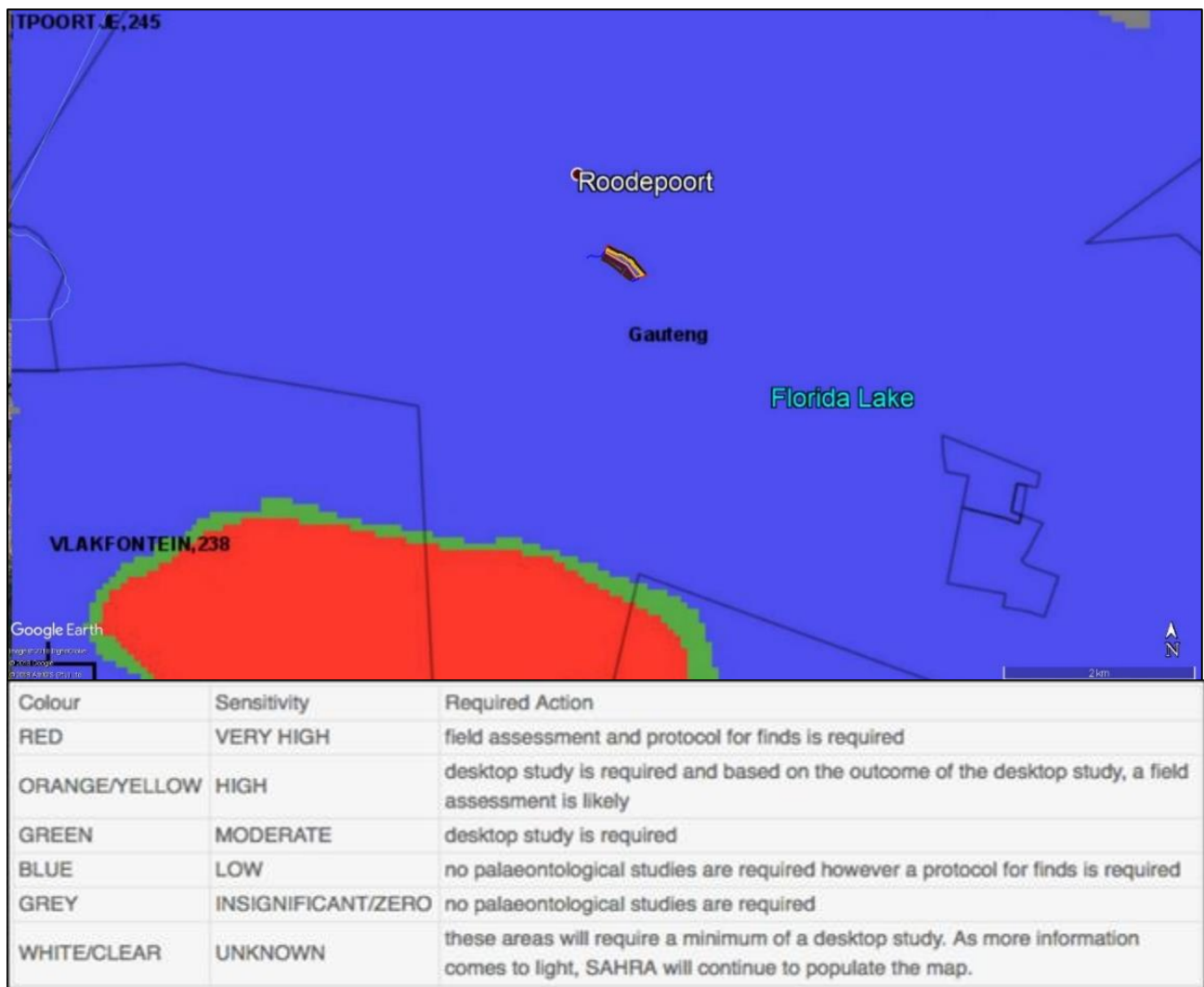


Figure 32: Overlay of the Creswell Park opencast footprint on the palaeo-sensitivity map from the SAHRIS database

Field Work Findings

Field assessment was conducted on two separate days (26 April and 8 May 2018) by vehicle and on foot by a team from PGS consisting of an archaeologist and a heritage specialist. During the field assessment of the Creswell Park pit footprint, no heritage sites were identified within the footprint area. The possible sensitive areas (i.e. Ridge, possible features, Features and Forest Area) is NOT present on the site. The only sensitive heritage areas identified in the surrounding area is presented

in figure 33 as CP001 (Muslim cemetery), CP002 and CP003 (historical housing) and Site PB, 2008 (historical ash midden). None of the features are within the proposed site boundary.

A Muslim cemetery (Site CP001) and two residential areas (Site CP002 and CP003) containing historical housing structures were identified in close proximity to the footprint area. All three identified sites are situated extremely close to the Creswell Park opencast footprint area; therefore, these sites are described below. In addition, an historical ash midden was identified by a previous HIA study (Site PB, 2008) (Birkholtz, 2008), which is located just outside the northern boundary of the opencast area footprint. The site description has been included in this report.



Figure 33: Sensitivity map

Site CP001 - Municipal Roodepoort Muslim and Hindu Cemetery

This is a large formal burial ground containing approximately 350-500 graves. The cemetery is surrounded by a concrete palisade fence. The site is deemed to be of High Significance and is rated as **GP. A**. It is recommended that the cemetery should be left in situ. If there is any activity in the vicinity, at least a 100m buffer around the cemetery should be applied as per the requirements of Section 17.6(a) of the Mine Health and Safety Act.

Site CP002 - Historical mining residential

A historical mining residential area was identified at this location, which is likely to be associated with the Kimberley Roodepoort or Roodepoort United gold mine, which was operational in this area. The site is graded as locally significant **GP. B**, due to the age of the houses and their highly likely association with one of the historical mines in this area. Section 17.6(a) of the Mine health and Safety Act is applicable and reduction of the 100m horizontal distance restriction from buildings can only be authorised by the DMR.

Site CP003 - Historical residential area

This site comprises the three southernmost blocks of the Creswell Park residential suburb, which are located 60m east of the Creswell Pit footprint area, and which are marked as a built-up area on both the 1954 and the 1977 topographical maps of the area. The site is graded as locally significant **GP. C**, due to the presence of houses that are likely to be 60 years or older. Section 17.6(a) of the Mine health and Safety Act is applicable and reduction of the 100m horizontal distance restriction from buildings can only be authorised by the DMR.

Site PB, 2008 – Historical ash midden

A historical ash midden was identified at this location during the HIA study by Birkholtz in 2008 (the description was taken from the report). The site represents a historic rubbish dump associated with one of the early gold mines on the Witwatersrand goldfields. As such it has the potential to possess information on everyday life on these early gold mines. The site is graded as locally significant **GP. C**. It is extremely likely that the site has been destroyed in the years since it was identified (by illegal mining activity and dumping), and due to the location of the site outside the Creswell Park footprint, it is recommended instead that an archaeological monitoring programme should be undertaken on commencement of vegetation clearance and earth moving activities to identify any archaeological material that may be located sub-surface.

Conclusion and Recommendations

The Creswell Park opencast mining footprint has been disturbed extensively by historical and recent gold mining activities. Any archaeological or other heritage resources that existed within the footprint have been destroyed by these activities and therefore the additional project impacts will not increase or decrease the significance of the existing baseline impacts within the footprint area. The impact is going to happen and will be short term in nature. The impact risk class is thus Low with regards to cumulative impacts within the footprint area.

No fatal flaws were identified from a cultural, historical, archaeological and paleontological perspective. Since no heritage resources were identified within the Creswell Park opencast footprint area, the overall direct impact of the development on heritage resources is regarded as Low to negligible and no mitigation measures are required for the footprint area. However, the indirect impact of the proposed project unmitigated on the heritage resources identified in the immediate vicinity of the footprint will be Medium and will require a certain amount of mitigation.

It is the considered opinion of the specialist, based on the findings of the desktop research together with the fieldwork findings, that the overall direct impact on heritage resources is acceptably low although the indirect impact on heritage resources is Medium before mitigation. However, provided the mitigation measures recommended for the identified sites situated adjacent to the proposed Creswell Park opencast footprint are implemented, the project can be approved from a heritage perspective.

Noise Baseline Assessment

The information in this section has been obtained from the Noise Impact Assessment (Airshed Planning Professionals, May 2018). For full specialist study refer to Appendix G-v.

Airshed Planning Professionals (Pty) Ltd (Airshed) was commissioned to undertake a specialist environmental noise impact study for the West Wits Creswell Park Mine.

Mining and associated activities often emit significant noise levels which can become a nuisance or health risk when not properly managed. This impact may affect not only to the mining area, but also to the surrounding land users and occupiers. The main objective of the noise specialist study was to determine the potential impact on the acoustic environment and noise sensitive receptors (NSRs) as a result of the operations at the project and recommend suitable management and mitigation measures.

In South Africa, provision is made for the regulation of noise under the National Environmental Management Air Quality Act (NEMAQA) (Act. 39 of 2004) but environmental noise limits have yet to be set. It is believed that when published, national criteria will make extensive reference to SANS 10103 of 2008 '*The measurement and rating of environmental noise with respect to annoyance and to speech communication*'. This standard has been widely applied in South Africa and is frequently used by local authorities when investigating noise complaints. These guidelines, which are in line with those published by the IFC in their General EHS Guidelines and World Health Organisation (WHO) *Guidelines for Community Noise*, were considered in the assessment.

The data from a baseline noise surveys conducted on 26 and 27 March 2018 was studied to determine current noise levels within the area. The rock breaker(Xcentric Ripper) L_w 's were calculated based on source measurements as obtained from the site visit undertaken at Sol Plaatjie on 8 May 2018. The baseline acoustic environment was described in terms of the location of NSRs, the ability of the environment to attenuate noise over long distances, as well as existing background and baseline noise levels. The following was found:

- The closest NSRs to the project site is ~20 m to the southwest.
- Vehicles are the main contributors to the acoustic environment of the area.
- The baseline noise levels (as measured during the survey) was 41.75 dBA during the day and 41.64 dBA during the night.

Noise emissions from diesel powered mobile equipment were estimated using LW predictions for industrial machinery (Bruce & Moritz, 1998), where LW estimates are a function of the power rating of the equipment engine. General materials handling LW's were obtained from the database of François Malherbe Acoustic Consulting cc (FMAC) for similar operations. Values from the database are based on source measurements. Estimates of road traffic were made given mining and production rates, truck capacities, assumed vehicle speeds and road conditions.

The source inventory, local meteorological conditions and information on local land use were used to populate the noise propagation model (CadnaA, ISO 9613). The propagation of noise was calculated over an area of 2.5 km east-west by 2.3 km north-south. The area was divided into a grid matrix with a 20-m resolution. Results are also presented in isopleth form (Figure 34). The simulated equivalent continuous day-time rating level ($L_{Req,n}$) of 55 dBA (guideline level) extends ~280 m from the operational area. The closest NSRs are ~20 m to the southwest of the waste rock dump. The simulated equivalent continuous day/night time rating level ($L_{Req,dn}$) of 55 dBA (guideline level) extends ~220 m from the operational area.

Based on the simulated increase in noise levels above the baseline and according to the SANS 10103 (2008), the community reaction due to day-time noise levels from the project operations are expected to result in varying reactions and complaints based on distance from the project. A summary of the community reaction is provided in Table 24. It should be noted that the expected community reaction will overlap as not all individuals are equally sensitive to noise. Change of 10 dB is subjectively perceived as a doubling in the loudness of the noise.

Table 24: Expected community reaction due to day-time noise level increases from the baseline

Increase in noise levels above the baseline	Expected Community reaction according to the SANS 10103	Distance from Creswell Park operations (i.e. pit and waste rock dumps, onsite haul road)
$0 \text{ dB} < \Delta \leq 10 \text{ dB}$	'Little' reaction with 'sporadic complaints'	Up to ~420 m
$5 \text{ dB} < \Delta \leq 15 \text{ dB}$	'Medium' reaction with 'widespread complaints'	From ~200 m to ~950 m
$10 \text{ dB} < \Delta \leq 20 \text{ dB}$	'Strong' reaction with 'threats of community action'	From ~90 m to ~420 m
$15 \text{ dB} < \Delta$	'Very strong' reaction with 'vigorous community action'	Up to ~200 m

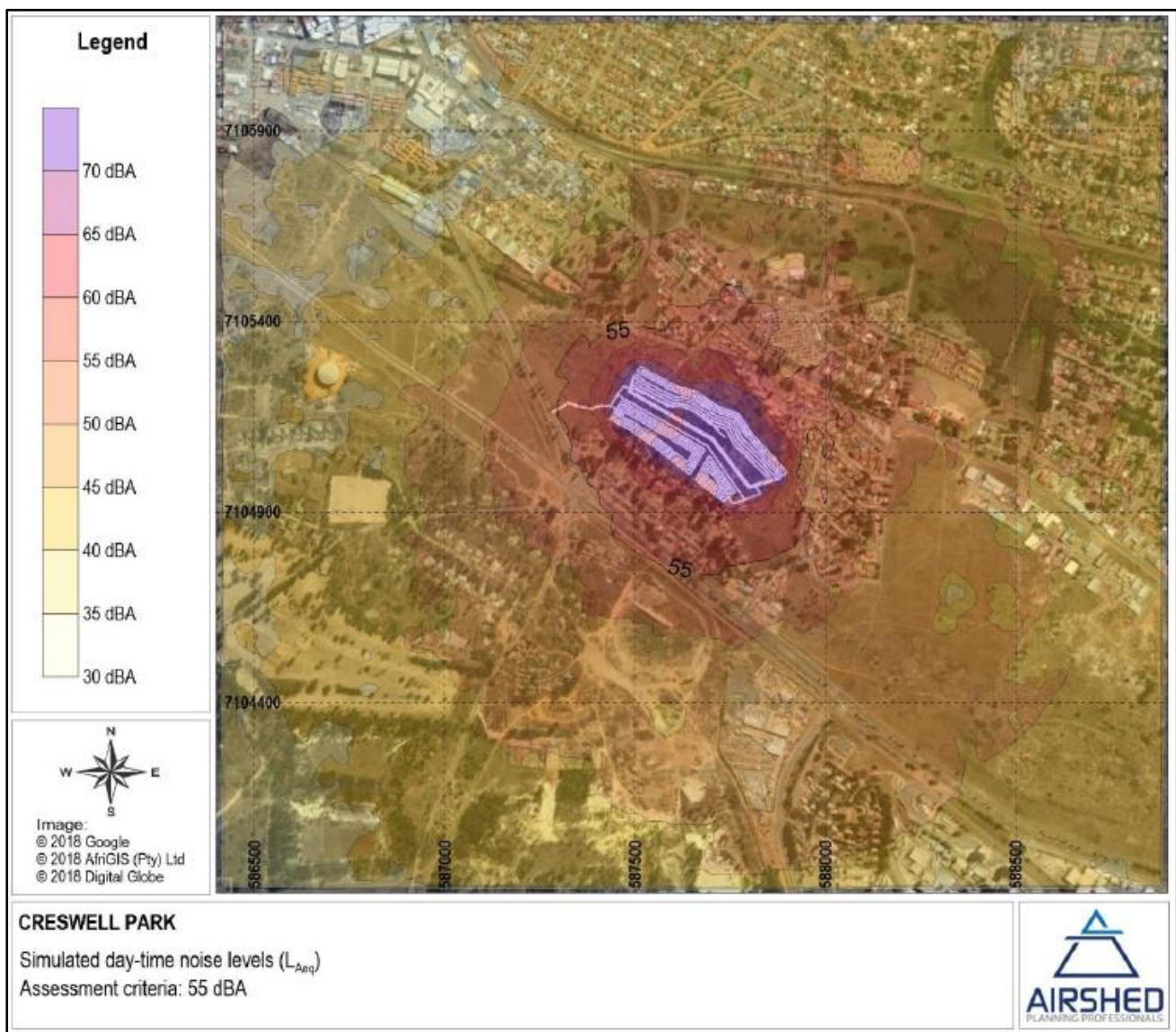


Figure 34: Simulated equivalent continuous day-time rating level ($L_{Req,d}$) for project activities

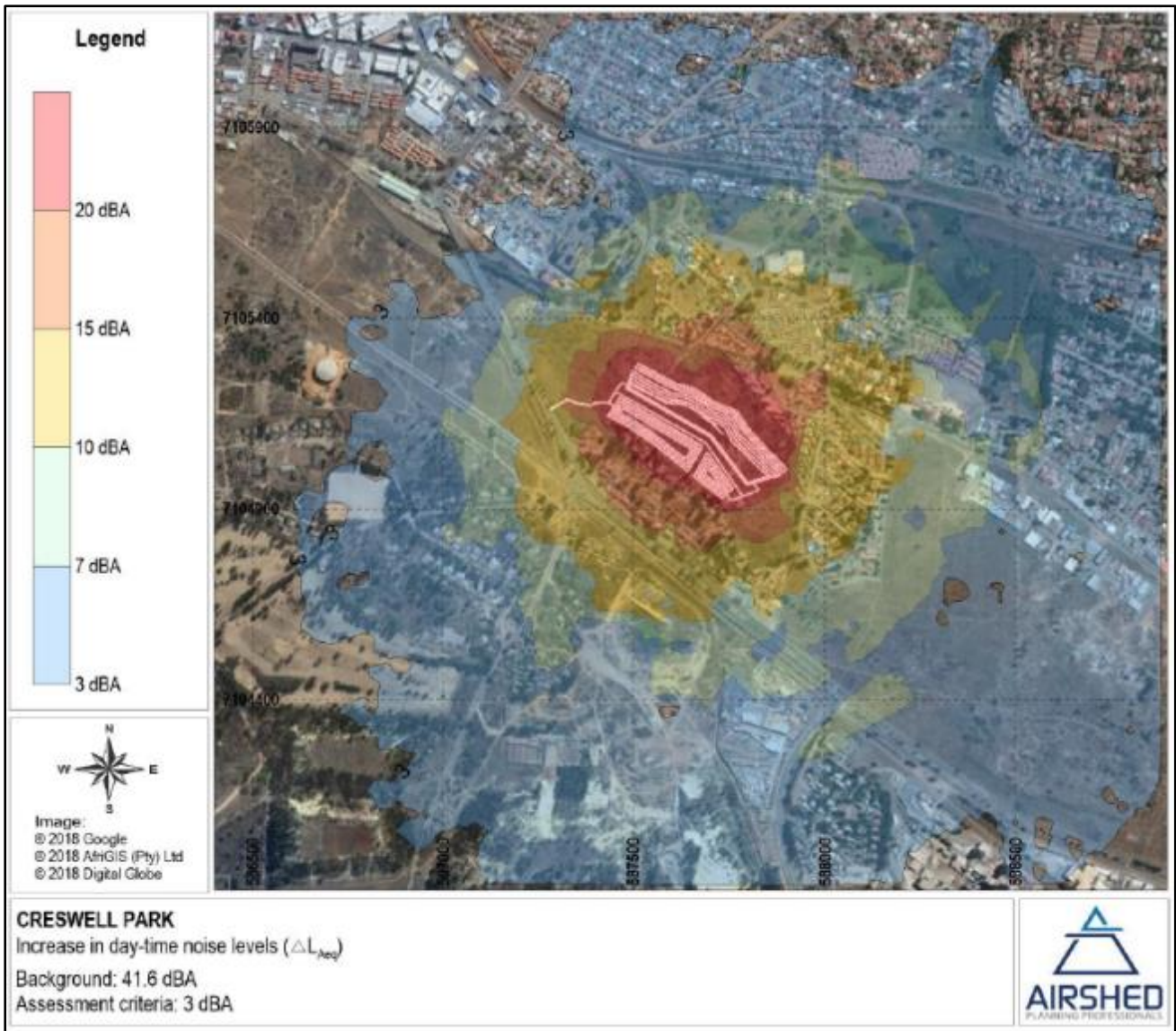


Figure 35: Simulated increase in equivalent continuous day-time rating level ($\Delta L_{Req,d}$) above the baseline

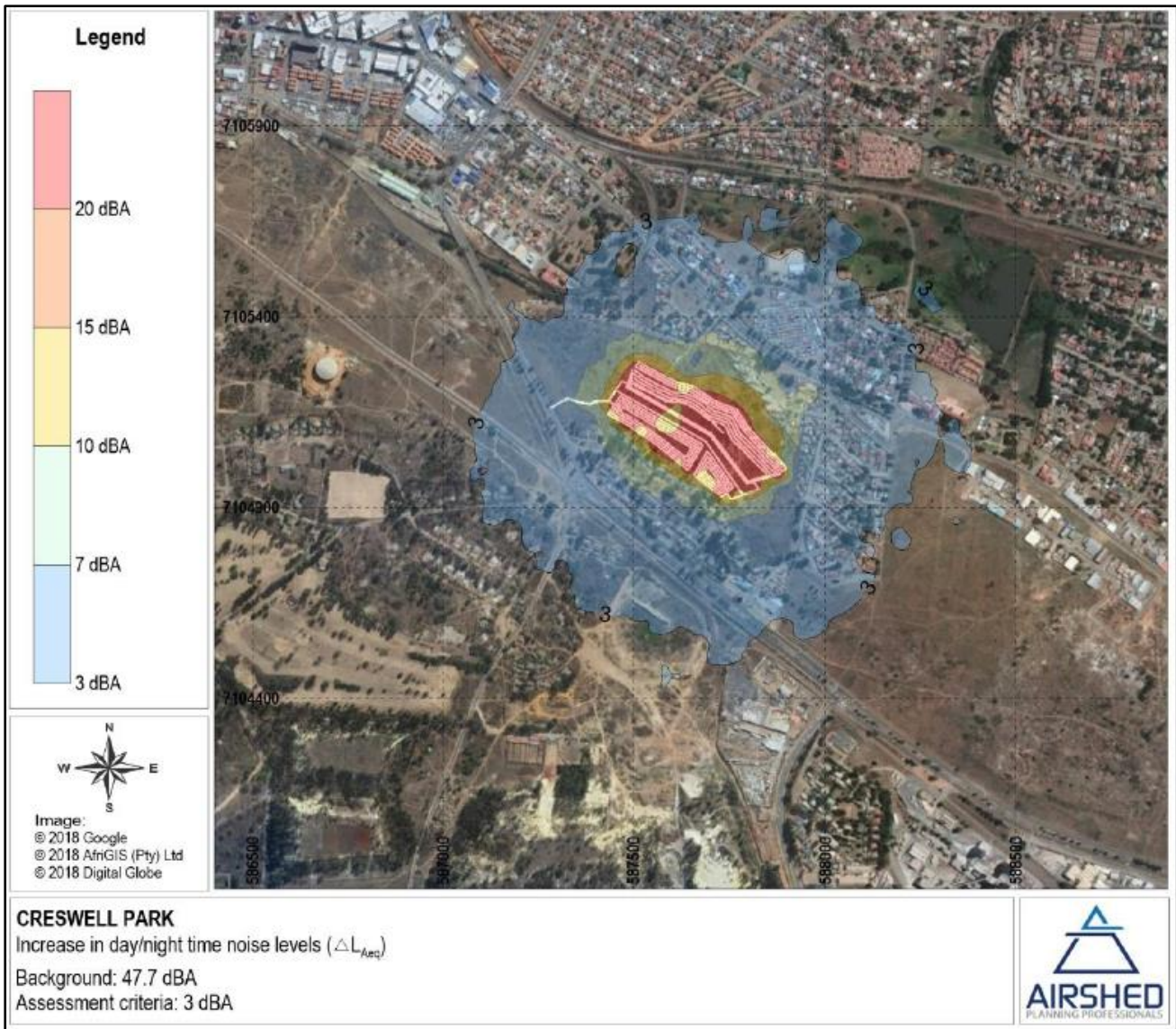


Figure 36: Simulated increase in equivalent continuous day-time rating level ($\Delta L_{Req,d}$) above the baseline

The simulated increase in equivalent continuous day-time rating level ($\Delta L_{Req,d}$) above the baseline is presented in Figure 35 and Figure 36. The background noise for the modelling was set at 41.6 dBA and 47.7 dBA respectively.

The main findings of the impact assessment are:

- The noise levels from the project operations exceed the selected noise criteria (SANS 10103) at the closest NSRs surrounding the project site.
- Construction and closure phase impacts are expected to be similar or slightly lower than simulated noise impacts of the operational phase.

The following key recommendations should be included in the project environmental management programme:

- A monitoring programme as per the requirements of the International Finance Corporation (IFC) and SANS 10103:
- Monitoring annually during the operational phase at the closest NSR; and
- In response to complaints received.

In managing noise specifically related to truck and vehicle traffic, efforts should be directed at:

- Minimising individual vehicle engine, transmission, and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.
- Maintain road surface regularly to avoid corrugations, potholes etc.
- Avoid unnecessary idling times.
- Minimising the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level near the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level' (Burgess & McCarty, 2009).
- Limiting traffic to hours to between 06:00 and 18:00.
- Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.
- A noise complaints register must be kept.

Based on the findings of the assessment and the close proximity of NSRs to the project, it is recommended that the mitigation and monitoring measures recommended in this report are in place during the operational phase of the project.

Air Quality Baseline

The information in this section has been obtained from the Air Quality Impact Assessment (Airshed Planning Professionals, May 2018). For full study refer to Appendix G-vi.

Airshed Planning Professionals (Pty) Ltd (Airshed) was appointed to undertake an air quality specialist study for the project as part of the Basic Assessment process. Sensitive receptors in the vicinity of the Creswell Park operations include the residential areas of Creswell Park to the north, east and

south of the mining operations. For the purposes of this assessment all residences within these areas were considered as sensitive receptors (See Figure 38).

The Creswell Park operations fall across the northern boundary of the Vaal Triangle Priority area (Figure 37). The Vaal Triangle Airshed was declared the first priority area by the minister on 21 April 2006. The location of the proposed Creswell Park operations within the Vaal Triangle Priority area might have several important implications for these operations. New developments which are associated with atmospheric emissions and hence the potential for contributing to air pollutant concentrations are being subject to intense scrutiny by national air pollution control officers. Emphasis is being placed on ensuring that best practice control measures are being proposed for implementation and that the development will not substantially add to the existing air pollution burden in the region.

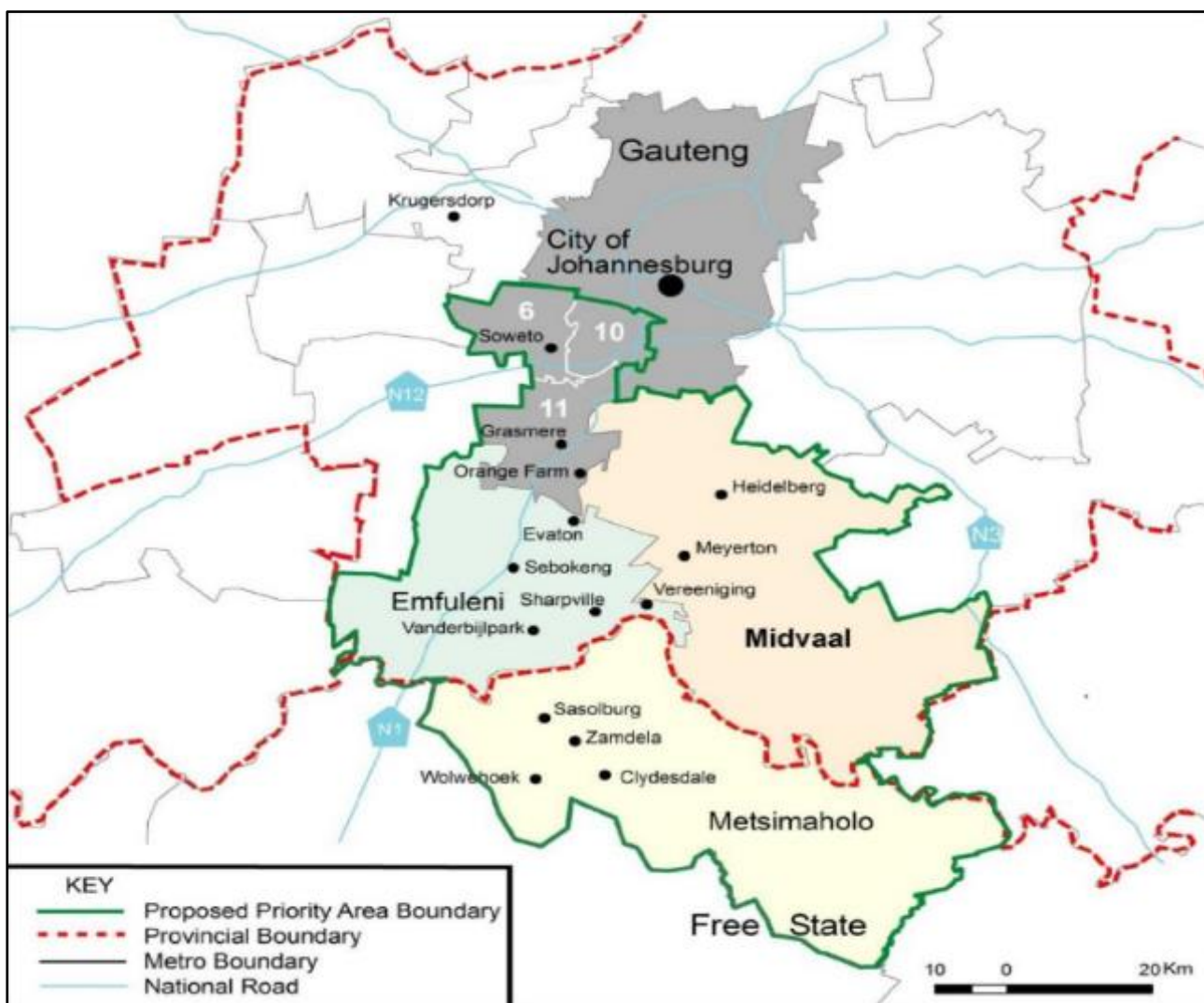


Figure 37: Boundaries of the Vaal Triangle Airshed Priority Area, as declared on 21 April 2006

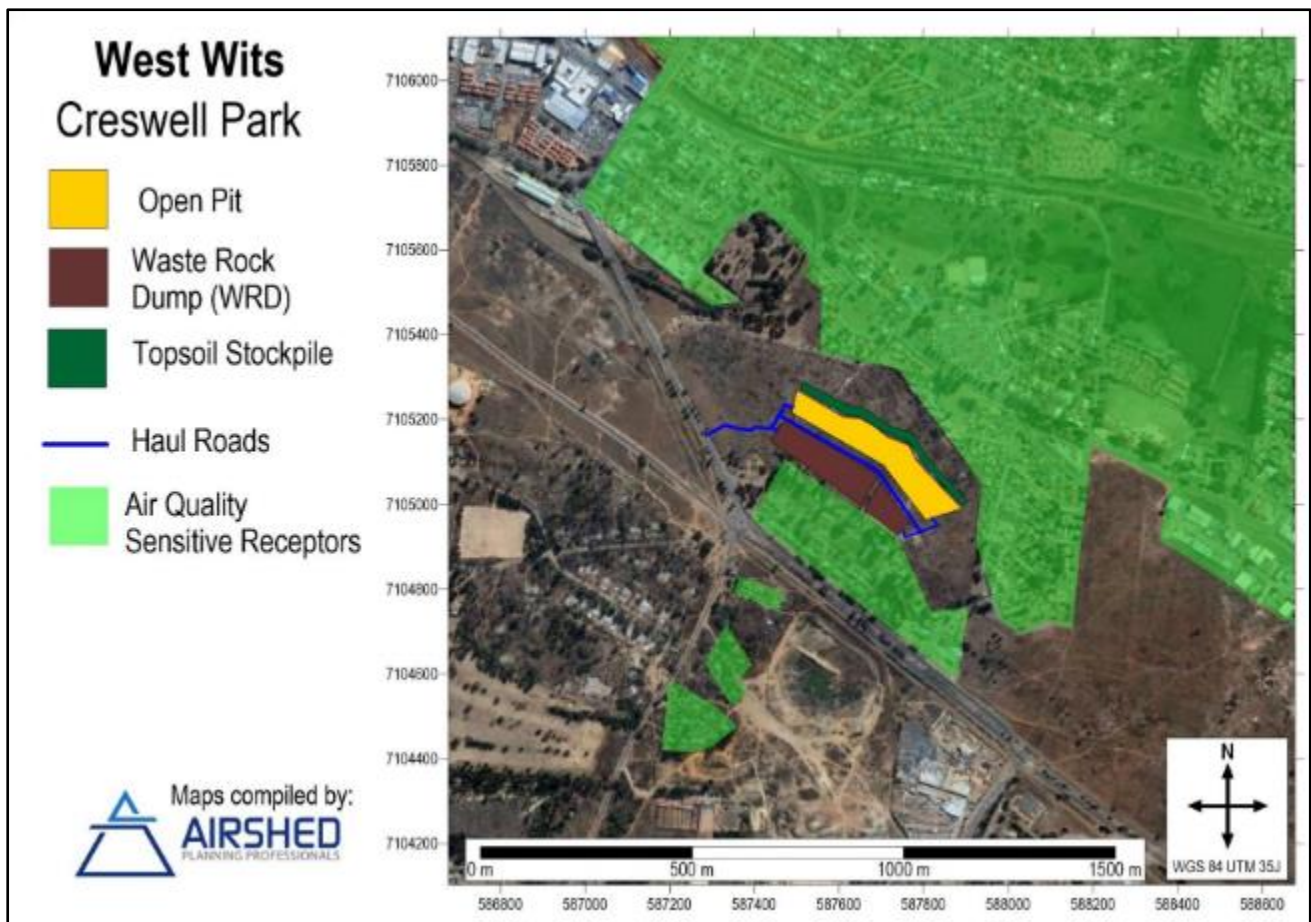


Figure 38: Location of potentially sensitive receptors in relation to the project

Ambient Air Quality within the Region

Sampling results from a dustfall monitoring network currently operated to the south and southeast of the Creswell Park study area was made available for inclusion in the air quality study. The sampling locations with available data for 2017, as provided by the operator of the dust fallout network, are shown in Figure 39. Dustfall for the period 2017 is provided in **Table 25**.

In accordance with the National Dust Control Regulation (NDCR) the dustfall limits (600 mg/m²/day for residential areas and 1200 mg/m²/day for non-residential areas) allows for two exceedances in a year, not sequential months. The NDCR dust limits for non-residential areas are exceeded at the residences of Modise, Maswanganyi and George Thengwani and for residential areas are exceeded at the residence of Moreroa and Yvonne Meno during the period 2017. The high variability between dust fallout rates at each sampling location indicates that dust fallout at each location is likely mainly influenced by localised sources. High dust fallout rates at all current sampling locations during the windy spring months from September to November indicates that wind erosion is likely a significant source of dust emissions in the study area.

Table 25: Available dust fallout data in the study area for the period 2017

Sampling Site	Sampling month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Modise	424	573	182	233	97	447	997	543	6492	5327	4588	2029
Mashilane	123	214	111	108	0	0	0	0	0	0	0	0
Moreroa	366	211	277	292	227	410	211	247	3308	1114	1640	730
Maswanganyi	195	340	295	175	193	376		266	2495	2792	2172	1843
George Thengwani	482	342	185	238	551	373	442	356	6193	3243	1888	1118
Yvonne Meno	167	342	147	109	383	196	332	269	1681	803	952	202
Anna Doornkop	204	324	246	217	259	198	66	63		675	378	327



Figure 39: Current dust fallout sampling locations with available results for 2017.

Emissions Inventory

Emissions from the Creswell Park operations were calculated using emissions factors published by the US EPA AP42 Section 13.2.4 (Aggregate Handling and Storage Piles) and Section 13.2.2

(Unpaved Roads), and the Australian NPi Emission Estimation Technique Manuals for Combustion Engines (Version 3.0) and Mining (Version 3.1). Emission rates were calculated based on an average 60 tonnes/hour ROM mining rate, crushed and a 780 tonnes/hour waste rock removal rate. Vehicle exhaust emissions were calculated based on the estimated fuel usage of the Creswell Park fleet. Mining at the Creswell Park operations will take place from 6:00 to 18:00 on Mondays to Fridays and 6:00 to 14:00 on Saturdays.

Dispersion Model Selection and Results

Dispersion modelling simulations were undertaken to determine highest hourly, highest daily and annual average ground level concentrations for each of the pollutants considered for the operational phase. Averaging periods were selected to facilitate the comparison of simulated pollutant concentrations to the SA NAAQS

Ambient air quality criteria apply to areas where the Occupational Health and Safety regulations do not apply, which are generally outside the property or lease area. Ambient air quality criteria are therefore not occupational health indicators but applicable to areas where the general public has access. For this assessment the ambient criteria were assumed to be applicable for all areas outside the area actively being mined at any given time.

With no mitigation measures applied simulated highest daily PM₁₀ concentrations exceed the NAAQS at the closest sensitive receptor locations to the east of the operations. With simple mitigation measures such as wet suppression of dust at material handling points and regular water sprays on haul roads, simulated incremental PM₁₀ concentrations due to the Creswell Park operations are in compliance with the SA NAAQS at all sensitive receptor locations. Even with no mitigation measures applied simulated PM_{2.5}, NO₂, SO₂, and CO concentrations are in compliance with the SA NAAQS for all averaging periods and simulated highest monthly dust fallout rates are in compliance with the SA NDCR residential limit at all sensitive receptor locations and in compliance with the SA NDCR non-residential limit at all off-site areas.

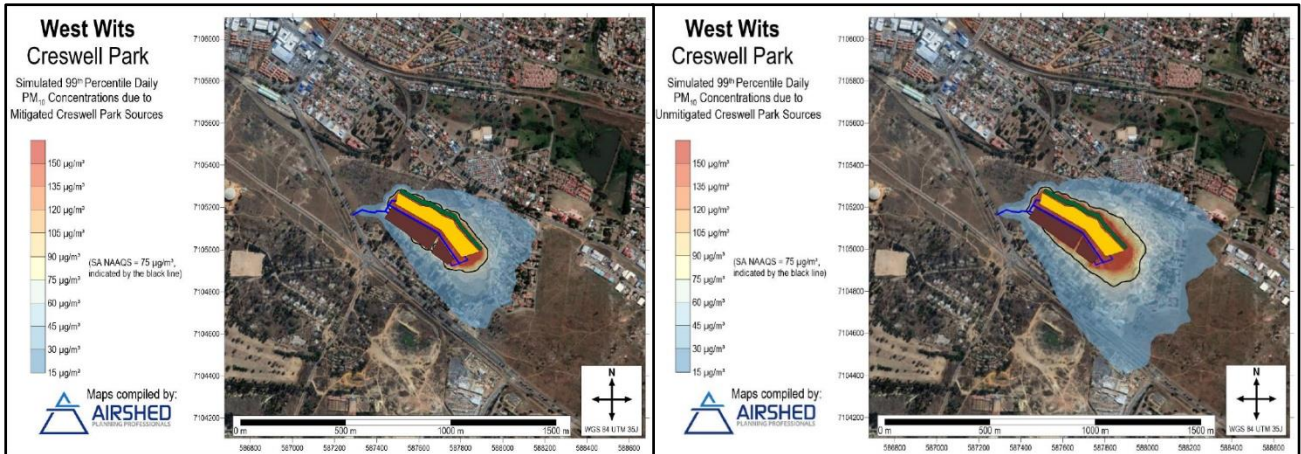


Figure 40: Simulated incremental mitigated 99th percentile (4th highest) PM10 concentrations due to mitigated and unmitigated Creswell Park operations

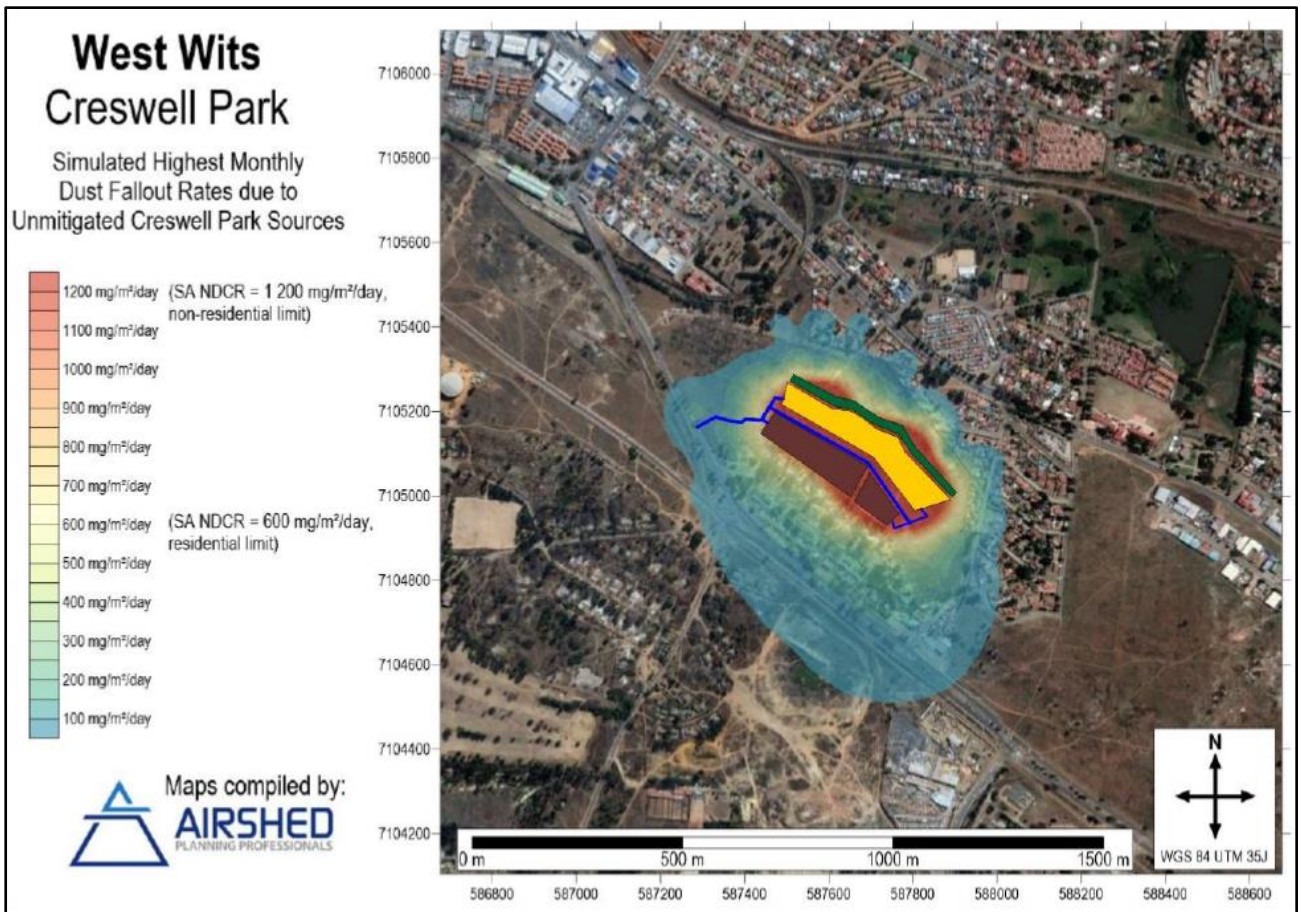


Figure 41: Simulated incremental unmitigated and mitigated highest monthly dust fallout rates due to Creswell Park operations

The main findings from the baseline assessment are as follows:

- The flow field is dominated by winds from the north-north-east. During day-time conditions, winds from the north increase in frequency, with winds from the north-north-east sector increasing at night.

- Existing sources of emissions in the study area include vehicle exhaust and entrainment on paved and unpaved roads, household fuel burning, biomass burning (veld fires), industrial activities, mining operations and wind erosion from exposed areas and tailings storage facilities. High dust fallout rates recorded at all current sampling locations during the windy spring months from September to November indicates that wind erosion is likely a significant source of dust emissions in the study area.

The main findings from the impact assessment are as follows:

- The main sources of dust emissions from the Creswell Park operations are likely to be materials handling of RoM (crushing) and waste rock in the pit and of waste rock at the WRD and vehicle entrainment emissions from haul trucks and other mobile equipment.
- With no mitigation measures applied simulated highest daily PM₁₀ concentrations exceed the NAAQS at the closest sensitive receptor locations to the east of the operations. With simple mitigation measures such as wet suppression of dust at material handling points and regular water sprays on haul roads, simulated incremental PM₁₀ concentrations due to the Creswell Park operations are in compliance with the SA NAAQS at all sensitive receptor locations.
- Even with no mitigation measures applied simulated PM_{2.5}, NO₂, SO₂, and CO concentrations are in compliance with the SA NAAQS for all averaging periods and simulated highest monthly dust fallout rates are in compliance with the SA NDCR residential limit at all sensitive receptor locations and in compliance with the SA NDCR non-residential limit at all off-site areas.
- With no mitigation measures applied the incremental impact of the Creswell Park project on the receiving environment is expected to be MEDIUM. With 50% mitigation of material handling emissions (achievable with the mitigation measures recommended below) and 30% mitigation of vehicle entrained dust from unpaved roads, the incremental impact of the Creswell Park project is expected to be LOW. The cumulative impact during the mining phase (with mitigation measures applied) is expected to be MEDIUM, but the short life of the Creswell Park operations means that long term impacts (annual average pollutant concentrations) are unlikely to exceed the SA NAAQS.

Based on the findings above the following recommendations are made:

It is recommended that:

- Best practice mitigation measures (wind breaks, wet suppression etc) for both the mining and rehabilitation phases.
- A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent

community liaison meetings should be held with the neighbouring communities to address air quality related concerns;

- Wet suppression techniques should be used to control dust emissions, especially in areas where dry material is handled or stockpiled.
- Exposed soils and other erodible materials should be re-vegetated or covered promptly;
- New areas should be cleared and opened-up only when absolutely necessary;
- Surfaces should be re-vegetated or otherwise rendered non-dust forming when inactive;
- Storage for dusty materials should be enclosed or operated with efficient dust suppressing measures;
- Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems;
- Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts.
- Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions.
- Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates.
- The vehicle fleet be regularly serviced and maintained to minimise CO, NO₂, SO₂ and greenhouse gas emissions.
- Older vehicles in the current fleet should be replaced with newer, more fuel-efficient alternatives where feasible.
- PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location on the southern or western edge of the residential area of Creswell Park, directly to the north and east of the operations.
- If PM₁₀ concentrations are found to be in exceedance of the NAAQS at the closest sensitive receptor locations additional dust suppression measures should be investigated. If the mitigation measures employed are considered best practise, additional offset measures should be considered. Such offset measures include upgrading of public road surfaces, electrification of houses for cooking and heating or supply of cleaner burning fuel for cooking and heating purposes.

Visual Impact and Sense of Place

The receiving environment of the Creswell Park study area is associated with historic and current anthropogenic activities, which includes mining activities, urban development and the proliferation of alien and invasive plant species that have led to a significant decrease of available natural faunal habitat. The Creswell Park residential area makes up the eastern and norther boundary of the proposed mining permit area. A historical mine house residential area is located to the south. The residential areas are located within close proximity to the proposed mining area.

The topography is characterised by gently undulating terrain with the site sloping from south to north. With the natural high point located on the south western corner of the site and the natural low point located on the norther section. The sense of place associated with the study areas are related to the landscape character type of the area – historical and current mining, historical tailing dumps, residential development and commercial areas. The natural area are highly disturbed and of low medium to low significant.

The proposed mining will be completed within a period of 3 to 4 months and the rehabilitation will be completed within 5 to 6 months. Although the visual impact will be considerable during the operational period to the surrounding sensitive receptors the duration of the impact will be of limited duration. After rehabilitation no visual impact will remain.

During the operational phase the topsoil and waste rock dumps will be positioned to create a safety, visual and/or noise berm between the mining operations and nearby receptors. Dust suppression by means of water will be applied to the mining area and access/haul roads to prevent visual impact as a result of dust pollution. The preferred mining method will limit the amount of dust produced and should limit the visual impact associated with dust pollution. No drill and blasting as a mining method will be utilised and therefore no dust cloud will be forms associated with the mining method.

Traffic Impact Assessment

Information in this section was obtained from the Traffic Impact Assessment (Siyazi Limpopo Consulting Services, May 2018). For full specialist study refer to Appendix G-vii.

Siyazi Gauteng Consulting Services (Pty) Ltd. was appointed to conduct a Traffic Impact Assessment (TIA) for the proposed Creswell Park Mining Permit. The purpose of this study is to undertake an assessment of the implications of the vehicle traffic that could potentially be generated by the proposed mining development and:

- The traffic impact that the change in land use would have on road- and transport-related infrastructure;

- Whether it is possible to accommodate the proposed mining development within acceptable norms from a traffic engineering point of view; and
- The mitigating measures required to accommodate the proposed mining development within acceptable traffic engineering norms.

The proposed mining development would involve opencast mining which would include conventional open pit mining operations of load and haul. Ore excavated will be transported by haul trucks via the existing roads network to a processing plant located off site. It is proposed that up to 47 925 tonnes of ore would be transported to the off-site processing plant over a maximum period of 4 months. It is anticipated that 6 trucks will be utilised doing 3 trips a day (i.e. Average of between 16 -18 trips per day) for the transport of ore.

As summary of the extent of the proposed mining development for all project phases are presented in the table below.

Table 26: Summary of the extent of the proposed mining development for the respective phases

TABLE 1.2: SUMMARY OF THE EXTENT OF THE PROPOSED MINING DEVELOPMENT FOR THE RESPECTIVE PHASES					
DESCRIPTION	PHASE				
	CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE	
ROM Ore to be transported off site for processing	<p>The relevant proposed mining development does not include any construction of mining infrastructure since the ROM ore will only be excavated and transported to an off-site processing facility.</p> <p>Only some ground clearing will be done of the relevant property and this is envisaged to generate less vehicle trips than the operational phase</p>	Total: ±47 925 Per Month: ±11 981	Not relevant. (Activities include the demolition of all infrastructures and the rehabilitation of the site.)	Not relevant. (All activities on the site, although limited, are planned to be completed and the mining company will leave the site.)	
Duration		± 4 months	± 1 months		
Relevant time frame		Late 2019	After operational phase is completed		
Location from where workers are expected to come for all phases		Management and supervision	50% from the east and 50% from the west of the proposed mining development (travelling via Randfontein Road)		
		Semi-skilled workers	From areas within Goudrand, Bram Fischerville and Meadowlands West via existing public transport or walking to site		
Total number of management / supervision staff		9	Not known at the time of preparing the traffic impact assessment. Anticipated to be lower than operational phase.		
Total number of semi-skilled staff		38			
Number of shifts and shift times for all staff		Anticipated to be one shift per day, Mondays to Fridays from 07:00 to 17:00.			
Heavy vehicles delivering consumables per day via road transport		5	Limited, occasionally.	Limited, occasionally.	
Assumed maximum % of heavy vehicles during AM or PM peak respectively		20%	Limited, occasionally.	Limited, occasionally.	
Calculated number of vehicle trips to be generated per AM or PM peak hour	AM – 16 PM – 16 (See Tables 2.7 of Section 2)	Less than construction and operational phases.	Less than construction and operational phases.		

Access Road

Access to and from the proposed Creswell Park site might be possible from and to Miles Stoker Road which links up with Randfontein Road (Road R41) at Point H and would require a new access intersection. Two potential points for the proposed access road were identified which are (**Figure 42**):

- Via a new intersection with Miles Stoker Road and direct access to the proposed mining development; or
- It might be required that Tornado Crescent be extended to intersect with Miles Stoker Road to provide access to the area and in turn the proposed Creswell Park site gain access from Tornado Crescent.

Further investigation and collaboration with the relevant roads authority and the proposed mining development project team would be required as part of the traffic impact assessment. Refer to Figure 42 for a graphical presentation of the proposed potential access routes.

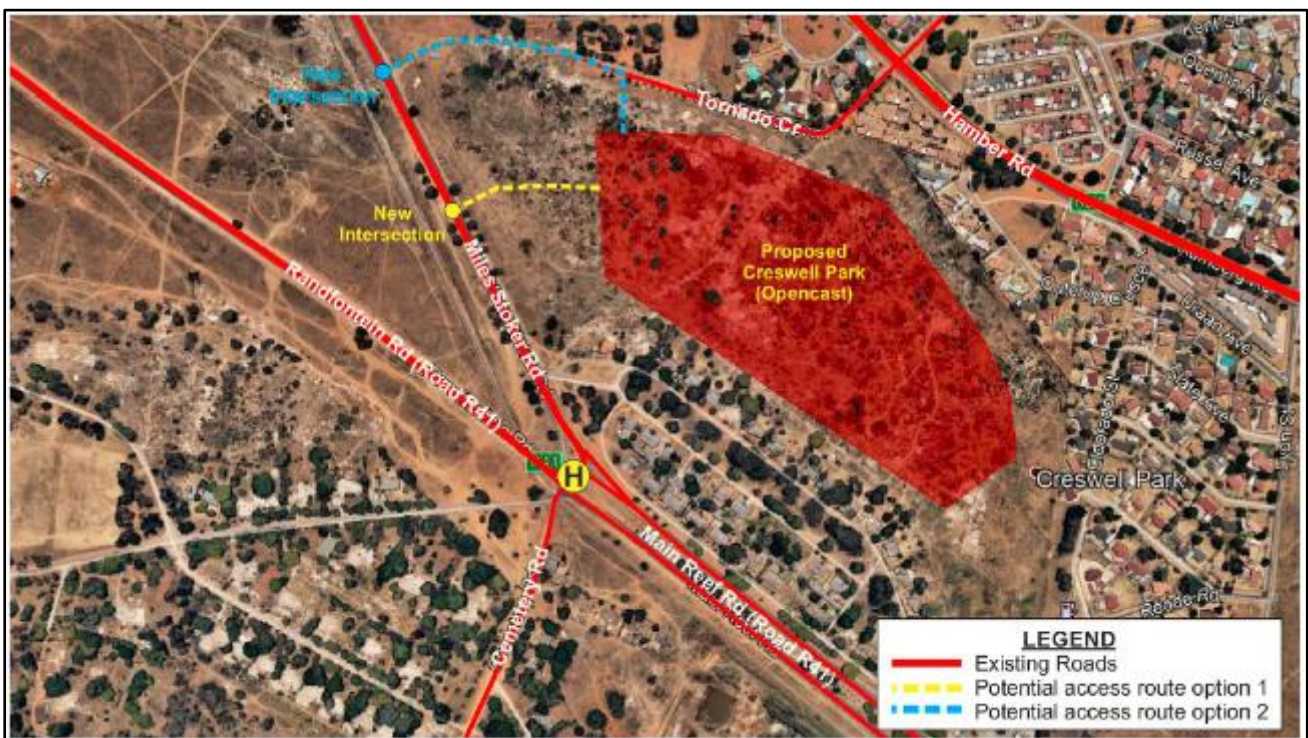


Figure 42: Potential Access to the Proposed Creswell Park Site

Determination of the levels of service at the relevant intersections.

The “**SIDRA Intersection**” software was used as an aid for the design and evaluation of the relevant intersections. The following intersections were evaluated for levels of service:

- Point H: Intersection of Randfontein Road (Road R41), Miles Stoker Road, Main Reef
- Road (Road R41) and Cemetery Road;
- Point 1: Proposed intersection of Miles Stoker Road and Proposed Access Road.

Sensitive Road Sections

Figure 43 is an indication of the sensitive road sections and intersections indicating existing sensitive area and intersections WITHOUT the proposed mining development and mitigation measures. The anticipated sensitive road sections and intersections with background mitigation and WITH the proposed mining development is presented in **Figure 44**.

The sensitivity of the relevant section of the roadways under investigation and the relevant intersections under investigation would improve with mitigating measures that is recommended. The proposed mining development would have an insignificant impact on the sensitivity of the roads network within the vicinity.

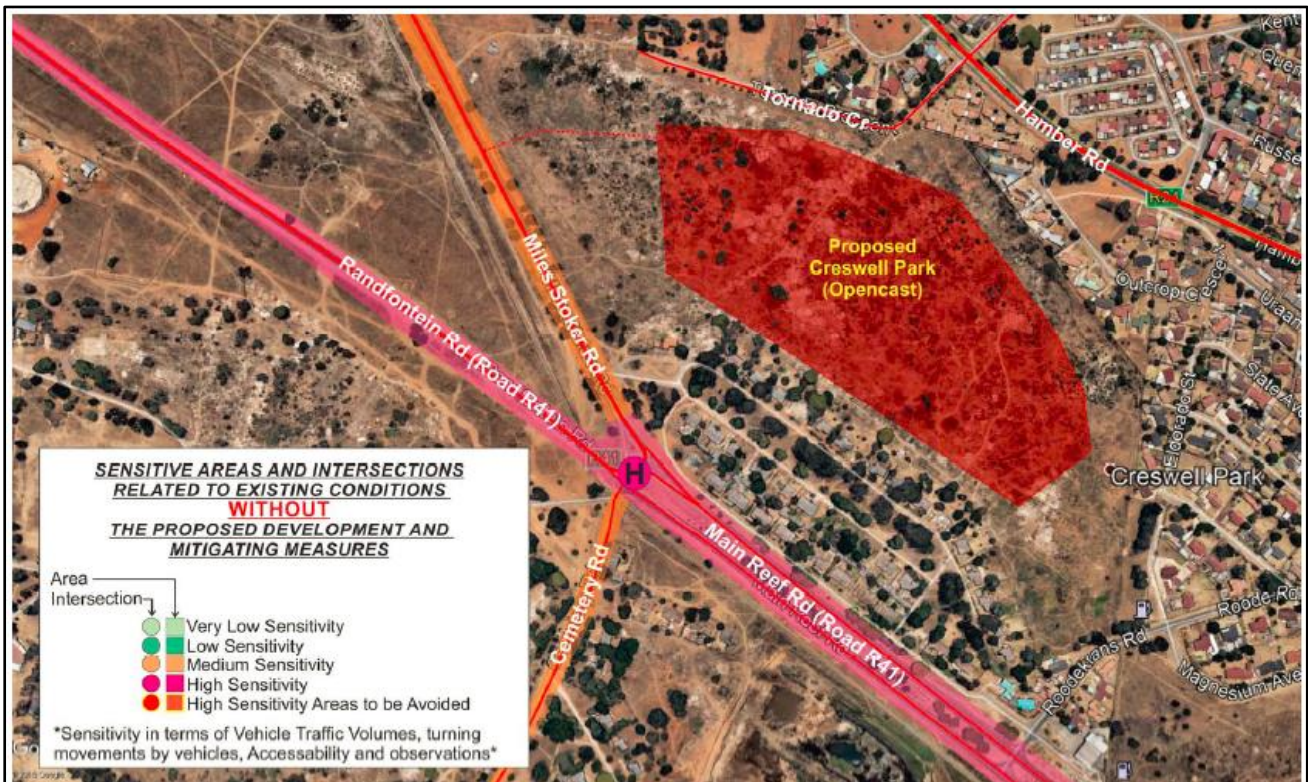


Figure 43: Presentation of existing sensitive road sections and intersections without the proposed mining development



Figure 44: Presentation of existing sensitive road sections and intersections with background mitigating measures with proposed mining development

Conclusion and Recommendations

Based on a site inspection of the existing road network adjacent to the site under investigation, traffic surveys, calculations and reference to the relevant traffic engineering guideline documents, the following findings and recommendations were made:

Based on a site inspection of the existing road network adjacent to the site under investigation, traffic surveys, calculations and reference to the relevant traffic engineering guideline documents, the following findings and recommendations are made:

- Detailed investigations should be conducted in conjunction with the relevant road 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 needs to be prepared in conjunction with the relevant road authority on public roads where trucks will operate as soon as the project has been approved in order to ensure that the consumables, ROM ore and workers
- can be transported at all times. Road markings, reflective road studs (LED), road signs, overhead lights should be provided and maintained at all the relevant intersections under

investigation to ensure visibility during night time, proper visibility of intersection lane geometry and sufficient information to road users; and

- As part of the proposed mining development, it is recommended that ore haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods.

In conclusion of the findings as part of the investigations, Siyazi Gauteng Consulting Services (Pty) Ltd is of the opinion that the proposed mining development would have a manageable impact on the relevant roads network as long as the mitigating measures are implemented as recommended as part of the Traffic impact assessment report and should thus be granted authorisation.

Closure Assessment

Information in this section was obtained from the Closure Plan (Golder, May 2018). For full specialist report refer to Appendix G-ix.

Golder Associates Africa (Pty) Ltd (Golder) was appointed to compile a Mine Closure Plan (Closure Plan) for the proposed Creswell Park opencast pit. The Closure Plan was compiled in alignment to the NEMA GN R. 1147 Regulations. Good practice measures widely adopted by the South African and international gold mining industry were incorporated where deemed necessary.

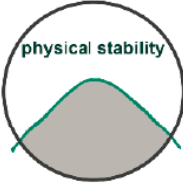






The approach adopted in undertaking closure planning for Creswell Park mining permit is founded on three key planning foci.

1. The application of an iterative closure planning / design process



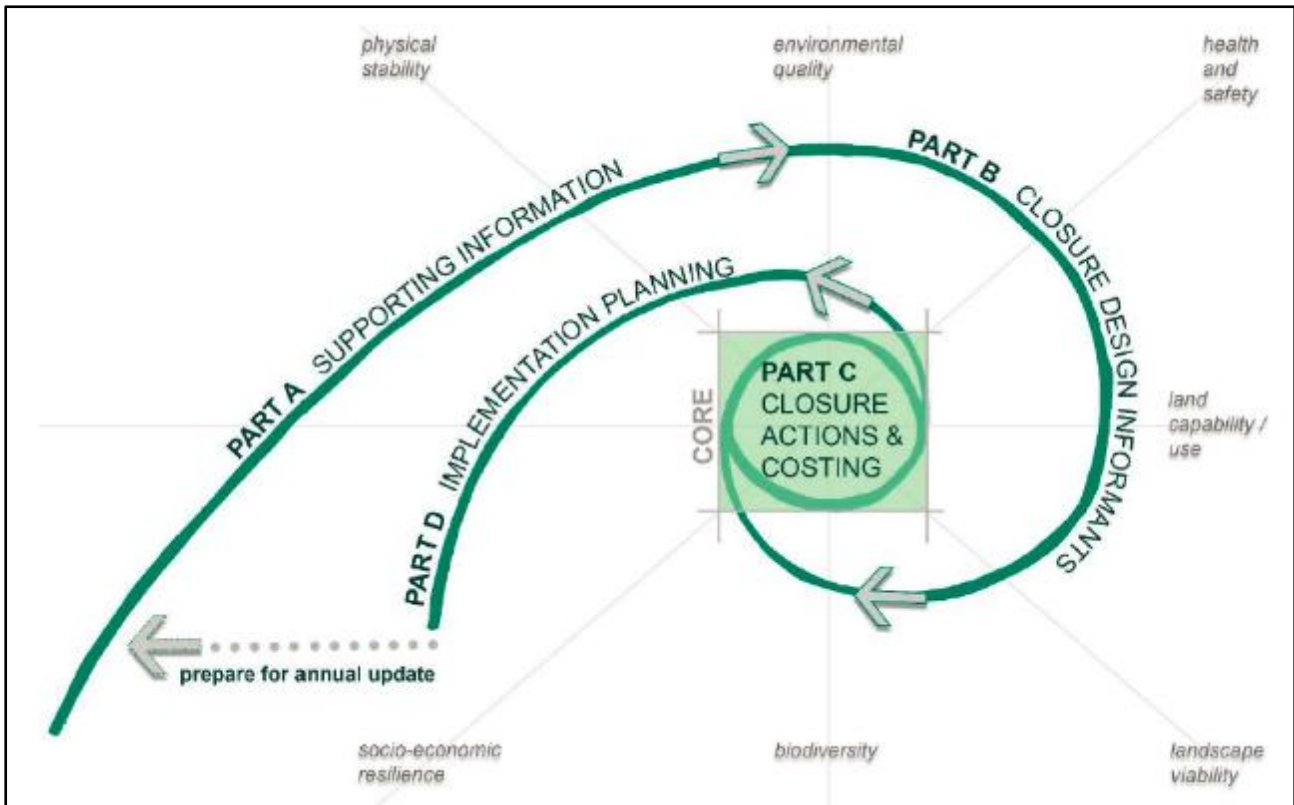
This iterative process underpins the principle that planning for closure should occur throughout the life of the mine, with solutions continually being refined via a cyclical process of survey, analysis and design.

2. An entrenchment of seven key closure objectives:

	<p>To create a physically stable, safe, rehabilitated landscape that limits long term environmental degradation, erosion and failure / collapse of unavoidably remnant mining residue which are present on the mine site post closure, thus enabling the successful establishment of the planned post-mining land use</p>
	<p>To ensure that local environmental quality is not adversely affected by possible physical effects and chemical contamination arising from the mine site or individual facilities, as well as to sustain catchment yield as far as possible after closure</p>
	<p>To limit the possible health and safety threats to humans and animals using the rehabilitated mine site as it becomes available</p>
	<p>To re-instate a suitable land capability over the mine site to facilitate the progressive implementation of the planned post-mining land use</p>
	<p>To create a landscape that is self-sustaining and over time will converge to the desired ecosystem structure, function and composition</p>
	<p>To encourage, where appropriate and as aligned to the planned post-mining land use, the re-establishment of native vegetation on the rehabilitated mine site such that the terrestrial biodiversity is largely re-instated over time</p>
	<p>To ensure that there constructive engagement and alignment with local communities and regulatory authorities regarding the proposed end land use</p>

3. The application of a tiered risk-based process to allow for a true understanding of the challenges and opportunities that needs to be addressed and refining, abstracting and prioritising essential issues.

The structure, development (intensification) and application of the above foci is illustrated below, with each section of the Closure plan described below.



Preferred Closure Options

The preferred option for current closure planning is:

- Backfill the open pit with all the available overburden to create a free-draining post mining landform in line with final land use requirements;
- Construct slopes congruent with the surrounding topography and not steeper than a gradient of 1:9;
- Replace all topsoil stripped ahead of mining;
- Plant naturally occurring grasses to prevent erosion, to provide a wilderness land use, potential habitat and limited grazing potential.

Planned Rehabilitation

The mining layout is indicated in Figure 45. It is anticipated that the footprint of the overburden stockpile may be reduced through the implementation of concurrent rehabilitation. The anticipated stages of mining are also indicated in Figure 45. The final land form is presented in Figure 45.

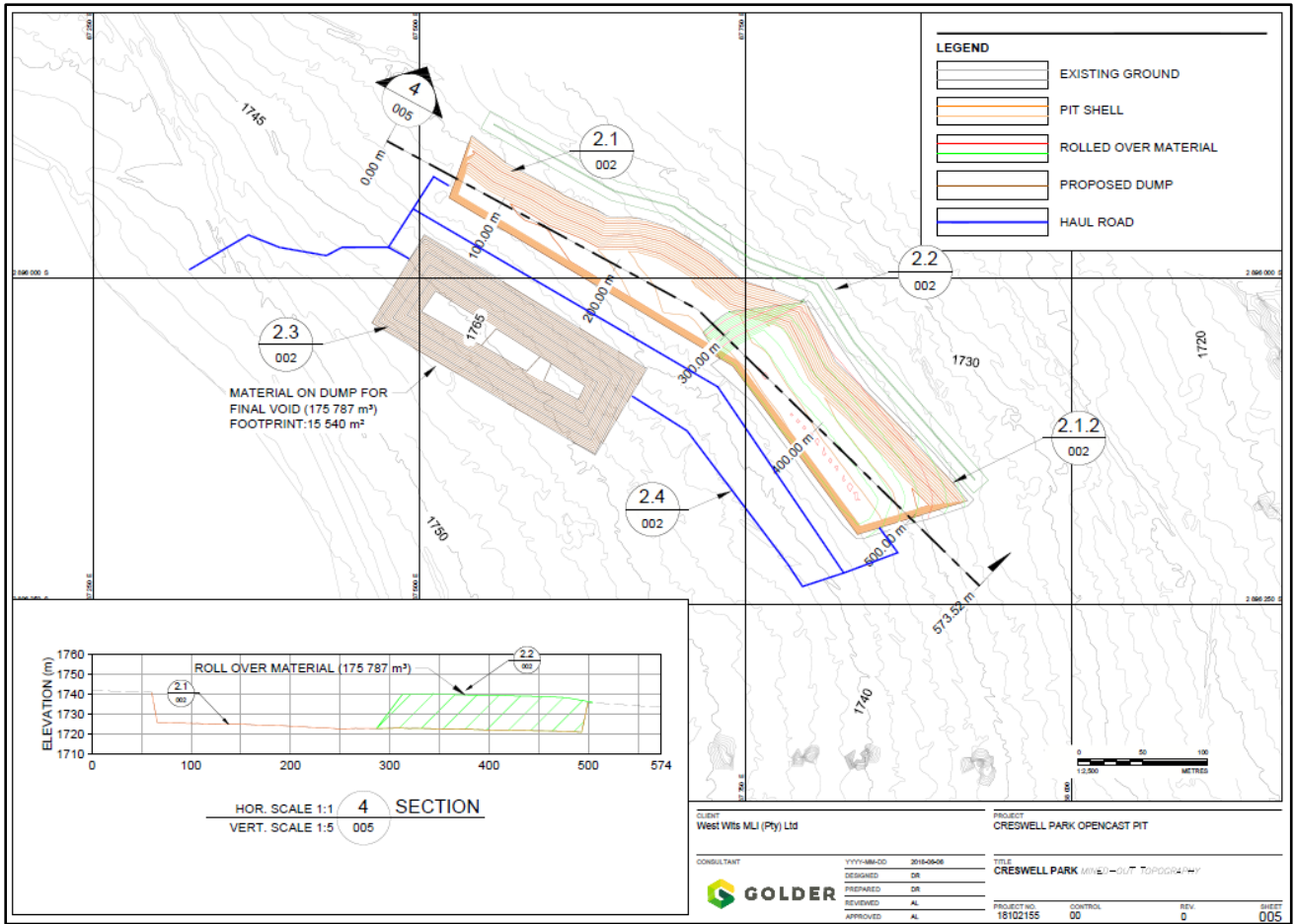


Figure 45: Mining sequence, concurrent backfill and final void.

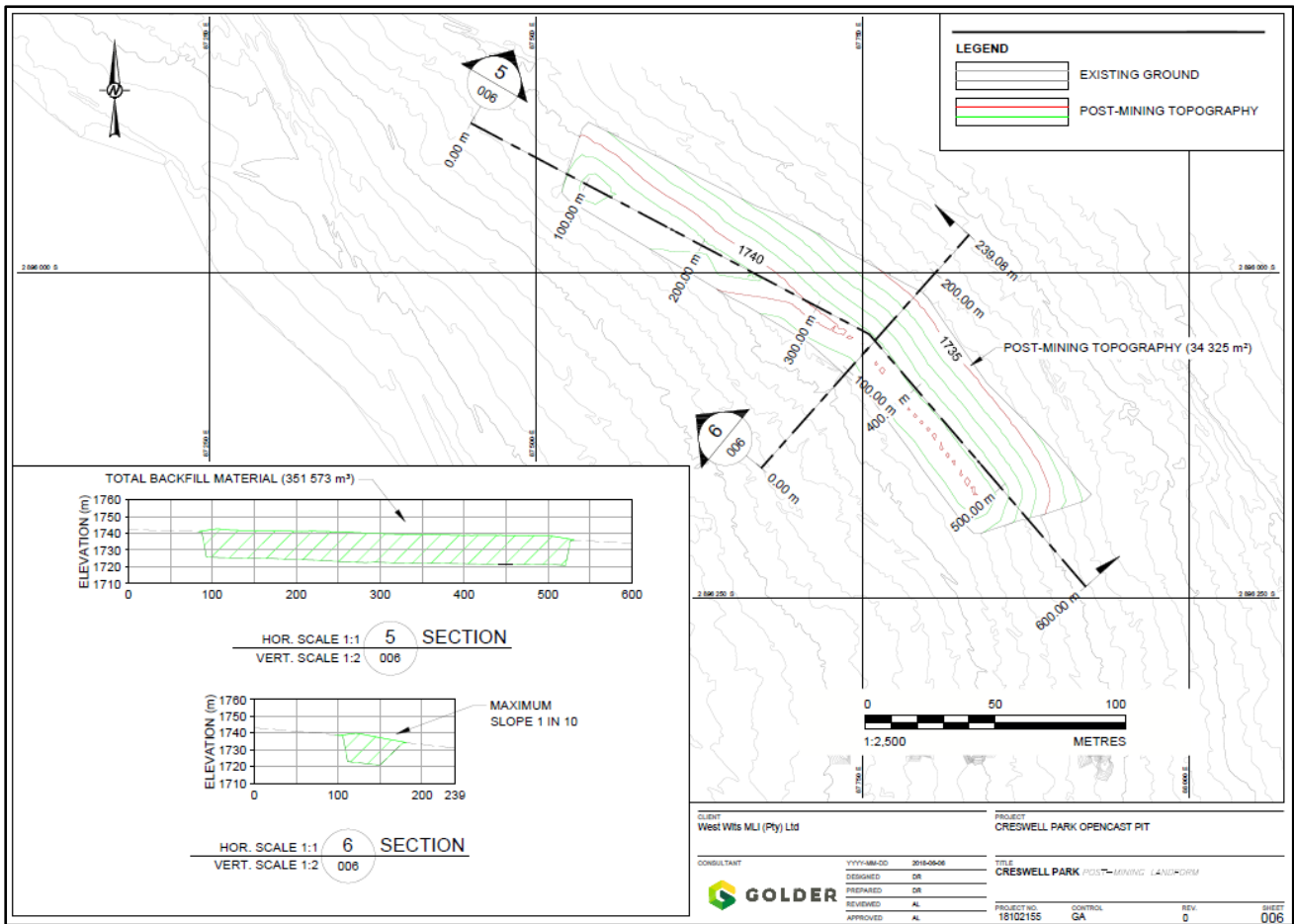


Figure 46: Post Mining Landform

Preliminary Closure Schedule

The preliminary closure schedule is presented in Schedule Table, including the closure and post closure timeline. The closure plan is a live document that should be updated regularly throughout the life of the mine, as solutions are continually refined and the knowledge base is developed.

Table 27: Preliminary Closure Schedule

Facility life/ phase	Activity	Timeline	Frequency
Operational	Further refine / update the closure plan and closure action plan to incorporate detailed specialist assessment outcomes	2018/19	As required
	Develop cash flows and related financial information for funding the implementation of the stipulated closure measures	2018/19	As required
	Ongoing environmental monitoring to establish baseline conditions to benchmark the closure situation	Pre-mining and the LoM	Monthly

	Engage with relevant stakeholder and I&APs with respect to concurrent rehabilitation, closure planning and end land use	To be informed by stakeholder engagement plan (SLP 2018).	
	Compile final closure plan	2018/19	Once-off
Closure	Backfill final void, replace topsoil, prepare and revegetated all affected areas; and General site rehabilitation	2018/19	Once-off
	On-going communications with regulatory bodies and submission of required reporting and applications	To be determined	As required
Post-closure	Maintaining closure measures and conducting required inspection and monitoring to demonstrate achievement (success) of closure measures	+ 3 years post closure	As informed by operational monitoring
End state/land use	Implement agreed-upon end state/land use	Approximately 3 years post-closure	Once-off
	On-going care and maintenance as per arrangement with regulators, as required	As agreed upon with regulators	

Conclusion and Recommendations

The closure cost estimate must be updated annually during the operation's life to reflect known developments, including changes from the annual review of the closure strategy assumptions and inputs, scope changes, the effect of a further year's inflation, new regulatory requirements and any other material developments (GNR 1147). A preliminary schedule of monitoring, auditing and reporting requirements which relate to the risk assessment, legal requirements and knowledge gaps is proposed as follows

- Internal annual rehabilitation audits co-ordinated by the mine and including soils, groundwater and closure specialists. The purpose is to review the closure plan and monitoring the implementation of concurrent rehabilitation measures;
- External financial audits co-ordinated by the financial manager and the Closure manager, by suitable qualified independent auditors; and
- Legal compliance audits co-ordinated by the Mine manager aligned with Environmental Authorisation requirements. Relevant aspects relating to closure, such as changes to the risk assessment, changes in closure options and changes in the closure provision will be reported.

This primary closure plan, is compiled in the overall approach and structure to align for closely to Appendix 4 of GN.R. 1147, namely minimum content of a final rehabilitation, decommissioning and mine closure plan. This plan also reflects an integration and consolidation of closure-related studies and additional specialist work recently undertaken.

- Develop the conceptual post mining landform to detailed design level prior to the commencement of the concurrent backfill;
- Capture improved accuracy regarding the bulking factor into the design and planning and costing as required;
- Develop and include a detailed topsoil balance for the site based on actual survey data to replace the current estimates;
- Utilising the improved topsoil data to accurately plan the topsoil placement depths;
- Capture the updated outcomes of the refined ground water model which will be updated with site specific monitoring data from the proposed boreholes;
- Incorporate the relevant outcomes of the specialist studies detailed in the scoping report and EIA phase of the larger mining right application;
- The detailed social aspects of this closure plan is currently being incorporated into the broader mining right application which have a more comprehensive approach. The relevant components must be used to inform the further development of this closure plan;
- Develop a detailed monitoring plan;
- Develop detailed relinquishment criteria
- Refine the closure scheduling; and
- Include a revision of the closure costs to improve the accuracy running into the closure phase.

Closure Cost Assessment

The summary of the scheduled closure costs calculated for the proposed Creswell Park opencast pit are indicated in the table below.

Table 28: Schedule Close Cost

18102155 Creswell Park Opencast Pit Closure Costs, as at June 2018			
Closure components		Unscheduled Closure (2018)	Scheduled Closure (2019)
1	Infrastructural aspects	R -	R -
2	Mining aspects	R -	R 3,394,419.55
3	General surface rehabilitation	R -	R 94,322.26
Sub-Total 1		R -	R 3,488,741.81
5 Post-Closure Aspects			
5.1	Surface water monitoring - 5 years	R -	R 229,994.20
5.2	Groundwater monitoring - 5 years	R -	R 313,888.70
5.3	Rehabilitation monitoring - 3 years	R -	R 211,722.00
5.4	Care and maintenance - 3 years	R -	R 219,372.71
5.5	Contingencies for post-closure aspects	R -	R 97,497.76
Sub-Total 2		R -	R 1,072,475.37
6 Additional Allowances			
6.1	Preliminary and general	R -	R 348,874.18
6.2	Contingencies	R -	R 348,874.18
6.3	Additional studies	R -	R 208,792.50
Sub-Total 3		R -	R 906,540.86
Grand Total Excl. VAT. (Sub-total 1 +2 +3)		R -	R 5,467,758.04

Radiation

Information in this section was obtained from the Radiation Statement (SciRAD Consulting, May 2018). For full specialist statement refer to Appendix G-viii.

SciRAD consulting was appointed to provide a statement on Radiation impact for the West Wits – Creswell Park mining permit and the possible health risk for surrounding communities and workers. Uranium and Thorium and their daughter products (e.g. Radium and Radon) are the radioactivity found in the gold and uranium bearing ore. The radiation from the ore may present a health risk to the public living close to the mine. The risk to members of the public can be influence by a number of factors and may come from various sources:

- Inhalation of radioactive dust and radon,
- Exposure to the radioactive dust deposited in the area as a result of the mining operations.

However, studies at a number of mines in the Witwatersrand area have shown that the radiation dose to members of the public is not expected to exceed the 250 microSievert (0.25 mSv/a) per year dose constraint (for a single operation) set by the National Nuclear Regulator (NNR). In addition, for the

Creswell Park operations, dust concentrations are expected to be low with mitigation measures (refer to the Airshed Air Quality Assessment), groundwater in the area is not potable (refer to the Noa Agencies Groundwater Report) and tailings - that could potentially pollute the environment – will not be present. These aspects will contribute to a reduction in the radiation dose compared to other operations. It may therefore be concluded that radiation from the Creswell Park mining operation presents a very low health risk to members of the public.

The health risk for workers at the mine will be exposed to the same radiation sources as the public but at higher concentrations, due to closer proximity to these sources. Still, the worker doses are not expected to exceed the worker dose limit of 20 mSv/a (20 000 microSievert per year). The radiation from the Creswell Park mining operation may therefore present a low health risk to the workers on site.

Possible risk after closure. Remediation, from a radiological perspective, must be performed according to the NNR's Regulatory Guide – Site Remediation and Release from Regulatory Control (RG-0026). If remediation is done properly, the risk to the environment and the public is expected to be low. A radiological assessment has been initiated to determine the remediation requirements for the activity. The assumed conclusion can only be confirmed once the radionuclide analyses have been received and used as input in the radiological assessments that are currently underway.

Vibration Assessment

Information in this section was obtained from the Vibration Statement (Cambria CC, May 2018). For full specialist statement refer to Appendix G-viii.

Cambria CC was appointed to assess the possible impact associated with vibration during opencast mining at the West Wits – Creswell Park mining permit area. Vibration measures were undertaken at an existing opencast area (i.e. Sol Plaatjie). No blasting will take place on site and rock breaking will be done through modern rock breaking methods (Xcentric rippers). As a result that no blasting will take place the risk of rock fly is negligible small and was not assessed as a risk.

A White Industrial Mini Seis II seismograph was used to measure the disturbance levels. The seismograph is equipped with a tri-axial geophone and a microphone so it is capable of measuring vibration and noise simultaneously. The seismograph was initially set up at a distance of 15m from the ripper. The trigger levels were set to 0.762mm/sec for ground vibration and to 106dB for air disturbance (noise). Monitoring was carried out at both locations for almost one hour. The seismograph was then moved to a second position 45m away from the ripper. The vibration trigger level was initially set to 0.254mm/sec and the air trigger was left at 106dB, which is the lowest possible trigger setting.

The vibration trigger was then changed to 0.381mm/sec because of the number of haul trucks that were moving in the close proximity to the seismograph location.

Analysis of the ground vibration levels recorded at a distance of 15m from the ripper shows that 57% of the events recorded registered levels of less than 1.0mm/sec, 89% of the events recorded registered levels of less than 1.5mm/sec, 95% of the events registered levels of less than 2.0mm/sec and 100% of the events registered levels less than 2.5mm/sec.

The vibration levels were highest close to the ripper and the levels had attenuated significantly at a distance of 45m. The same was true for the air /noise disturbance. In the table below the ground vibration level reduces from 2.29mm/sec at 15m to 0.508mm/sec at 45m. The highest PPV level recorded at 15m from the ripper was utilised to model the possible impact of ground vibration with increase in distance. The results show how the PPV levels decrease rapidly with increase in distance. The results show how the PPV levels decrease rapidly with increase in distance. Based on the measurements made and the calculations performed the vibration levels at any distance greater than 100m from the pit will be imperceptible. If the calculated values are compared to the USBM and DIN recommended standards it is clear that they are well within the proposed limits. The results are presented below.

VIBRATION	
Distance increment metres	Vibration Level
Distance (m)	PPV (mm/s)
15	2.28
20	1.42
30	0.73
35	0.56
40	0.45
45	0.37
50	0.31
100	0.10
150	0.05
200	0.03
235	0.02

Despite the low levels predicted, the vibrations may still attract attention as the highest levels fall into the 'distinctly perceptible' human response category at distances starting at about 50m. The effect of ground vibrations on humans is summarised in the Table 27.

Ground Vibration Limits

Human response to ground vibration

Although buildings can withstand ground vibration amplitudes of 12.7 mm/sec or more, depending on the frequency, human beings are easily disturbed at lower levels. The typical human response to ground vibration is illustrated in the table below.

Table 29: Human response to ground vibration

Effect on Humans	Ground Vibration Level in mm/sec
Imperceptible	0.025 – 0.076
Barely perceptible	0.076 – 0.254
Distinctly perceptible	0.254 – 0.762
Strongly perceptible	0.762 – 2.540
Disturbing	2.540 – 7.620
Very disturbing	7.620 – 25.400

Ground vibration levels of 0.76 to 2.54 mm/sec received at a structure are perceptible, but the probability of damage is almost non-existent. Levels in the 2.54 to 7.6 mm/sec can be disturbing and levels above 7.6 mm/sec can be very unpleasant, although permanent damage to structures are unlikely.

Building response to ground vibration

Although there are no formalized limits to vibration, the United States Bureau of Mines (USBM) limits are commonly applied in South Africa. The limiting curve is shown in Figure 47 and it has been developed from empirical studies (Siskind et.al. 1980).

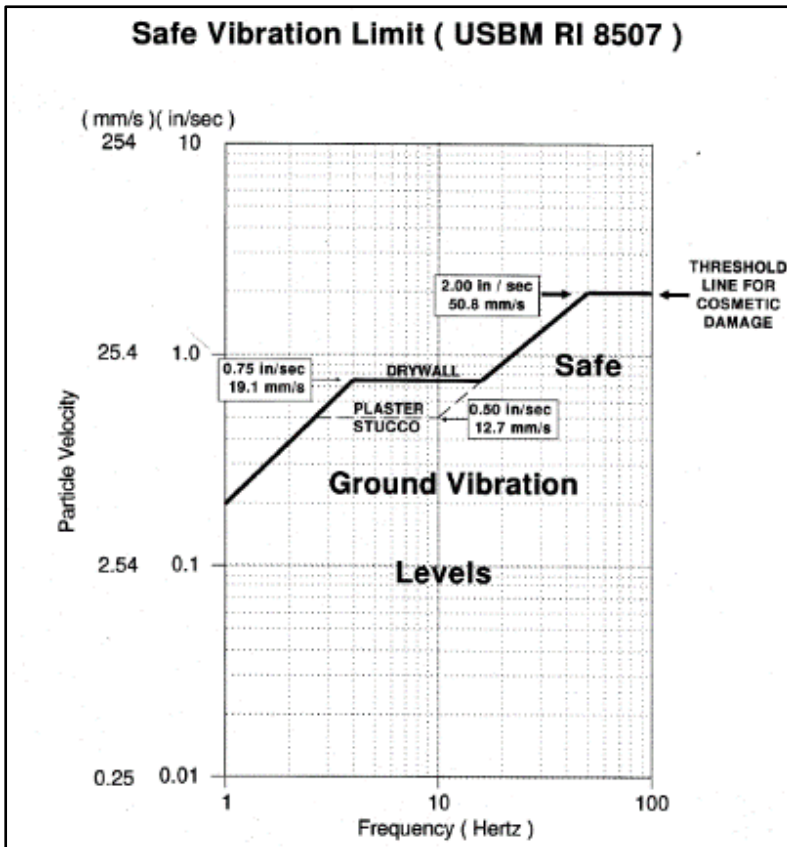


Figure 47: USBM curve that is generally used in South Africa.

The limiting curve in Figure 47 represents the limit for cosmetic damage to a house. The maximum ground vibration amplitudes are frequency dependent with higher frequencies allowing higher peak amplitudes. In general, at lower frequencies (less than 10 Hz), the ground vibration should not exceed 12.7 mm/sec, but at higher frequencies, the limit can increase to 50 mm/sec.

Conclusion

The ground vibration levels were highest close to the Xcentric ripper's area of operation. The levels attenuated rapidly with increase in distance. Vibration levels at distances greater than 50m will be negligible in this geological environment. The ground vibration levels recorded in close proximity to the equipment were not high enough to cause damage to structures. The levels recorded at a distance of 45m were even lower and is within the lower end of the *Distinctly Perceptible* range. The vibration decreases to the imperceptible range within 100m from the activity. The close sensitive receptor to the proposed Creswell Park mining activity will be greater than 50m and based on the measurements will be between the distinctly perceptible to barely perceptible range. For a comprehensive noise assessment, refer to the noise impact assessment in Appendix G.

The Kimberley Reef rock in pit 3 was weathered and appeared to break very easily. The vibration levels will vary in response to how competent the rock mass is in a specific geological environment. The low levels recorded in pit #3 would not necessarily be the case in other areas where a more competent rock mass is encountered. Higher vibration levels should be expected when this occurs. It may be necessary to carry out control monitoring in the different mining areas as and when required.

Socio-Economic Environment

Information in this section was obtained from the West Wits Social and Labour Plan (April 2018).

The socio-economic profile of the area was compiled from the 2017-2018 City of Johannesburg draft Integrated Development Plan (IDP) Review, Stats SA 2011 Census data and Stats SA 2016 Community Survey. This information is supplemented by information from the Gauteng Socio-economic Review and Outlook (2016), the City of Johannesburg Annual Economic Review (2015) and Wazimap Municipal Data (2016). The emerging socio-economic profile from this desktop review also provides the backdrop for the development of the West Wits Mining Community Development Strategy upon which the Local Economic Development (LED) projects are premised.

Demographics

The size of the population of City of Johannesburg Metropolitan Council (CoJ) as per the 2016 Stats SA Community Survey results is 4.9 million people. This makes it the biggest Metro by population size in South Africa and is projected to grow to 5.4 million by 2021 and to 7.6 million by 2027. The City of Johannesburg population represents 36% of the Gauteng Province population, and 8.9% of the country's population. The mining permit area is located in Ward 127 and on the boundary of Ward 84.

A general trend emerging from the first Census of 1996 is that the white population is decreasing in proportion to the other races in both the province and the municipality. The CoJ population continues to grow at an annual rate of 2.0% - 2.3% with a third of the population comprising young people aged between 14 and 35 years. The growth rate could also be attributed to the monthly inflow of mainly migrants to the city for better opportunities, estimated to be approximately 3000 each month.

Table 30: Population Distribution

Population	City of Johannesburg		Ward 127	Ward 84
	Census 2001	Census 2011	Wazimap Municipal Data 2016	
Total Population	3 226 055	4 434 827	38 731	33 179
African	73.5%	77.1%	99%	35%
Coloured	6.4%	5.6%	0%	20%
White	16.0%	12.4%	0%	39%
Indian or Asian	4.2%	4.9%	0%	5%
Other			1%	1%

Source : Stats SA Census 2001 and Census 2011; Wazimap Municipal Data 2016

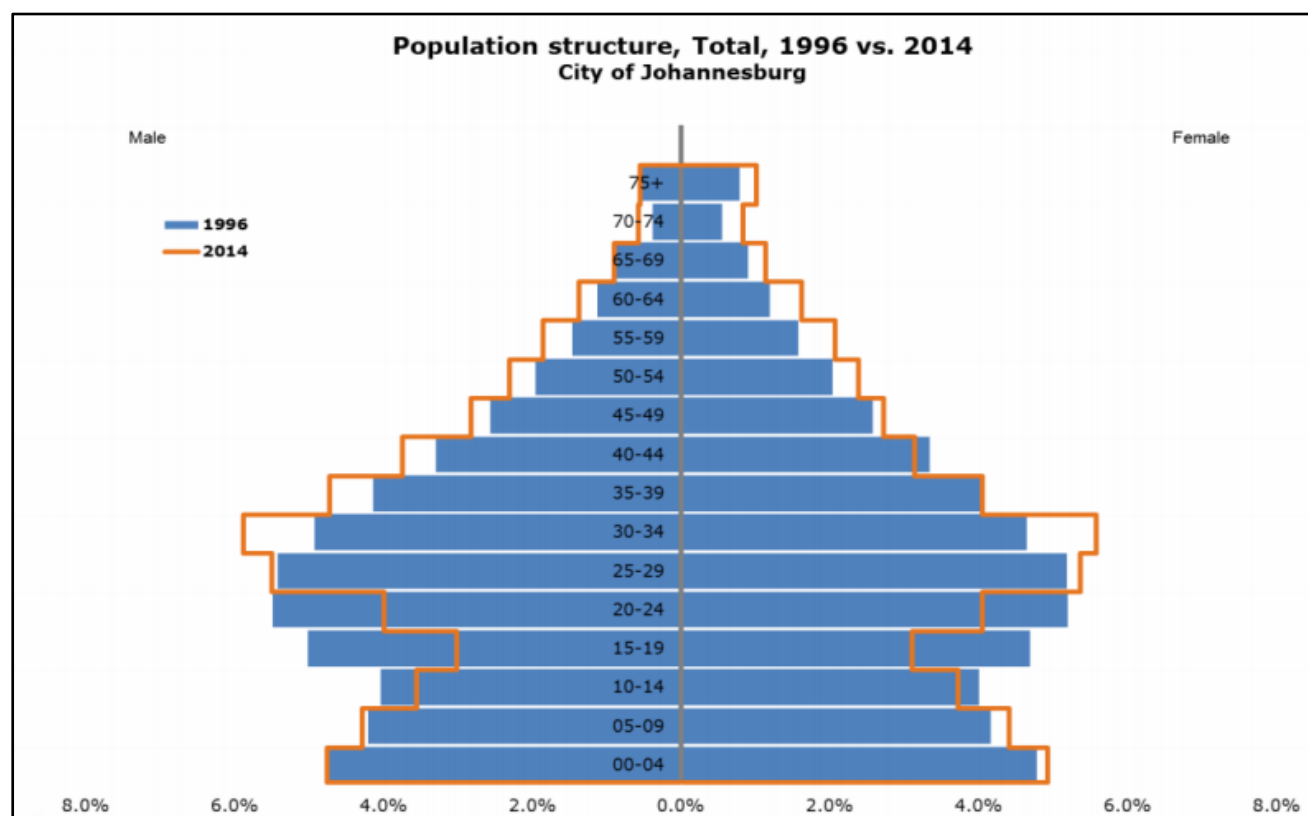


Figure 48: City of Johannesburg population pyramid, 2014

The bulk of the population, i.e., more than two-thirds, is aged between 15 to 64. The older population aged 64 and older remained unchanged over the two Census periods of 2001 and 2011, while the rest of the population saw insignificant growth. The median age is 26 in Wards 127.

Table 31: Household Dynamics

Socio-Economic Indicators	Gauteng Province	City of Johannesburg
Total household population	11 567 089	4 132 148
Total number of households	3 909 022	1 434 856
Average size of households	3.0	2.9
Female headed household (%)	36.2	34.1
Child headed household (%)	0.3	0.3

Source : Stats SA Census 2011 ; Community Survey 2016

The total number of households in the municipality stood at 1.4 million households during Census 2011 and has increased to 1.85 million as reported in the Stats SA 2016 Community Survey. This number is expected to grow at an annual rate of 3.5% to 3.9% to approximately 2.16 million by the year 2030. Sixty-four percent (64%) of households were headed by males, and 36% by females. While Census 2011 showed a decline in the proportion of households headed by children, the Stats SA 2016 Community Survey highlights a growing trend of male, child-headed households in South Africa.

Table 32: Households by Type of Dwelling

Type of Dwelling	Gauteng Province	Ward 84	Ward 127
House	55.4%	61%	33%
Shack	17.8%	0.7%	50.4%
Backyard in Flat	5.3%	7%	4.4%
Semi-detached house	1.1%	12%	2.6%
Other	20.5%	11%	9.1%

Source : Wazimap Municipal Data (2016)

Slightly more than half of households of Ward 127 reside in shacks, while Ward 84 has the least number of shacks. This is partly because Ward 84 comprises mainly of residential houses. There is an increase in the proportion of households residing in formal dwellings across the province and in the CoJ. Similarly, the use of traditional dwellings first increased in the past decade but has declined steadily to date.

Most of the City's population resides in formal houses in urban areas while the number of those who dwell in traditional houses or farm areas has declined significantly, especially after 1994. According

to the Gauteng Socio-economic Review and Outlook (2015), urban areas are linked to the trend towards the urbanization of poverty, with a proliferation of informal settlements characterised by extreme levels of unemployment and poverty. It is estimated that over 4.4 million people live in informal settlements in Gauteng, with most of them being in the City of Johannesburg alone. Ironically, the City is at once, a centre of high economic activity and poverty and inequality. This challenge poses a dilemma for City officials and calls for concerted and proactive responses to, and management of the urbanization process. The City's rapid urbanization has several implications, i.e., increase in social problems such as: i) housing backlogs, ii) growth in informal settlements, and iii) overcrowding and its attendant problems of squalor and health related problems.

Table 33: Access to Basic Services

Socio Economic Indicators	Gauteng Province		City of Johannesburg Metropolitan Council	
	2001 (%)	2011(%)	2001(%)	2011(%)
Flush toilet with sewerage system	78.2	83.1	82.3	87.1
No access to any toilet facilities	3.6	1.1	2.8	0.8
Weekly waste removal	84.6	89.8	93.9	97.0
Own refuse dump	12.4	7.9	4.8	2.3
No rubbish disposal	3.0	2.0	1.3	0.5
Electricity used for cooking	72.0	83.9	78.7	87.4
Electricity used for lighting	80.1	87.4	84.9	90.8
Electricity used for heat	69.4	74.7	76.9	82.1
Piped water inside dwelling/yard	82.7	89.4	84.5	91.6
Piped water on communal stand	14.5	8.8	12.6	7.0
No access to water	2.9	1.8	3.0	1.4

Source : Stats SA Census 2001 and Census 2011

While a large percentage of the City's households enjoys access to basic services such as electricity, piped water and flush toilets, a significant proportion of the population is still without the means to access and/benefit from these services. This is partly due to increasing inward migration, growth in the number of households and rapid urbanisation. Furthermore, poor households cannot afford to pay for these basic services, let alone for their places of abode. Wazimap Municipal Data for 2016 shows that some households occupied houses without paying rent – 4% in Ward 84 and 45% in Ward 127. Lack of affordability poses a challenge for the City, which must create mechanisms to expand delivery to meet the growing demand and to constantly review tariffs in efforts to facilitate affordability for the poor.

Table 34: Population by Highest Educational Level

Educational Level	Gauteng Province	Ward 84	Ward 127
No schooling	3.6%	0.9%	5.4%
Other	0.5%	0.9%	0.2%
Some primary	7.3%	3.1%	12.1%
Primary	3.3%	1.5%	6.6%
Some secondary	32.2%	24.5%	45.5%
Grade 12	39.7%	52.5%	28.7%
Undergraduate	6.8%	9.6%	1.1%
Post graduate	4.1%	4.8%	0.4%
N/A	2.5%	2.3%	0.3%

Source : Wazimap Municipal Data 2016 ; Stats SA Census 2011

According to Stats SA 2016 Community Survey, illiteracy levels have declined significantly since the first Census of 1996. The reduction in illiteracy levels is further corroborated by figures for school attendance in the 2 Wards (90% in Ward 84 and 84.5% in Ward 127). While this improvement augurs well for functional literacy, the City should aim at improving the number of individuals with appropriate skills that can be sold to the labour market.

Table 35: Average Annual Household Income

Income Category	Gauteng Province	Ward 84	Ward 127
No income	17%	13.3%	30%
Under R4 800	3%	1%	5.4%
R 5 000 - R 10 000	5%	1.7%	7.8%
R 10 000 to R 20 000	12%	5.8%	16%
R 20 000 – R 40 000	17%	8.1%	21.7%
R 40 000 – R 75 000	15%	11.7%	12.1%
R 75 000 – R 150 000	11%	15.1%	3.6%
R 150 000 - R 300 000	9%	19.2%	1.7%
R 300 000 – R600 000	7%	16.5%	1%
R 600 000 – R 1 200 000	3%	5.8%	0.2%
R 1 200 000 – R 2 500 000	1%	1.1%	0.1%
Over R 2 500 000	1%	0.8%	0.0%

Average annual household income is a median estimate, which is the band at which the incomes of half of households are at or below. Thus, the average annual household income across the City, the province and country is R 29 400. This figure is applicable to Wards 84, but not to Ward 127 which has an average annual household income of R14 600; about half the amount earned on average in Gauteng Province and in South Africa. A third of the population of Ward 127 (approximately 30%) earns no income at all, while about 10% of households survive on earnings of less than R10 000 per annum.

Table 36: Annual Employee Income

Income Category	Gauteng Province	Ward 84	Ward 127
No income	8%	6.9%	8.1%
R1 - R4 800	3%	1.5%	4.1%
R 5 000 - R 10 000	4%	2%	8.7%
R 10 000 to R 20 000	11%	5.6%	23.8%
R 20 000 – R 40 000	20%	9.5%	31.5%
R 40 000 – R 75 000	15%	13.7%	12.2%
R 75 000 – R 150 000	13%	20.4%	3.4%
R 150 000 - R 300 000	11%	20.2%	2.2%
R 300 000 – R600 000	6%	7.1%	0.8%
R 600 000 – R 1 200 000	3%	1.5%	0.1%
R 1 200 000 – R 2 500 000	1%	0.6%	0.1%
Over R 2 500 000	1%	0.4%	0.1%
Unspecified	6%	10.6%	5.1%

Source : Wazimap Municipal Data 2016

Average annual employee income is a median estimate, which is the band at which the incomes of half of the workers are at or below. Thus, the average annual employee income across Wards 127 is the same as the average annual income in South Africa at **R 30 000**. The average annual employee income in Gauteng Province is higher at **R 57 500** than Ward 127, however the average annual income for Ward 84 is more than double the amount in Gauteng at **R 117 000**.

Employment and Procurement Requirements

West Wits at the Sol Plaatjie operation employs 47 employees, 16 permanent employees and 31 contract employees. It is envisaged that the number of people (permanent and contractors) employed will remain the same for this proposed project. The procurement requirements will be communicated before the commencement of the project. The procurement for the project will be aligned to the requirements as set out in the Social and Labour plan of the West Wits mining right and will take the requirements of the Broad-Based Black Economic Empowerment Act into consideration.

Land Claims

A land claim has been lodged in terms of the Restitution of land Rights Amendment Act, 2014 (Act no 15 of 2015) on Portion 407 and 408 of the Farm Roodepoort 237 IQ. The Commission will not process the above claim until it finishes claims lodged by 31 December 1998 or until Parliament passes a new law providing for re-opening of lodgement of claims. It is important to note that the provisions of section 11(7) of the Restitution of land Rights Amendment Act, 1994 do not apply until after the Commission has accepted the claim for investigation and published its details in the Government Gazette.

The mining permit will be located on a portion of Portion 408 and a section of the haul/access road will be located on a portion of Portion 407 of the Farm Roodepoort 237 IQ. Where section 11(7) of Restitution of land Rights Amendment Act, 1994 applies, the land claim commission will be informed a month before any activity is undertaken on the property.

(b) Description of the current land uses

The proposed mining area is vacant with no formal land use taking place. The area is dominated by historical mining activities, alien vegetation and illegal waste dumping (See



Figure

49

to



Figure 54). Some illegal mining has taken place on the site and illegal mines are very active in the surrounding areas. Informal gravel roads have been established on site to provide frequent access for the activities mentioned.

The Transformed Habitat Unit is considered to be in a significantly modified ecological condition, abundant in alien and invasive floral species such as *Tagetes minuta*, *Acacia mearnsii* and *Melia azedarach*. The transformed areas also include existing illegal and historical mining areas. As a result of habitat degradation and alien and invasive plant proliferation, the habitat suitability for faunal and floral species has been significantly compromised. No drainage lines or water resources are located on the site or in close proximity.

Only a small portion of a wetland was identified approximately 482m north of the Mining Permit Application Area. Due to the distance of this wetland from the Creswell Park Mining Permit Application Area and the fact that this wetland feature is upgradient of the Mining Permit Application Area and the fact that extensive urban infrastructure occurs between the feature and the proposed mining area, it is considered unlikely that the proposed mining activities within the Mining Permit Application Area will pose a risk to the wetland.

Surrounding land use map is included in Appendix E.

Surrounding land uses include *inter alia*:

- The proposed opencast pit borders on the Creswell Park residential area to the south, north and east.
- A historical mining residential area is located south of the proposed permit area.
- A school (Laerskool Die Ruiters) is situated approximately 500m to the northeast;
- A burial Ground is located approximately 200m to the northwest;

- Historical mining and waste dumps are located 800m south and 1.6 km southwest from the study area;
- Access to the site is obtained from Miles Stoke Road that is located to the west;
- The R41 (Main Reef road) is located 300 m south of the study area;
- A railway line is located more than 500m to the north of the area with the Georginia station on the line is approximately 650m to the north of the area.
- Hamburg Road (R24) is about 200 m north of the proposed pit;
- The Rand Leases Bowling club is located about 400 m north; and
- The Durban Deep Golf Course is approximately 1 km southwest of the proposed pit;



Figure 49: Site from the Eastern boundary



Figure 50: Site from the Western boundary with Miles Stoke Road



Figure 51: Burial Ground northwest of the site



Figure 52: Historical mine houses south of the site.



Figure 53: Gravel road and waste dumping



Figure 54: Alien Vegetation, Northern side

(c) Description of specific environmental features and infrastructure on the site

Environmental Features

No sensitive features are present within the proposed site footprint. Sensitive features located adjacent to the proposed area include the following. As identified in specialist studies.

- No water resource features are located on or around the site. The closest feature is a wetland area more than 480m from the site.
- Burial Ground – Municipal Roodepoort Muslim and Hindu Cemetery
- Heritage buildings in the Creswell Park area.
- Surrounding residential areas, sensitive receptors.
- Possible heritage site – Historical ash midden
- Servitude – Pipe line

A sensitivity map of the area is included in Appendix E – Sensitivity Maps

(d) Environmental and current land use map

(Show all environmental, and current land use features)- **Please see Appendix E – Land use map**

The proposed site and surrounding areas consist out of the following land uses as presented in Figure 54. The figure also indicated the proposed residential development that will be located in the area.

- Formal Urban
- Industrial
- Mining
- Vacant

- Build Up Area

10. Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).

The following table contains impacts identified for the activities associated with the proposed mining development. The impact methodology used to determine the significance of the impact is presented in **Table 37** below. Significance is determined through a synthesis of the various impact characteristics and represents the combined effect of the Irreplaceability (Magnitude, Extent, Duration, and Intensity) multiplied by the Probability of the impact.

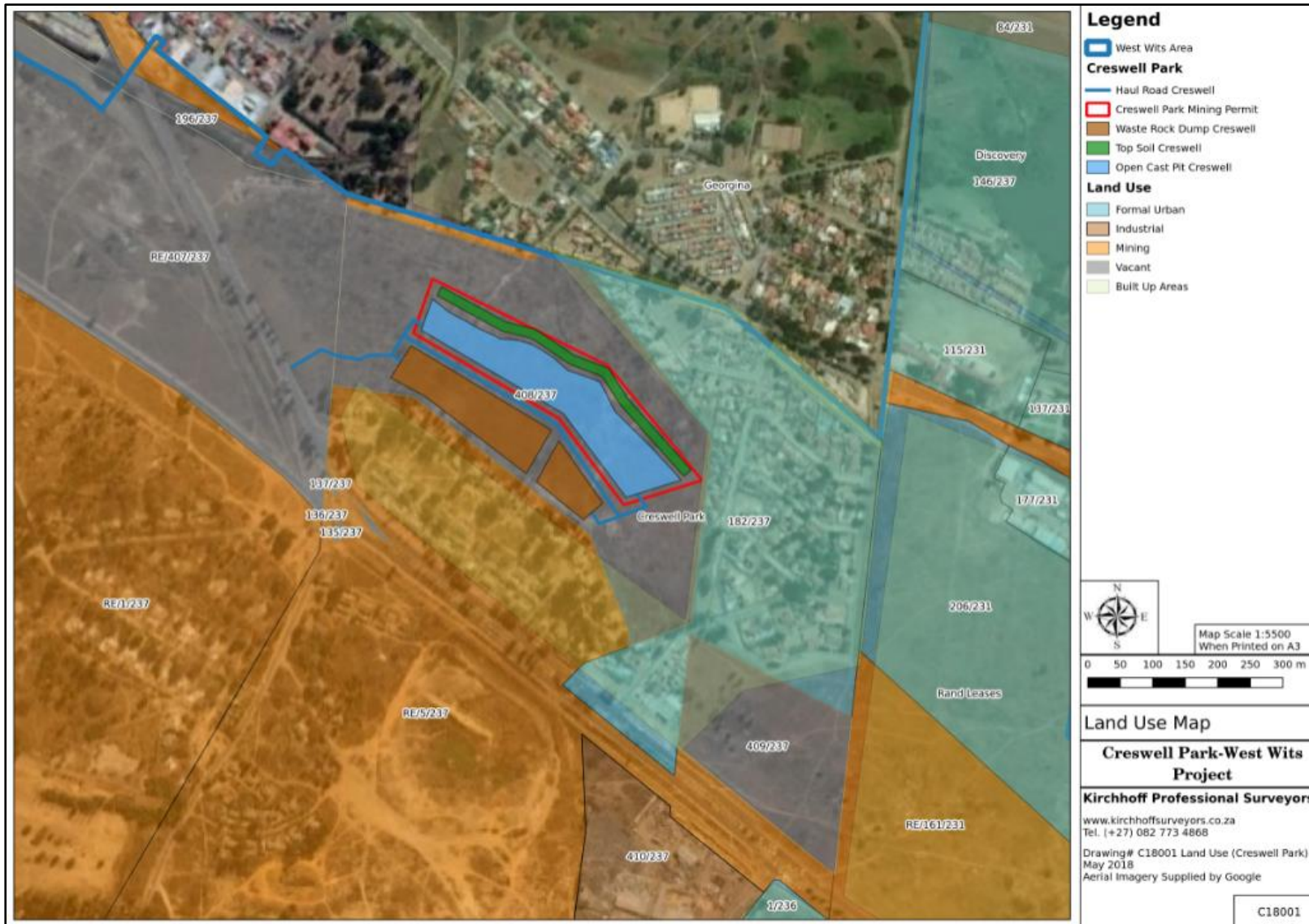


Figure 55: Land Use Map

Table 37: Impact Significance Calculation – Construction, Operational and closure phase

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	EXTENT	DURATION	INTENSITY	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE	MITIGATION POTENTIAL	SIGNIFICANCE	CONFIDENCE RATING	CUMULATIVE IMPACTS
									PRE-MITIGATION		POST-MITIGATION		
GEOLOGY AND SOILS	Opencast mining will lead to loss and disturbance to topsoil as a result of clearing of vegetation and excavation of topsoil to stockpile. Loss of soil natural structure and properties (physical and chemical) as a result of stripping and stockpiling of topsoil. The soils natural structure is disturbed and as a result the natural cycle is broken exposing the bare soil to erosion. Decline in topsoil fertility due to mixing of soil's A and B horizons (upper and lower horizons) and due to possible mixing of different soil types	N	2	2	5	3	12	5	60 –Medium	High	36– Low	Certain	Very Low
	Insufficient topsoil quality and quantity present on site.	N	2	5	4	2	13	4	52–Medium	High	26– Low	Certain	Very Low
	Hydrocarbon spills on soils can occur where heavy machinery and vehicles are parked such as the hard park area because they contain large volumes of lubricating oils, hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking.	N	1	1	3	2	7	3	21– Low	Medium	14 - Very Low	Certain	Very Low
	Contamination of soil through the utilization of stormwater for dust suppression	N	1	1	3	3	8	3	24– Low	Medium	16- Very Low	Certain	Very Low
	Loss of topsoil through erosion at stockpiles, pit edges and rehabilitated areas	N	2	5	3	3	13	4	52–Medium	High	39	Certain	Low
	Ineffective soil amelioration resulting in poor vegetation establishment	N	2	5	5	3	15	4	55–Medium	High	30	Certain	Low
	Opencast mining will result in destruction of geological structures. Loss of geological structure, integrity. Loss of natural resources	N	1	5	5	4	15	5	75 – High	Medium	60–Medium	Sure	Low
TOPOGRAPHY	Change in topography as a result of opencast mining. Change in surface drainage	N	1	3	3	2	9	5	45–Medium	Medium	36– Low	Sure	Very Low
	Change in topography as a result of opencast mining. Change in final land form.	N	1	3	3	3	9	5	45–Medium	Medium	36– Low	Sure	Very Low
LAND CAPABILITY	Loss of soil resources for agricultural and other land uses. Loss of soil fertility.	N	2	3	4	3	12	4	48–Medium	Medium	36– Low	Sure	Low
	Change in landforms due to mining activities and rehabilitation of opencast mining area.	N	2	1	3	3	9	3	27	High	18- Very Low	Certain	Very Low
HYDROLOGY GROUNDWATER	Dewatering of local aquifer an impacting local and neighboring groundwater users	N	3	5	5	2	15	1	15- Very Low	High	15- Very Low	Sure	Low
	Mass migration from waste rock dump negatively impacting groundwater quality	N	3	5	5	2	15	1	15- Very Low	High	15- Very Low	Sure	Low
	Formation of Acid Mine Drainage (AMD) and the generation of AMD decant from the rehabilitated pit area	N	3	4	5	3	15	1	15- Very Low	High	15- Very Low	Sure	Low
HYDROLOGY SURFACE WATER	Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality. Change in flow regimes. The impact is cause by compaction of soil, removal of vegetation	N	3	3	3	3	12	4	48–Medium	Medium	36– Low	Sure	Very Low
	Contamination of stormwater runoff from waste rock dump and water flowing into pit area. Changes in water quality. Increase siltation and dissolved solids.	N	3	2	3	3	11	3	33– Low	Medium	22– Low	Sure	Very Low

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	EXTENT	DURATION	INTENSITY	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE	MITIGATION POTENTIAL	SIGNIFICANCE	CONFIDENCE RATING	CUMULATIVE IMPACTS
									PRE-MITIGATION		POST-MITIGATION		
	Pollution of surface water resources through the discharge of contaminated stormwater	N	3	1	3	3	10	2	20- Low	High	10- Very Low	Sure	Very Low
GEOCHEMISTRY	Disposal of waste rock onto the waste rock facility and resulting formation of acid mine drainage conditions	N	3	5	5	2	15	1	15- Very Low	High	15- Very Low	Sure	Low
	Disposal of waste rock onto the waste rock facility and resulting leaching of metal(lion)s, especially arsenic, from the material	N	3	5	5	2	15	1	15- Very Low	High	15- Very Low	Sure	Low
TERRESTRIAL ECOLOGY	Impact on Habitat Integrity for Faunal and Floral Species	N	2	2	3	3	10	5	50-Medium	Medium	40- Low	Sure	Very Low
	Impact on Faunal Species of Conservation Concern	N	2	2	3	3	10	4	40- Low	Medium	30- Low	Sure	Very Low
	Introduction and spread of alien invasive species.	N	4	3	3	3	13	4	52-Medium	Medium	39- Low	Sure	Very Low
CULTURAL HERITAGE	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks. Destruction of historical areas or structures.	N	2	5	3	5	15	3	45-Medium	High	15- Very Low	Sure	Very Low
	Possible destruction of palaeontological fossil material	N	1	1	1	4	7	2	14- Very Low	Medium	7- Very Low	Sure	Low
	Possible destruction of archaeological structures or material	N	2	5	5	4	15	3	45-Medium	Medium	15- Very Low	Unsure	Low
	Possible destruction of burial grounds and graves	N	3	5	5	5	18	3	54-Medium	Medium	18- Very Low	Sure	Low
	Possible destruction of historical structures or material	N	3	5	5	5	18	3	54-Medium	Medium	18- Very Low	Sure	Medium
	Possibility of uncovering subsurface heritage material	N	1	1	1	5	9	2	18- Very Low	Medium	9- Very Low	Unsure	Low
VISUAL AND SENSE OF PLACE	Visibility from sensitive receptors / visual scarring of the landscape as a result of the mining activities. Visual impact as a result of operation of waste rock dump.	N	3	1	3	3	10	5	50-Medium	Medium	40- Low	Certain	Low
	Visual impact resulting for dust and air pollution	N	2	1	3	2	8	4	32- Low	High	24- Low	Certain	Low
NOISE AND VIBRATION	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise and vibration impacts associated with the operation of vehicles, machinery and equipment.	N	3	1	4	3	11	4	44-Medium	Medium	33- Low	Sure	Low
	Increase in background noise levels as a results of site activities. Transporting of ore.	N	3	1	4	3	11	5	55-Medium	Medium	44-Medium	Sure	Very Low
	Mining operations, hauling and decommissioning. Noise impacts generated may impact on the social environment, especially residential areas adjacent to the mining area.	N	3	1	4	3	11	4	44-Medium	Medium	33- Low	Sure	Low
	Mining operations, hauling and decommissioning. Vibration generated may impact on surrounding communities having a negative impact on structures and social environment.	N	2	1	2	2	7	3	21- Low	Medium	14- Very Low	Sure	Very Low
AIR QUALITY	Increased dust pollution due to vegetation clearance, vehicles driving on gravel road and mining activities including crushing of ore. Increase in windblown particles from exposed surfaces, gravel roads, soil and rock dumps and open pit area	N	3	1	3	2	9	5	45-Medium	Medium	36- Low	Certain	Low
	Mining operations, haulage and decommissioning resulting in impact of inhalable particular concentrations at sensitive receptor locations	N	3	2	3	2	10	5	50-Medium	Medium	40- Low	Certain	Low

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	EXTENT	DURATION	INTENSITY	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE	MITIGATION POTENTIAL	SIGNIFICANCE	CONFIDENCE RATING	CUMULATIVE IMPACTS
									PRE-MITIGATION		POST-MITIGATION		
	Gaseous emissions from vehicles and machinery may cause an impact on ambient air quality. Impact of inhalable gaseous concentrations and dust fallout at sensitive receptor locations	N	3	1	2	3	9	4	40– Low	Medium	27– Low	Sure	Low
RADIATION	Risk of exposure to radiation through the inhalation of radioactive dust and radon. Exposure to the radioactive dust deposited in the area as a result of the mining activities.	N	3	2	5	5	15	2	30– Low	Medium	15- Very Low	Sure	Low
	Risk of exposure to radiation to the mine workers during the mining and transportation of ore.	N	3	2	5	5	15	2	30– Low	Medium	15- Very Low	Sure	Low
	Risk of exposure to land users after rehabilitation of the mining area	N	2	5	5	5	16	2	32– Low	Medium	15- Very Low	Sure	Low
WASTE	Generation of additional general waste, litter and building rubble and hazardous waste.	N	3	3	1	5	12	5	60–Medium	High	36– Low	Certain	Very Low
	Clearing site and disposing of illegally dumped waste on the site at appropriate waste disposal facility	P	2	1	3	3	9	5	45–Medium	N/A	45–Medium	Certain	Very Low
	Residue Stockpile. Impact the depositing of waste rock and subsoil and have on the receiving environment	N	3	3	2	2	10	3	30 – Low	Medium	20- Very Low	Sure	Low
SERVICES	Minor impact caused by need for services i.e. water, electricity and sewerage systems during the mining phase causing additional strain on natural resources and service infrastructure.	N	2	2	1	3	8	2	16- Very Low	Medium	8- Very Low	Certain	Very Low
SERVITUDES	Mining activities causing damage to pipeline	N	5	1	5	4	15	4	60–Medium	High	30– Low	Certain	Very Low
	Spills associated with damage to pipeline and disruption in transmission of fuel/gas.	N	5	1	5	4	15	4	60–Medium	High	30– Low	Certain	Very Low
	Environmental and Health & safety risk associated with spills and damages to pipeline	N	3	3	5	4	15	4	60–Medium	High	30– Low	Certain	Very Low
TRAFFIC	Change in traffic patterns as a result of traffic entering and exiting the site on the surrounding road infrastructure and existing traffic.	N	4	1	3	3	11	5	55–Medium	Medium	33– Low	Certain	Low
	Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, and heavy vehicles.	N	3	1	3	3	10	4	40– Low	Medium	20- Very Low	Sure	Very Low
HEALTH AND SAFETY	Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners and users	N	3	1	4	3	11	3	33– Low	High	22– Low	Sure	Very Low
	Increased risk to public and worker safety: If not fenced off, the public and workers may fall into excavated areas and trenches. Increase in traffic.	N	3	1	4	3	11	3	33– Low	High	22– Low	Sure	Very Low
	Increase health risk associated with increase in noise and air pollution	N	3	2	3	3	11	4	44–Medium	Medium	33– Low	Sure	Low
	Improved control of the site resulting in reduce health and safety risk associated with illegal waste dumping and illegal mining.	P	3	3	4	2	12	5	60–Medium	N/A	60 –Medium	Certain	Low

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	EXTENT	DURATION	INTENSITY	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE	MITIGATION POTENTIAL	SIGNIFICANCE	CONFIDENCE RATING	CUMULATIVE IMPACTS
									PRE-MITIGATION		POST-MITIGATION		
SOCIO-ECONOMIC	Potential creation of employment opportunities for the local community, ensuring job security.	P	3	3	1	1	8	5	40– Low	N/A	40– Low	Certain	Very Low
	Multiplier effects on local economy will be positive, but limited in extent and only short term.	P	3	3	1	1	7	5	35– Low	N/A	35– Low	Certain	Very Low
	Reduction in illegal mining taking place in the area	P	2	5	2	3	12	5	60–Medium	N/A	60–Medium	Certain	Low
	Opening areas for housing developments	P	3	5	2	3	12	5	60–Medium	N/A	60–Medium	Certain	Low
	Damage to infrastructure on surrounding properties	N	3	1	3	3	10	3	30 – Low	Medium	20- Very Low	Sure	Very Low
	Land claims can limit the access to land, should land claims be successful before post closure.	N	2	5	5	5	17	3	51–Medium	High	17- Very Low	Uncertain	Low
	Disruptions in daily living and movement patterns	N	3	1	3	3	10	4	40 – Low	Medium	30– Low	Sure	Low

11. Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

The impact assessment methodology used to determine the significance of impacts prior and after mitigation is presented below.

Extent of the impact

The EXTENT of an impact is the physical extent/area of impact or influence.

Score	Extent	Description
1	Footprint	The impacted area extends only as far as the actual footprint of the activity.
2	Site	The impact will affect the entire or substantial portion of the site/property.
3	Local	The impact could affect the area including neighbouring properties and transport routes.
4	Region	Impact could be widespread with regional implication.
5	National	Impact could have a widespread national level implication.

Duration of the impact

The DURATION of an impact is the expected period of time the impact will have an effect.

Score	Duration	Description
1	Short term	The impact is quickly reversible within a period of less than 2 years, or limited to the construction phase, or immediate upon the commencement of floods.
2	Short to medium term	The impact will have a short term lifespan (2–5 years).
3	Medium term	The impact will have a medium term lifespan (6 – 10 years)
4	Long term	The impact will have a medium term lifespan (10 – 25 years)
5	Permanent	The impact will be permanent beyond the lifespan of the development

Intensity of the impact

The INTENSITY of an impact is the expected amplitude of the impact.

Score	Intensity	Description
1	Minor	The activity will only have a minor impact on the affected environment in such a way that the natural processes or functions are not affected.
2	Low	The activity will have a low impact on the affected environment.
3	Medium	The activity will have a medium impact on the affected environment, but function and process continue, albeit in a modified way.
4	High	The activity will have a high impact on the affected environment which may be disturbed to the extent where it temporarily or permanently ceases.
5	Very High	The activity will have a very high impact on the affected environment which may be disturbed to the extent where it temporarily or permanently ceases.

Reversibility of the impact

The REVERSIBILITY of an impact is the severity of the impact on the ecosystem structure

Score	Reversibility	Description
1	Completely reversible	The impact is reversible without any mitigation measures and management measures
2	Nearly completely reversible	The impact is reversible without any significant mitigation and management measures. Some time and resources required.
3	Partly reversible	The impact is only reversible with the implantation of mitigation and management measures. Substantial time and resources required.
4	Nearly irreversible	The impact is can only marginally be reversed with the implantation of significant mitigation and management measures. Significant time and resources required to ensure impact is on a controllable level.
5	Irreversible	The impact is irreversible.

Probability of the impact

The PROBABILITY of an impact is the severity of the impact on the ecosystem structure

Score	Probability	Description
1	Improbable	The possibility of the impact occurring is highly improbable (less than 5% of impact occurring).






2	Low	The possibility of the impact occurring is very low, due either to the circumstances, design or experience (5% to 30% of impact occurring).
3	Medium	There is a possibility that the impact will occur to the extent that provision must be made therefore (30% to 60% of impact occurring).
4	High	There is a high possibility that the impact will occur to the extent that provision must be made therefore (60% to 90% of impact occurring).
5	Definite	The impact will definitely take place regardless of any prevention plans, and there can only be relied on migratory actions or contingency plans to contain the effect (90% to 100% of impact occurring).

Calculation of Impacts – Significance Rating of Impact

Significance is determined through a synthesis of the various impact characteristics and represents the combined effect of the Irreplaceability (Magnitude, Extent, Duration, and Intensity) multiplied by the Probability of the impact. The significance of an impact is rated according the scores a presented below:

Significance = Irreplaceability (Reversibility + Intensity + Duration + Extent) X Probability

Significance Rating

Score	Significance	Colour Code
1 to 20	Very low	
21 to 40	Low	
41 to 60	Medium	
61 to 80	High	
81 to 100	Very high	

Degree to which the impact can be mitigated: *The effect of mitigation measures on the impact and its degree of effectiveness.*

- High (Impact 100% mitigated)
- Medium (Impact >50% mitigated)
- Low (Impact <50% mitigated)

Confidence rating: *Level of certainty of the impact occurring.*

- **Certain**
- **Sure**
- **Unsure**

Cumulative impacts: *The effect the combination of past, present and “reasonably foreseeable” future actions have on aspects.*

- Very Low cumulative impact
- Low cumulative impact
- Medium cumulative impact
- High cumulative impact

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

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties).

West Wits applied for a mining permit on the existing prospecting right area. The site is therefore regarded as the preferred site and alternative sites are not considered. From the public participation already completed the main concerns raised by I&AP's focussed on:

This section will be updated once comments have been received from the IA&P's during the 30 day review period.

Possible Negative Impacts on Communities

- Social economic impact on communities
- Vibration
- Illegal Mining in the area
- Terrestrial Ecology Impact
- Water Pollution (surface and ground water)
- Air and Noise pollution (increase in dust and noise pollution)
- Impact on traffic (increase in traffic volume)
- Impact on Heritage sites
- Influx of persons (job seekers)
- Health risk associated with Radiation

Possible Positive Impacts on Community

- Positive impact on local GDP
- Employment opportunities (direct and indirect)
- Social Economic benefit to the communities (skills development)
- Eradication of illegal mining
- Improved security of the area
- Rehabilitation of historical areas.
- Opening land for housing developments
- Eradication and clearing of illegal waste dumping and mining

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

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

Comments and concerns raised by stakeholders as summarised in Appendix F are included and taken into consideration and have informed the mitigations outlined in Part B –EMPR. Mitigation measures proposed by specialist for each of the specialist studies undertaken to inform the BAR has been included in Part B – EMPR.

Motivation where no alternative sites were considered

Mining is determined by the present and availability of minerals. Minerals can only be mined where they exist. The location of the open pit mining areas was informed by the presence of economically mineable resources to which West Wits would have access. Extensive prospecting has indicated the presence of gold bearing reef on these properties. Therefore, the specific locations and extent of the mining activity is relatively set.

The proposed property is in an area dominated by current and historical mining activities. The site is infested with alien vegetation, extensive illegal dumping of waste has taken place and illegal mining that is causing destabilisation of the area. No location alternatives were considered however a number of layout alternative and technology alternative were considered.

A number of alternatives in terms of layout, mining method, technology and infrastructure were investigated. The layout of the mining area (i.e. placement of waste rock dumps, topsoil stockpiles and roads) has been influenced by inputs from the specialists, stakeholders and landowners. The mining method, technology and layout assessed in this report is the preferred alternative. The topsoil and waste rock dumps have been positioned to create a safety, visual and/or noise berm between the mining operations and nearby receptors. Haul roads will be constructed, no other surface infrastructure is planned for the area.

Statement motivating the alternative development location within the overall site

(Provide a statement motivating the final site layout that is proposed)

The preferred site was chosen as a result of the following:

- Sensitive areas;

- The economic viability of the reserve
- Specialist Studies ;
- Legislative requirements;
- Limiting material handling;
- Existing road network;
- Servitudes; and
- Comments from I&AP's and land owners;

The design and layout of the mining activity is solemnly dependant on the mining plan. The mine planning is done in such a way to reduce the amount of material handling and to optimise the recovery of the resource. A number of alternatives for the placement of waste rock dumps, topsoil stockpiles and road network was investigated. A sensitivity analysis (see Appendix E) was utilised to position the layout. The assessment of the environmental attributes (specialist areas) that informed the sensitivity analysis essentially determined the site layout. The attributes that were included in the sensitivity analysis are:

- Availability of the resource;
- Avoidance of Sensitive areas;
- Specialist Studies ;
- Limiting material handling;
- Existing road network;
- Servitudes; and
- Comments from I&AP's and land owners;

The waste rock dump placement was altered as a result of servitudes present on the property. The stockpile will act as a visual barrier to opencast area. No infrastructure will be constructed on the site as existing infrastructure will be utilised. The preferred site layout avoids environmental sensitive areas, access to the site is from existing roads network and the existing infrastructure will be utilised located on Sol Plaaityje. Therefore, no alternative layout is assessed as part of this report.

b) Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (in respect of the final site layout plan) through the life of the activity

(Including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (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).

An Environmental Impact Assessment (EIA), Basic Impact Assessment process was followed. The Basic Impact Assessment for this project complies with the following requirements:

- National Environmental Management Act (1998) [as amended];
- NEMA Environmental Impact Assessment Regulations (2014) [as amended]; and
- Guidelines of the Department of Environmental Affairs (DEA).

The following principles from the guideline document was followed:

- **Desktop Assessment**

Information gathering is performed by the EAP by analysing the desktop information available for the study area. The desktop assessment is performed to identify any sensitivities that would be impacted upon through the proposed mining activity. Various specialist studies were identified based on these observations.

Identification of the legal framework took place during the desktop assessment. The legal framework was again assessed after the conclusion of the specialist studies and site assessment.

- **Site Investigation**

A physical site visit by the project team is undertaken to confirm and expand on identified potential impacts. The following specialist studies has been conducted:

- Groundwater Study;
- Geochemical Study;
- Terrestrial Ecology;
- Heritage impact Assessment;
- Noise Impact Assessment
- Air Quality Baseline Assessment
- Vibration Assessment
- Traffic Impact Assessment;
- Closure Plan and Cost Assessment; and
- Geo-chemical sampling and Lithological Statement

The objective of the independent specialist studies are to provide sufficient information on the current environmental conditions of the area, together with other studies on the physical and socio-cultural environment for the Environmental Assessment Practitioner (EAP) and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable

development. The needs for conservation as well as the risks to other spheres of the physical and socio-cultural environment need to be compared and considered along with the need to ensure economic development of the country. Specialist input, based on sensitive futures identified, with input from stakeholders and landowners determined the final layout of the proposed mining activity.

- **Assessment of Impacts**

As part of the specialist studies the proposed layout is assessed to establish the best social-economical and biophysical option. Potential impact of the proposed mining activities are identified and assessed by the specialist and the EAP.

The mitigation and management measures for environmental impact as identified by the specialist studies were incorporated into the Basic Assessment Report. An environmental Management Programme is established from containing mitigation, management and monitoring measures and specifying roles and responsibilities was compiled with specialist input and are included in this report.

- **Stakeholder engagement**

Consultation with stakeholders, landowners and IA&P's took place as described in this report. See section on Public Participation and Appendix F for information on the process followed.

- c) Assessment of each identified potentially significant impact and risk**

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties)

Potential impacts that may be caused by the proposed development will be identified using input from the following, Stakeholder Engagement, Existing information; Specialist investigations, Site visit with the project team and Legislation.

12. Impacts Assessment for the Construction phase

Table 38: Impact and proposed mitigation measures of activities in the construction phase of the project

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
Clearing of Vegetation	Soils	<p>Vegetation clearing on the site will take place before any construction can take place. The clearing of vegetation will result in loss of topsoil</p> <p>Insufficient topsoil quality and quantity present on site.</p>	Medium	<ul style="list-style-type: none"> Establish a soil management plan before construction of the activity is undertaken. A detail topsoil balance to be developed. Clearing of areas to take place a maximum of one month prior to intended mining in the area; Stripping of topsoil will not take place during rain or excessive wind; The top 30 cm of vegetation and topsoil is to be stripped from the area to be mined. Topsoil (top 30cm) is to be stored in predetermined topsoil berms, (+/- 5m) outside the boundary of the specific area; Topsoil stockpiles will be restricted to 1.5 to 2m in height Seedbank to be preserved during vegetation clearing and topsoil stripping. Alien vegetation to be cleared to prevent contamination of topsoil. strip all available soils/growth medium off the pit, pit fringe (5m buffer), stockpile and road footprints prior to mining and store in the berm (depth determined during soil survey); Utilize the stored topsoil for the sole purpose of rehabilitation; and No topsoil should be used for landscaping or construction purposes such as roads or embankments 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
	Vegetation and Terrestrial Ecology	Vegetation clearing can result in loss of species of conservation concern. Reduction in biodiversity of the area. Note that no red data species or species of conservation concern were identified within the proposed mining area.	Medium	<ul style="list-style-type: none"> • Environmental awareness training should include that no hunting, trapping or killing of fauna are allowed; • An alien vegetation management plan should be drawn up and implemented; • Regular removal of invasive alien species should be undertaken. This should extend through to the closure phase of the project; • Rehabilitation of disturbed areas to take place with indigenous vegetation. • No clearing of vegetation outside of the footprint area. • Animals may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-contractors' employees. This includes foraging, food and wood collecting outside of the construction site • No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel if any species occur on site; • Should any other floral SCC species be encountered or will be disturbed, ensure effective relocation of individuals to suitable similar habitat. Arrangement with the relevant authorities needs to take place to rescue and relocate the species; and • Informal fires by construction personnel within the Creswell Park Mining Permit Application Area should be prohibited; 	Low
	Surface Water	Increase runoff as a result of vegetation clearing.	Medium	<ul style="list-style-type: none"> • Establish a stormwater management plan before construction of the activity is undertaken in line with requirements as set out in GN 704. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		Increase sediment load resulting in sedimentation of water resources. Altering water quality		<ul style="list-style-type: none"> • Proper storm water measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. Strict erosion control to be implemented. • If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; • Existing vegetation must be retained as far as possible to minimise erosion problems; • Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; • No river or surface water may be affected by silt emanating from the area; and • No wastewater may run freely into any of the surrounding areas 	
	Air	Clearing of Vegetation may cause dust that will influence the quality of air. Vehicle emissions can also cause deterioration in air quality.	Medium	<ul style="list-style-type: none"> • An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. • A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns. • Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rate. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Loading, transfer, and placement of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Emissions report must be made in the format required for NAEIS to the relevant air quality officer. PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location. Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	
	Visual impact	A visual impact will be created as a result of the clearing of vegetation and dust pollution	Low	<ul style="list-style-type: none"> No clearing of vegetation outside of the footprint area. Best practice mitigation measures (wet suppression) during all phases of operation Visual barriers to be created with topsoil stockpile. 	Low
	Background Noise levels	<p>Clearing of vegetation activities may cause an increase in background noise levels.</p> <p>Noise generated by equipment. Vegetation acts as a natural noise boundary.</p>	Medium	<ul style="list-style-type: none"> A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all noise related problems. Frequent community liaison meetings should be held with the neighbouring communities to address noise related concerns. Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. Implement noise monitoring programme as specified by specialist study. 	Medium

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Activities to be restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday. Minimising the need for trucks/equipment to reverse. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. Waste rock and stockpiles to be utilized as noise barriers to reduce impact on surrounding sensitive receptors 	
	Cultural Heritage	Alteration of archaeological, historical and paleontological resources that may be discovered during earthworks. Impact on the burial ground	Medium	<ul style="list-style-type: none"> Implement chance find procedures in case where possible heritage finds area made In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed instantly. These finds must be protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that mitigation (e.g. recording, collection) can be undertaken by a professional paleontologist. Preceding any excavation of fossils, a collection permit from SAHRA must be obtained. Demarcate burial ground with a 100m buffer and avoid them. If any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on ; and Implement archaeological monitoring program for Site PB, 2008. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
	Servitudes	Damage cause to the pipeline as a result of vegetation clearing and topsoil stripping	Medium	<ul style="list-style-type: none"> The servitude should be demarcated and required buffer zone establish Vegetation clearing and topsoil not to take place within servitude area. 	Low
Construction of haul roads	Soils	Soils will be stripped to construct haul roads. This could lead to and mixing of topsoil. Due to the presence of vehicles and equipment hydro-carbon spills may occur impacting on the quality of the soils.	Medium	<ul style="list-style-type: none"> Spill kits to be stored on site, and staff trained to act when spills occur. Contaminated soil to be removed and transported to a facility for remediation. Drip trays to be used for vehicles that stand overnight. All vehicles and machinery will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks; All leaks will be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner; Strip all available soils/growth medium off the pit, pit fringe (5m buffer), stockpile and road footprints prior to mining and store in the berm (depth determined during soil survey); Utilize the stored topsoil for the sole purpose of rehabilitation; and No topsoil should be used for landscaping or construction purposes such as roads or embankments. 	Low
	Vegetation and Terrestrial Ecology	<p>Vegetation will be removed during the construction of the roads.</p> <p>No protected or species of concern was found to be on the site. Loss of</p>	Medium	<ul style="list-style-type: none"> Removal and storage of all usable soils to be used in rehabilitation. Access roads and haul roads to avoid sensitive areas Clearing of vegetation to be restricted to mining area. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		biodiversity as a result of clearing of vegetation		<ul style="list-style-type: none"> Any animals rescued or recovered will be relocated in a suitable habitat away from the mining operations and associated infrastructure; Any lizards, snakes or monitors encountered should be allowed to escape to a suitable habitat away from disturbance. No reptile should be intentionally killed, caught or collected during any phase of the project; and General avoidance of snakes is the best policy if encountered. Snakes should not be intentionally harmed or killed and allowed free movement away from the area. 	
	Surface Water	Loose material can contaminate surface water in the event of a storm water run-off occurring during the construction of the roads. Runoff from areas where hydro-carbon spills are present may also cause deterioration in surface water quality.	Medium	<ul style="list-style-type: none"> All hydrocarbon spills to be contained and soils removed. Proper storm water measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; Existing vegetation must be retained as far as possible to minimise erosion problems; Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; No wastewater may run freely into any of the surrounding naturally areas. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Runoff from roads must be managed to avoid erosion and pollution problems. 	
	Air Quality	Construction activities may cause dust that will influence the quality of air. Vehicle emissions can also cause deterioration in air quality.	Medium	<ul style="list-style-type: none"> An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rate. Loading, transfer, and placement of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	Low
	Background Noise levels	Construction activities may cause an increase in background noise levels.	Medium	<ul style="list-style-type: none"> A noise complaints register must be kept. Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. Construction of Waste Rock will limit noise levels to the residential area to the south of the mine Implement noise monitoring programme. 	Medium

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday Heavy vehicle traffic should be routed away from noise sensitive areas where possible; Noise levels should be kept within acceptable limits. All noise and sounds generated should adhere to South African Bureau of Standards (SABS) specifications for maximum allowable noise levels for construction sites. No pure tone sirens or hooters may be utilised except where required in terms of SABS standards or in emergencies 	
	Traffic	Increase in traffic on roads surrounding the mining area. Impact on surround road network users	Medium	<ul style="list-style-type: none"> Road markings, reflective road studs, road signs should be provide and maintained. Ensure speed limits are set on all roads and enforce speed limits. Ensure all drivers at the site are informed about speed limits. Ensure drivers are informed that off-road travelling is prohibited. All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual. 	Low
	Servitudes	Damage cause to the pipeline as a result of vegetation clearing, topsoil stripping and haul road construction	Medium	<ul style="list-style-type: none"> The servitude should be demarcated and required buffer zone establish Vegetation clearing and topsoil not to take place within servitude area. Haul road to be located way for the servitude to prevent damage during construction and use. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
Stripping and stockpiling of topsoil	Soils	<p>Topsoil will be stripped and stockpiled; this may cause deterioration in soil quality. During the stripping process topsoil may be mixed. Due to the presence of vehicles and equipment hydro-carbon spills may occur impacting on the quality of the soils.</p> <p>Due to the presence of vehicles and equipment hydro-carbon spills may occur impacting on the quality of the soils.</p>	Medium	<ul style="list-style-type: none"> Establish a soil management plan before construction of the activity is undertaken. A detail topsoil balance to be developed. Clearing of areas to take place a maximum of one month prior to intended mining in the area; Stripping of topsoil will not take place during rain or excessive wind; and The top 30 cm of vegetation and topsoil is to be stripped from the area to be mined. Topsoil (top 30cm) is to be stored in predetermined topsoil berms, (+/- 5m) outside the boundary of the specific area; and Topsoil stockpiles will be restricted to 1.5 to 2m in height Seedbank to be preserved during vegetation clearing and topsoil stripping. Alien vegetation to be cleared to prevent contamination of topsoil. strip all available soils/growth medium off the pit, pit fringe (5m buffer), stockpile and road footprints prior to mining and store in the berm (depth determined during soil survey); Utilize the stored topsoil for the sole purpose of rehabilitation; and No topsoil should be used for landscaping or construction purposes such as roads or embankments The stored topsoil should be used as soon as possible in concurrent rehabilitation; Visual inspections to be conducted. Spill kits to be stored on site, and staff trained to act when spills occur. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Contaminated soil to be removed and transported to a facility for remediation. Drip trays to be used for vehicles that stand overnight or for any emergency maintenance work All vehicles and machinery will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks; All leaks will be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner; and Proliferation of alien and invasive plant species are expected within any disturbed areas. These species should be eradicated and controlled, to prevent their spread beyond the proposed development footprint areas. Alien and invasive plant seed dispersal within the top layers of the soil within footprint areas must be controlled; 	
	Vegetation and Terrestrial Ecology	<p>Vegetation will be removed during the stripping of the topsoil and will also be affected during the stockpiling process.</p> <p>Loss of species of conservation concern</p> <p>Note that no red data species or species of conservation concern were identified within the proposed mining area.</p>	Medium	<ul style="list-style-type: none"> Environmental awareness training should include that no hunting, trapping or killing of fauna are allowed; An alien vegetation management plan should be drawn up and implemented; Regular removal of invasive alien species should be undertaken. This should extend through to the closure phase of the project; Rehabilitation of disturbed areas to take place with indigence vegetation. No clearing of vegetation outside of the footprint area. Animals may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub- 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<p>Contractors or his Sub-contractors' employees. This includes foraging, food and wood collecting outside of the construction site.</p> <ul style="list-style-type: none"> No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel if any species occur on site; Should any other floral SCC species be encountered or will be disturbed, ensure effective relocation of individuals to suitable similar habitat. Arrangement with the relevant authorities needs to take place to rescue and relocate the species. 	
	Land Capability	Stripping of topsoil will result in the current possible land use to cease completely. Loss of soil fertility No agricultural activities are taking place on the area.	Medium	<ul style="list-style-type: none"> Rehabilitation of disturbed areas to take place with indigence vegetation. Land use after rehabilitation to be open space for housing development. Soil fertility testing to be performed before construction and before rehabilitation to establish the need to improve the soil fertility. 	Low
	Surface Water	Loose material can contaminate surface water in the event of a storm water run-off occurring during the stripping and stockpiling of topsoil. Runoff from areas where hydro-carbon spills are present may also cause deterioration in surface water quality.	Low	<ul style="list-style-type: none"> All hydrocarbon spills to be contained and soils removed. Proper stormwater measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. Stormwater to be in line with the requirements Regulation 704 (4 June 1999). If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Existing vegetation must be retained as far as possible to minimise erosion problems; Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; No wastewater may run freely into any of the surrounding naturally areas. 	
	Air Quality	Stripping and stockpiling of topsoil may cause dust due to vehicle movement that will influence the quality of air. Material handling (topsoil) will generate dust and this and vehicle emissions can potentially cause deterioration in air quality.	Medium	<ul style="list-style-type: none"> An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns Loading, transfer, and placement of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
	Background Noise levels	Stripping and stockpiling activities may cause an increase in background noise levels.	Medium	<ul style="list-style-type: none"> • Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. • Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday • Establish noise monitoring program as specified by specialist study. • A noise complaints register must be kept. • Minimising the need for trucks/equipment to reverse. • Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered 	Medium
	Servitudes	Damage cause to the pipeline as a result of vegetation clearing and topsoil stripping	Medium	<ul style="list-style-type: none"> • The servitude should be demarcated and required buffer zone establish • Vegetation clearing and topsoil not to take place within servitude area. 	Low
	Cultural Heritage	Alteration of archaeological, historical and paleontological resources that may be discovered during earthworks	Medium	<ul style="list-style-type: none"> • A heritage practitioner 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. • Implement chance find procedures in case where possible heritage finds area made • In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed instantly. These finds must be 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<p>protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that mitigation (e.g. recording, collection) can be undertaken by a professional paleontologist.</p> <ul style="list-style-type: none"> • Preceding any excavation of fossils, a collection permit from SAHRA must be obtained. The fossil material must be housed in an approved collection (museum or university collection) and the fieldwork and reports need to comply with the minimum standards for palaeontological impact studies developed by SAHRA. • Demarcate burial ground with a 100m buffer and avoid them. • If any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on ; and • Implement archaeological monitoring program heritage sites. 	
Storage of overburden material and stockpiles	Soil	Loss of topsoil as n result of wind and water erosion	Medium	<ul style="list-style-type: none"> • Existing vegetation must be retained as far as possible to minimise erosion problems; • Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; • No river or surface water may be affected by silt emanating from the area; • Height of topsoil and overburden material to be restricted 	Low
	Surface Water	Contaminated runoff from overburden and stockpile areas. Siltation of river systems.	Low	<ul style="list-style-type: none"> • Proper stormwater measures to be put in placer to prevent contamination of surface water. This will include the construction of berms and trenches. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Stormwater to be in line with the requirements Regulation 704 (4 June 1999). If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; Existing vegetation must be retained as far as possible to minimise erosion problems; Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; No wastewater may run freely into any of the surrounding naturally areas. 	
	Groundwater	<p>The formation of acid mine drainage as a result of ingress water and oxygen into the stockpiled overburden. Mass migration from waste rock dump negatively impacting groundwater</p> <p>According to the Geo-chemical assessment the overburden is considered inert and therefore does not have a great potential for AMD.</p>	Low	<ul style="list-style-type: none"> Proper stormwater measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. Establishment monitoring boreholes between the WRD/open pit and the community to the south, east and north. Monitoring (water levels and quality) during construction should be performed monthly due to the construction period (1 months). All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
	Geochemistry	Disposal of water rock onto waste rock facility and resulting formation of acid mine drainage and the leaching of metal(loids), especially arsenic from the material	Low	<ul style="list-style-type: none"> Establishment monitoring boreholes between the WRD/open pit and the community to the south, east and north. Monitoring (water levels and quality) during construction should be performed monthly due to the construction period (1 months). All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. 	Low
	Air Quality	Increase in air pollution as a result of wind erosion.	Medium	<ul style="list-style-type: none"> Establishment of air quality monitoring program as specified by specialist An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Roll over mining to limit amount of overburden 	
	Visual impact	A visual impact will be created	Medium	<ul style="list-style-type: none"> Keep stockpile and waste rock dump height as low as possible Placement of stockpiles and waste rock to be used to reduce visual impact of mining. Reduce dust pollution from stockpile and dumps Reduce time of stockpiling topsoil and waste rock through concurrent rehabilitation 	Low
	Radiation	Risk of exposure to radiation through the inhalation of radioactive dust and radon. Exposure to the radioactive dust deposited in the area as a result of the mining activities. Risk of exposure during transport of overburden	Low	<ul style="list-style-type: none"> Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material. An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impacts are minimised. Radiation testing to performed before construction and after rehabilitation. A radiation management and mitigation plan to be establish if radiation is high. 	Very Low
	Aesthetic quality and sense of place	Risk of exposure to radiation to the mine workers during the mining and transportation of ore.	Medium	<ul style="list-style-type: none"> Reduce amount of overburden stockpiles by implementing roll over mining. Restricted height of overburden to designed high. Use overburden as a visual barrier to shield mining operation. 	Low
Waste Management	Waste	Waste generated of waste from construction. Clearance and removal of waste dumped illegally on the site	Medium	<ul style="list-style-type: none"> Low volumes of waste will be produced on site during construction and all maintenance of equipment will take place of site. Disposal of any waste produce during emergency maintenance to be disposed of at the correct waste management facility. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Waste generated (hazardous and general) on site to be disposed within 30 days. Waste generated (illegally dumped) from clearing of site must be disposed at the correct waste management facility. Waste from chemical toilets to dispose by supplier. No chemical storage to take place on site. No waste storage to take place on site, all waste to be removed to offsite facility. 	
Construction of West Wits Project	Socio-Economic Impact	Impacts on local employment - Opencast mining operations: Contractor would require between 40 and 50 employees.	Medium Positive –	<ul style="list-style-type: none"> Apply employment/procurement policies and procedures (e.g. do not employ at the mine gate) to prevent unnecessary influx by job-seekers; Ensure compliance with socio-economic tools and legal requirements (BBBEE and Mining Charter); First source people from the local community before jobs are advertise Implement a skills development program 	Medium Positive –
		Disruptions in daily living and movement patterns for surrounding communities, land owners and road users could manifest in the form of traffic and intrusion impacts resulting in short-term disruptions and safety hazards.	Medium	<ul style="list-style-type: none"> Erect signboards indicating accesses to the construction site. Inspect trucks and other heavy vehicles on a regular basis to avoid oil spillages and un-roadworthy vehicles that could lead to accidents. The mine to consult with adjacent landowners whose private residences, crops, livestock and other infrastructure could be affected by dust, noise and other impacts that result from traffic movement. Provide a schedule of the construction activities to landowners and relevant I&APs if required. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		Health and safety risks for workers Inadequate management of the construction process and general construction related activities could result in health and safety risks for workers.	Medium	<ul style="list-style-type: none"> • A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; • Implement measures to suppress dust - spraying of gravel roads, surfaces and stock piles with water on a regular basis. • Construction workers to wear personal protective equipment; • Any health and safety incidents should be reported to the Site Manager (SM) immediately; • First aid facilities should be available on site at all times; • Workers have the right to refuse work in unsafe conditions; • Material stockpiles or stacks should be stable and well secured to avoid collapse and possible injury to site workers. • Access to excavation must be controlled; • Excavated areas should be temporarily • Provide sufficient ablution facilities (chemical/portable toilets, etc.) at strategic locations that are cleaned regularly. • Potable water to be provide to workers. 	Low

Assessment of Potential Impact During the Construction Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		Possibility of construction activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners, visitors and workers.	Medium	<ul style="list-style-type: none"> All workers will be sensitised to the risk of fire; Smoking is only allowed in designated smoking areas and disposal of cigarette butts safely in sand buckets; The Applicant shall ensure that the basic fire-fighting equipment is available on the site; Extinguishers should be located outside hazardous materials and chemicals storage containers; Fire response and evacuation: An Emergency Plan (including Fire Protection, Response and Evacuation Plan) is to be prepared by the Applicant and conveyed to all staff on the site' Identify major risks to minimise the environmental impacts e.g., air pollution and contaminated effluent runoff. 	Low

Table 39: Impact and proposed mitigation measures of activities in the operational phase of the project

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
Clearing of Vegetation	Soils	Vegetation clearing on the site will take place before any construction can take place. The clearing of vegetation will result in loss of topsoil	Medium	<ul style="list-style-type: none"> Establish a soil management plan before construction of the activity is undertaken. A detail topsoil balance to be developed. Clearing of areas to take place a maximum of one month prior to intended mining in the area; Stripping of topsoil will not take place during rain or excessive wind; and 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> The top 30 cm of vegetation and topsoil is to be stripped from the area to be mined. Topsoil (top 30cm) is to be stored in predetermined topsoil berms, (+/- 5m) outside the boundary of the specific area; and Topsoil stockpiles will be restricted to 1.5 to 2m in height Seedbank to be preserved during vegetation clearing and topsoil stripping. Alien vegetation to be cleared to prevent contamination of topsoil. strip all available soils/growth medium off the pit, pit fringe (5m buffer), stockpile and road footprints prior to mining and store in the berm (depth determined during soil survey); Utilize the stored topsoil for the sole purpose of rehabilitation; and No topsoil should be used for landscaping or construction purposes such as roads or embankments 	
	Vegetation and Terrestrial Ecology	Vegetation clearing can result in loss of species of conservation concern. Reduction in biodiversity of the area. Note that no red data species or species of conservation concern were identified within the proposed mining area.	Medium	<ul style="list-style-type: none"> Environmental awareness training should include that no hunting, trapping or killing of fauna are allowed; An alien vegetation management plan should be drawn up and implemented; Regular removal of invasive alien species should be undertaken. This should extend through to the closure phase of the project; and Rehabilitation of disturbed areas to take place with indigenous vegetation. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> No clearing of vegetation outside of the footprint area. Animals may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-contractors' employees. This includes foraging, food and wood collecting outside of the construction site; and Informal fires by construction personnel within the Creswell Park Mining Permit Application Area should be prohibited; 	
	Surface Water	Increase runoff as a result of vegetation clearing. Increase sediment load resulting in sedimentation of rivers. Altering water quality	Medium	<ul style="list-style-type: none"> Proper storm water measures to be implemented and maintained during operational phase to prevent contamination of surface water. This will include the construction of berms and trenches. Stormwater management to be in line with the requirements Regulation 704 (4 June 1999). Temporary diversion channels should be constructed and maintained ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; Existing vegetation must be retained as far as possible to minimise erosion problems; Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> No wastewater may run freely into any of the surrounding naturally areas 	
	Air	Clearing of Vegetation may cause dust that will influence the quality of air. Vehicle emissions can also cause deterioration in air quality.	Medium	<ul style="list-style-type: none"> An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. A complaints register be maintained during the operational phase and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rate. Loading, transfer, and placement of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location. Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	Low
	Visual impact	A visual impact will be created as a result of the clearing of vegetation and dust pollution	Low	<ul style="list-style-type: none"> No clearing of vegetation outside of the footprint area. Best practice mitigation measures (wet suppression) during all phases of operation 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Visual barriers to be created with topsoil stockpile. 	
	Background Noise levels	<p>Clearing of vegetation activities may cause an increase in background noise levels.</p> <p>Noise generated by equipment. Vegetation acts as a natural noise boundary.</p>	Medium	<ul style="list-style-type: none"> Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. Maintain a noise monitoring programme. A monitoring programme as per the requirements of the International Finance Corporation (IFC) and SANS 10103. Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday Heavy vehicle traffic should be routed away from noise sensitive areas where possible; Noise levels should be kept within acceptable limits. All noise and sounds generated should adhere to South African Bureau of Standards (SABS) specifications for maximum allowable noise levels for construction sites. No pure tone sirens or hooters may be utilised except where required in terms of SABS standards or in emergencies Minimising the need for trucks/equipment to reverse. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered 	Medium
	Servitudes	Damage cause to the servitude as a result of vegetation clearing and topsoil stripping	Medium	<ul style="list-style-type: none"> The servitude should be demarcated and required buffer zone establish Vegetation clearing and topsoil not to take place within servitude area. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
	Cultural Heritage	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks. Impact on the burial ground and other heritage resources.	Medium	<ul style="list-style-type: none"> Implement chance find procedures in case where possible heritage finds area made In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed instantly. These finds must be protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that mitigation (e.g. recording, collection) can be undertaken by a professional paleontologist. Preceding any excavation of fossils, a collection permit from SAHRA must be obtained. Demarcate burial ground with a 100m buffer and avoid them. If any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on ; and Implement archaeological monitoring program for Site PB, 2008. 	Low
Stripping and stockpiling of topsoil	Soils	Topsoil will be stripped and stockpiled; this may cause deterioration in soil quality. During the stripping process topsoil may be mixed. Due to the presence of vehicles and equipment hydro-carbon spills may occur impacting on the quality of the soils.	Medium	<ul style="list-style-type: none"> Establish a soil management plan before construction of the activity is undertaken. A detail topsoil balance to be developed. Stripping of topsoil will not take place during rain or excessive wind; and The top 30 cm of vegetation and topsoil is to be stripped from the area to be mined. Topsoil (top 30cm) is to be stored in predetermined topsoil berms, (+/- 5m) outside the boundary of the specific area; and 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		Due to the presence of vehicles and equipment hydro-carbon spills may occur impacting on the quality of the soils.		<ul style="list-style-type: none"> • Topsoil stockpiles will be restricted to 1.5 to 2m in height • Seedbank to be preserved during vegetation clearing and topsoil stripping. • Alien vegetation to be cleared to prevent contamination of topsoil. • strip all available soils/growth medium off the pit, pit fringe (5m buffer), stockpile and road footprints prior to mining and store in the berm (depth determined during soil survey); • Utilize the stored topsoil for the sole purpose of rehabilitation; and • No topsoil should be used for landscaping or construction purposes such as roads or embankments • The stored topsoil should be used as soon as possible in concurrent rehabilitation; • Visual inspections to be conducted. • Spill kits to be stored on site, and staff trained to act when spills occur. • Drip trays to be used for vehicles that stand overnight or for any emergency maintenance work • Contaminated soil to be removed and transported to a facility for remediation. • Drip trays to be used for vehicles that stand overnight. • All vehicles and machinery will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks; 	

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> All leaks will be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner; and 	
	Vegetation and Terrestrial Ecology	<p>Vegetation will be removed during the stripping of the topsoil and will also be affected during the stockpiling process.</p> <p>Loss of species of conservation concern</p> <p>Note that no red data species or species of conservation concern were identified within the proposed mining area.</p>	Medium	<ul style="list-style-type: none"> Environmental awareness training should include that no hunting, trapping or killing of fauna are allowed; An alien vegetation management plan should be drawn up and implemented; Regular removal of invasive alien species should be undertaken. This should extend through to the closure phase of the project; and Rehabilitation of disturbed areas to take place with indigence vegetation. No clearing of vegetation outside of the footprint area. Animals may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-contractors' employees. This includes foraging, food and wood collecting outside of the construction site. No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel if any species occur on site; 	Low
	Land Capability	Stripping of topsoil will result in the current possible land use to cease completely. Loss of soil fertility	Medium	<ul style="list-style-type: none"> Rehabilitation of disturbed areas to take place with indigence vegetation. Land use after rehabilitation to be open space for housing development. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> • Inspection of topsoil stockpile to be undertake. Any alien vegetation to be removed from topsoil stockpile • Fertility testing on topsoil to be undertaken before rehabilitation to establish treatment requirements to improve fertility of soils. 	
	Surface Water	Loose material can contaminate surface water in the event of a storm water run-off occurring during the stripping and stockpiling of topsoil. Runoff from areas where hydro-carbon spills are present may also cause deterioration in surface water quality.	Low	<ul style="list-style-type: none"> • All hydrocarbon spills to be contained and soils removed. • Proper stormwater measures to be maintained to prevent contamination of surface water. This will include the construction of berms and trenches. • Stormwater to be in line with the requirements of Regulation 704 (4 June 1999). • Temporary diversion channels should be constructed and maintained ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; • Existing vegetation must be retained as far as possible to minimise erosion problems; • Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; • No river or surface water may be affected by silt emanating from the area; • No wastewater may run freely into any of the surrounding naturally areas. 	Low
	Air Quality	Stripping and stockpiling of topsoil may cause dust due to vehicle movement that will influence the	Medium	<ul style="list-style-type: none"> • An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		quality of air. Material handling (topsoil) will generate dust and this and vehicle emissions can potentially cause deterioration in air quality.		<p>all mining and development phases. Water carts to be used to make sure dust impact are minimised.</p> <ul style="list-style-type: none"> • A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns • Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; • Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. • PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location. • Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	
	Background Noise levels	Stripping and stockpiling activities may cause an increase in background noise levels.	Medium	<ul style="list-style-type: none"> • Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. • A management and mitigation plan are recommended to minimise noise impacts from the project on the surrounding area. • A monitoring programme as per the requirements of the International Finance Corporation (IFC) and SANS 10103. 	Medium

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<p>Annually during the operational phase at the closest NSR; and in response to complaints received.</p> <ul style="list-style-type: none"> Waste rock and stockpiles to be utilized as noise barriers to reduce impact on surrounding sensitive receptors. Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday Minimising the need for trucks/equipment to reverse. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered 	
	Servitudes	Damage cause to the pipeline as a result of vegetation clearing and topsoil stripping	Medium	<ul style="list-style-type: none"> The servitude should be demarcated and required buffer zone establish Vegetation clearing and topsoil not to take place within servitude area. 	Low
	Cultural Heritage	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks. Impact on heritage resources identified.	Medium	<ul style="list-style-type: none"> An appropriately qualified archaeologist must be identified to be called upon in the event that any possible heritage resources or artefacts are identified. The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed instantly. These finds must be protected (preferably in situ) and the ECO must alert SAHRA 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<p>(South African Heritage Research Agency) to ensure that mitigation (e.g. recording, collection) can be undertaken by a professional paleontologist.</p> <ul style="list-style-type: none"> • Preceding any excavation of fossils, a collection permit from SAHRA must be obtained. The fossil material must be housed in an approved collection (museum or university collection) and the fieldwork and reports need to comply with the minimum standards for palaeontological impact studies developed by SAHRA. • Demarcate burial ground with a 100m buffer and avoid them. • If any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on ; and • Implement archaeological monitoring program for the heritage areas. 	
Storage of overburden material and stockpiles	Soil	Loss of topsoil as n result of wind and water erosion	Medium	<ul style="list-style-type: none"> • Existing vegetation must be retained as far as possible to minimise erosion problems; • Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; • No river or surface water may be affected by silt emanating from the area; • Height of topsoil and overburden material to be restricted • Proper storm water measures to be put in placer and maintained to prevent contamination of surface water. This will include the construction of berms and trenches. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Temporary diversion channels should be constructed and maintained ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system 	
	Surface Water	Contaminated runoff from overburden and stockpile areas. Siltation of river systems. Contaminated stormwater from storage areas.	Low	<ul style="list-style-type: none"> Proper stormwater measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. Stormwater to be in line with the requirements of Regulation 704 (4 June 1999). If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; Existing vegetation must be retained as far as possible to minimise erosion problems; Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; No wastewater may run freely into any of the surrounding naturally areas. Any water reporting to the open pit or storm water management areas should be kept in a closed system (classified as contact water) and not be discharged into the environment before 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<p>treatment to the specific catchment Target Water Quality Guideline (TWQG) standards</p> <ul style="list-style-type: none"> • Contact water can be recirculated and used in a closed system according to GN704 Best Practise Guideline 	
	Groundwater	<p>The formation of acid mine drainage as a result of ingress water and oxygen into the stockpiled overburden. Mass migration from waste rock dump negatively impacting groundwater</p> <p>According to the Geo-chemical assessment the overburden is considered inert and therefore does not have a great potential for AMD.</p>	Low	<ul style="list-style-type: none"> • Proper stormwater measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. • Establishment monitoring boreholes between the WRD/open pit and the community to the south, east and north. • Monitoring (water levels and quality) during construction should be performed monthly due to the construction period (1 months). • Monitoring (water levels and quality) during mining should be performed monthly due to the short Life of Mine (4 months). • All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. 	Low
	Geochemistry	<p>Disposal of waste rock onto waste rock facility and resulting formation of acid mine drainage and the leaching of metal(loids), especially arsenic from the material</p>	Low	<ul style="list-style-type: none"> • Establishment monitoring boreholes between the WRD/open pit and the community to the south, east and north. • Monitoring (water levels and quality) during construction should be performed monthly due to the construction period (1 months). • All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				metalloids, Uranium and Thorium as well as micro and macro chemical parameters.	
	Air Quality	Increase in air pollution as a result of wind erosion.	Medium	<ul style="list-style-type: none"> Establishment of air quality monitoring program An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. Roll over mining to limit amount of overburden present on stockpiles. Maintain air quality monitoring program as specified. Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	Low
	Visual impact	A visual impact will be created	Medium	<ul style="list-style-type: none"> Keep stockpile and waste rock dump height as low as possible 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> • Placement of stockpiles and waste rock to be used to reduce visual impact of mining. • Reduce dust pollution from stockpile and dumps • Reduce time of stockpiling topsoil and waste rock through concurrent rehabilitation 	
	Radiation	Risk of exposure to radiation through the inhalation of radioactive dust and radon. Exposure to the radioactive dust deposited in the area as a result of the mining activities. Risk of exposure during transport of overburden	Low	<ul style="list-style-type: none"> • Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material. • An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. 	Very Low
	Aesthetic quality and sense of place	Visibility from sensitive receptors / visual scarring of the landscape as a result of the overburden and stockpiles.	Medium	<ul style="list-style-type: none"> • Reduce amount of overburden stockpiles by implementing roll over mining. • Restricted height of overburden to designed high. • Use overburden as a visual barrier to shield mining operation. 	Low
Waste Management	Waste	Waste generated during normal operation. Clearance and removal of waste dumped illegally on the site. Disposing Waste Rock onto the residue stockpile.	Medium	<ul style="list-style-type: none"> • Low volumes of waste will be produced on site during construction and all maintenance of equipment will take place of site. Disposal of any waste produce during emergency maintenance to be disposed of at the correct waste management facility. • Waste generated (illegally dumped) from clearing of site must be disposed at the correct waste management facility. • Waste from chemical toilets to disposed of by supplier. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> No chemical storage to take place on site. No waste storage to take place on site, all waste to be removed to offsite facility. Waste Rock only to be dump at designated area. 	
	Soil	Residue Stockpile - Disposal of waste rock onto the waste rock facility and resulting formation of acid mine drainage conditions	Low	<ul style="list-style-type: none"> The required liner to be installed as recommended by specialist Monitoring of groundwater to take place to establish if the residue stockpile (Waste Rock Dump) has any impact on the groundwater or surface quality Any water discharging from the Waste Rock dump should be prevented from flowing into the receiving environment 	Low
	Surface Water	Contaminated runoff from overburden and stockpile areas. Siltation of river systems. Contaminated stormwater from storage areas.	Low	<ul style="list-style-type: none"> Proper stormwater measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. Stormwater to be in line with the requirements Regulation 704 (4 June 1999). If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; Existing vegetation must be retained as far as possible to minimise erosion problems; Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> No wastewater may run freely into any of the surrounding naturally areas. Any water reporting to the open pit or storm water management areas should be kept in a closes system (classified as contact water) and not be discharged into the environment before treatment to the specific catchment Target Water Quality Guideline (TWQG) standards Contact water can be recirculated and used in a closed system according to GN704 Best Practise Guideline 	
	Groundwater	The formation of acid mine drainage as a result of ingress water and oxygen into the stockpiled overburden. Mass migration from waste rock dump negatively impacting groundwater According to the Geo-chemical assessment the overburden is considered inert and therefore does not have a great potential for AMD.	Low	<ul style="list-style-type: none"> Proper stormwater measures to be put in placer to prevent contamination of surface water. This will include the construction of berms and trenches. Establishment monitoring boreholes between the WRD/open pit and the community to the south, east and north. Monitoring (water levels and quality) during mining should be performed monthly due to the short Life of Mine (4 months). All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters 	Low
	Radiation	Risk of exposure to radiation through the inhalation of radioactive dust and radon. Exposure to the radioactive dust	Low	<ul style="list-style-type: none"> Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material. 	Very Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		deposited in the area as a result of the mining activities. Risk of exposure during transport of overburden and dumping of waste.		<ul style="list-style-type: none"> An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. 	
Opencast mining activities including crushing of ore Concurrent rehabilitation /Roll over mining	Soil	<p>Loss of soil natural structure and properties (physical and chemical) as a result of stripping and stockpiling of topsoil.</p> <p>Operating of heavy duty equipment on site. Possible hydrocarbon spills from equipment</p>	Medium	<ul style="list-style-type: none"> Disturbed and cleared areas need to be revegetated with indigenous grass species in order to help stabilise the soil surface; Concurrent/progressive rehabilitation must be implemented at all times and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint, but will also reduce the overall rehabilitation effort and cost; Any hydrocarbon spills to be cleaned in accordance with the spill procedure. Spill kits and drip trays to be provided and available on site. Height of topsoil and overburden material to be restricted to decrease possibility of wind erosion Visual inspection of topsoil to be undertaken. Any alien vegetation observed on topsoil stockpiles to be removed. Fertility testing to be performed to establish fertilizer requirements during rehabilitation. Concurrent rehabilitation (roll over mining) to be in line with the closure plan and procedure. 	Low
	Geology	Opencast mining will result in destruction of geological	High	<ul style="list-style-type: none"> Stockpiling of subsoil and waste rock not to take place on the same stockpile. 	Medium

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		structures. Loss of geological structure and integrity. Low of resources Breaking of rock through modern methods to reduce noise.		<ul style="list-style-type: none"> Rehabilitation of pit to take place in accordance with rehabilitation plan, procedure to ensure rehabilitation objects are achieve. Final landform and land use to be achieved through rehabilitation. 	
	Groundwater	Dewatering of local aquifer an impacting local and neighboring groundwater users. Abstraction of groundwater to prevent pit flooding Deterioration of groundwater quality down gradient of the mining operations	Low	<ul style="list-style-type: none"> Proper stormwater measures to be put in placer to prevent contamination of surface water. This will include the construction of berms and trenches. Establishment monitoring boreholes between the WRD/open pit and the community to the south, east and north. Monitoring (water levels and quality) during mining should be performed monthly due to the short Life of Mine (4 months). All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. An updated hydrocensus should be completed in a 500m radius around the Creswell Park open pit project area. The data recorded should be used to update the monitoring protocol and the groundwater flow model and associated management scenarios 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
	Surface water	Discharge of polluted water. Increase sediment load. Damage to riparian vegetation	Low	<ul style="list-style-type: none"> Stormwater structure to be maintained to prevent uncontaminated stormwater flowing into the pit area. Clean and dirty water separation to take place. Any water reporting to the open pit or storm water management areas should be kept in a closes system (classified as contact water) and not be discharged into the environment before treatment to the specific catchment Target Water Quality Guideline (TWQG) standards Contact water can be recirculated and used in a closed system according to GN704 Best Practise Guideline No contaminated water to be discharge. Stormwater runoff from the area to be prevented to increase pollution and sediment load of the river system. 	Low
	Radiation	Risk of exposure to radiation through the inhalation of radioactive dust and radon. Exposure to the radioactive dust deposited in the area as a result of the mining activities. Risk of exposure during transport of overburden	Low	<ul style="list-style-type: none"> Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material. An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. 	Very Low
	Palaeontological and heritage	Alteration of archaeological palaeontological resources that may be discovered during earthworks	Low	<ul style="list-style-type: none"> An appropriately qualified archaeologist must be identified to be called upon in the event that any possible heritage resources or artefacts are identified. 	Very Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> • The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. • In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed instantly. These finds must be protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that mitigation (e.g. recording, collection) can be undertaken by a professional paleontologist. • Preceding any excavation of fossils, a collection permit from SAHRA must be obtained. The fossil material must be housed in an approved collection (museum or university collection) and the fieldwork and reports need to comply with the minimum standards for palaeontological impact studies developed by SAHRA. • If any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on 	

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
	Visual Aesthetic Impact	Visibility from sensitive receptors / visual scarring of the landscape as a result of the mining activities	Medium	<ul style="list-style-type: none"> The waste rock storage facility to be utilized as a visual barrier between the mining operation and sensitive receptors. Dust from Stockpile areas, roads and other activities must be managed by means of dust suppression to prevent excessive dust. Stockpiles should not exceed 15m in height. The retention of as much existing vegetation as possible 	Low
	Noise and Vibration	Increase in background noise levels from the increase activities and use of heavy equipment. Breaking of rock through modern methods. Excavation of overburden and reef.	Medium	<ul style="list-style-type: none"> A management and mitigation plan are recommended to minimise noise impacts from the project on the surrounding area. A monitoring programme as per the requirements of the International Finance Corporation (IFC) and SANS 10103. Annually during the operational phase at the closest NSR; and in response to complaints received. The waste rock storage facility to be utilized as a noise barrier between the mining operation and sensitive receptors. Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. The operation to use modern rock breaking equipment to reduce the noise and vibration. No blasting to take place. If any blasting is required approval should be obtained from surrounding communities. Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. 	Medium

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> • Maintain a noise monitoring programme. A monitoring programme as per the requirements of the International Finance Corporation (IFC) and SANS 10103: and • Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday • Minimising the need for trucks/equipment to reverse. • Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered 	
	Air Quality	Opencast mining can have a negative impact on surround air quality. Increase dust and emissions. Breaking of rocks, stripping of overburden. Load, haul and transporting of overburden. Breaking of rock through modern methods. Crushing of ore to correct size.	Medium	<ul style="list-style-type: none"> • An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. • A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns • Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; • Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location. Modern rock breaking equipment to be used to reduce the risk to air quality associated with blasting. No blasting to be performed. Dust suppression by means of water sprayers to be applied to crushing equipment to prevent dust pollution for crushing. Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	
	Topography	Opencast mining will result in a change in topography. Change in surface drainage and final land form	Medium	<ul style="list-style-type: none"> Implement of closure plan to ensure effective rehabilitation of the area. Re-establishment of vegetation to take place after rehabilitation Monitoring and maintenance program to be establish for the post closure phase. Final land form to be free draining and erosion control to be implemented. Final land use and land form to be establish in final closure plan. 	Low
	Servitudes	Damage cause to the pipeline as a result of mining activities. Vibration from the mining activity or excavation equipment causing damage and spills. Environmental, health and safety damage caused by spills.	Medium	<ul style="list-style-type: none"> The servitude should be demarcated and required buffer zone establish. No mining to take place within 50m from the servitude. Buffer zones to be maintained through all phases. No excavation or mining equipment to be operated within the servitude Any activity require to take place within the servitude to be undertake under supervision to ensure no damage is cause to 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<p>the pipeline. Risk assessment in terms of the MHSA required before any activity can be undertaken in the servitude area.</p> <ul style="list-style-type: none"> • Emergency number to be available on-site for emergency services. 	
	Health and Safety	Health and safety risks for workers Inadequate management of the mining process and general operation related activities could result in health and safety risks for workers. Increase in traffic.	Medium	<ul style="list-style-type: none"> • A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; • Implement measures to suppress dust - spraying of gravel roads, surfaces and stock piles with water on a regular basis. • Mine workers to wear personal protective equipment; • Any health and safety incidents should be reported to the Site Manager (SM) immediately; • First aid facilities should be available on site at all times; • Workers have the right to refuse work in unsafe conditions; • Material stockpiles or stacks should be stable and well secured to avoid collapse and possible injury to site workers. • Access to excavation must be controlled; • Excavated areas should be temporarily • Provide sufficient ablution facilities (chemical/portable toilets, etc.) at strategic locations that are cleaned regularly. • Potable water to be provide to workers. • Ensure speed limits are set on all roads and enforce speed limits. Ensure all drivers at the site are informed about speed limits. • Monitoring of water quality, air quality and noise. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
Load and Haul	Noise and Vibration	Increase in baseline noise as a result of equipment. Low vibration level is expected from equipment	Medium	<ul style="list-style-type: none"> A management and mitigation plan are recommended to minimise noise impacts from the project on the surrounding area. Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday 	Medium
	Air Quality	Increase in air pollution as a result of equipment movement, handling of overburden and ore, and placement of overburden on stockpiles.	Medium	<ul style="list-style-type: none"> An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. Wet suppression techniques should be used to control dust emissions, especially in areas where dry material is handled or stockpiled. Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts. Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	
	Radiation	Risk of exposure during transport of overburden	Low	<ul style="list-style-type: none"> Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material. A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety. Dust suppression to be applied to ore during crushing. 	Very Low
	Traffic	Increase in traffic surrounding the site.	Medium	<ul style="list-style-type: none"> Road markings, reflective road studs, road signs should be provide and maintained. Ensure speed limits are set on all roads and enforce speed limits. Ensure all drivers at the site are informed about speed limits. Ensure drivers are informed that off-road travelling is prohibited. All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual. Place point's men at intersections to ensure safe use. All traffic laws to be inforce on and surround site. Transport of ore should not take place during haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods. Minimising the need for trucks/equipment to reverse. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered 	
	Health and Safety	Increase risk as a result of air and noise pollution. Increase safety risk associated with the movement of equipment.	Medium	<ul style="list-style-type: none"> A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; Implement measures to suppress dust - spraying of gravel roads, surfaces and stock piles with water on a regular basis. Mine workers to wear personal protective equipment; Any health and safety incidents should be reported to the Site Manager (SM) immediately; First aid facilities should be available on site at all times; Workers have the right to refuse work in unsafe conditions; Material stockpiles or stacks should be stable and well secured to avoid collapse and possible injury to site workers. Equipment not use to be switch off to prevent air pollution, dangerous gasses. Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. 	Low
Transporting of Ore to treatment facility	Traffic	Increase in traffic as a result of the transportation of ore to offsite treatment facility.	Medium	<ul style="list-style-type: none"> Road markings, reflective road studs, road signs should be provide and maintained. Ensure speed limits are set on all roads and enforce speed limits. Ensure all drivers at the site are informed about speed limits. Ensure drivers are informed that off-road travelling is prohibited. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual. Place point's men at intersections to ensure safe use. All traffic laws to be in force on and around site. It is expected that 6 trucks will be utilized for the transport of ore. 18 trips per day. Ore haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods. Traffic management to be done in accordance with the Traffic Impact Assessment Detailed investigations should be conducted in conjunction with the relevant road 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 Ore trucks must be covered with a tarp to prevent dust pollution during transport; Transport of ore should not take place during haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods. 	
	Noise and Vibration	Increase in background noise as a result of the transportation of ore to offsite treatment facility.	Medium	<ul style="list-style-type: none"> A management and mitigation plan are recommended to minimise noise impacts from the project on the surrounding area. Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. 	Medium

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> • Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. • Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday. Ore haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods. • Minimising the need for trucks/equipment to reverse. • Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered 	
	Air Quality	Increase in dust and gas pollution associated with transportation of ore to offsite treatment facility.	Medium	<ul style="list-style-type: none"> • An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. • Wet suppression techniques should be used to control dust emissions, especially in areas where dry material is handled or stockpiled. • Loading of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; • Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. • Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. • Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
	Health and Safety	<p>Transport of ore to the offsite facility can increase the risk of accidents and safety risk to works and communities.</p> <p>Risk of exposure to radiation during transport of ore</p>	Medium	<ul style="list-style-type: none"> • A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; • Mine workers to wear personal protective equipment; • Any health and safety incidents should be reported to the Site Manager (SM) immediately; • Equipment not use to be switch off to prevent air pollution, dangerous gasses. • Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. • Equipment should have lights and ensure that they are visible. • Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material 	Low
Operation of West Wits Project	Socio-Economic Impact	<p>Impacts on local employment - Opencast mining operations: Contractor would require between 40 and 50 employees.</p>	Medium Positive	<ul style="list-style-type: none"> • Apply employment/procurement policies and procedures (e.g. do not employ at the mine gate) to prevent unnecessary influx by job-seekers; • Ensure compliance with socio-economic tools and legal requirements (BBBEE and Mining Charter); • First source people from the local community before jobs are advertise • Implement a skills development program 	Medium Positive
		<p>Disruptions in daily living and movement patterns</p>	Medium	<ul style="list-style-type: none"> • Erect signboards indicating accesses to the construction site. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		Disruptions in daily living and movement patterns for surrounding communities, land owners and road users could manifest in the form of traffic and intrusion impacts resulting in short-term disruptions and safety hazards.		<ul style="list-style-type: none"> Inspect trucks and other heavy vehicles on a regular basis to avoid oil spillages and un-roadworthy vehicles that could lead to accidents. The mine to consult with adjacent landowners whose private residences, crops, livestock and other infrastructure could be affected by dust, noise and other impacts that result from traffic movement. Provide a schedule of the construction activities to landowners and relevant I&APs if required. 	
		Health and safety risks for workers Inadequate management of the mining process and general operational related activities could result in health and safety risks for workers	Medium	<ul style="list-style-type: none"> A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; Implement measures to suppress dust - spraying of gravel roads, surfaces and stock piles with water on a regular basis. Construction workers to wear personal protective equipment; Any health and safety incidents should be reported to the Site Manager (SM) immediately; First aid facilities should be available on site at all times; Workers have the right to refuse work in unsafe conditions; Material stockpiles or stacks should be stable and well secured to avoid collapse and possible injury to site workers. Access to excavation must be controlled; Excavated areas should be temporarily Provide sufficient ablution facilities (chemical/portable toilets, etc.) at strategic locations that are cleaned regularly. Potable water to be provide to workers. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		Possibility of operation activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners, visitors and workers.	Low	<ul style="list-style-type: none"> All workers will be sensitised to the risk of fire; Smoking is only allowed in designated smoking areas and disposal of cigarette butts safely in sand buckets; The Applicant shall ensure that the basic fire-fighting equipment is available on the site; Extinguishers should be located outside hazardous materials and chemicals storage containers; Fire response and evacuation: <ul style="list-style-type: none"> An Emergency Plan (including Fire Protection, Response and Evacuation Plan) is to be prepared by the Applicant and conveyed to all staff on the site' Identify major risks to minimise the environmental impacts e.g., air pollution and contaminated effluent runoff. 	Low
		Improvement of security in and surround mining area.	Medium Positive	<ul style="list-style-type: none"> Eradication of illegal mining in the area through removal of resource and rehabilitation of area. Cleaning of area of illegally dump waste Freeing up land for housing developments after rehabilitation of area. 	Medium Positive
		Reducing quality of life. Damage to property and infrastructure	Medium	<ul style="list-style-type: none"> Equipment and trucks that produce loud noise must be fitted with appropriate silencers where possible. Dust suppression measures must be implemented to reduce the amount of dust released into the air. Low vibration equipment to be used to prevent damage to house and infrastructure. 	Low

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Houses within close proximity of mining area to be surveyed for crack before any operations commence. Equipment should not be overload, this will prevent damage to roads. An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns Groundwater monitoring (quality and quantity) to be monitored to ensure that groundwater users are not negatively affected. PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location. If PM₁₀ concentrations are found to be in exceedance of the NAAQS at the closest sensitive receptor locations additional dust suppression measures should be investigated. If the mitigation measures employed are considered best practice, additional offset measures should be considered. Such offset measures include upgrading of public road surfaces, 	

Assessment of Potential Impact During the Operational Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				electrification of houses for cooking and heating or supply of cleaner burning fuel for cooking and heating purposes	

Table 40: Impact and proposed mitigation measures of activities in the closure phase of the project

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
Closure of final void and placement of topsoil - Establishment of final land form	Soil	Loss of topsoil when loading and from topsoil stockpile and during placement.	Medium	<ul style="list-style-type: none"> Rehabilitation to be done in line with the requirements of the closure plan Placement of waste rock, subsoil and topsoil to be done in correct order. Roads to be ripped before topsoil is place. Do not overload trucks to prevent spillage of topsoil Limit driving over the topsoil areas to limit compaction and rip the topsoil after placement. Fertility testing to be undertaken on topsoil to establish the fertility of the soil against the baseline test. Mitigation measures to be establish if fertility of the soil is low or have decreased. 	Low

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
	Geology	Opencast mining will result in destruction of geological structures. Loss of geological structure and integrity. Rehabilitation, backfill of open pit. Placement of strata in correct order.	High	<ul style="list-style-type: none"> Rehabilitation of pit to take place in accordance with rehabilitation plan, procedure to ensure rehabilitation objects are achieve. Final landform and land use to be achieved through rehabilitation. Ensure compaction of waste rock to prevent ingress of water. Rehabilitation to be in line with landowner requirements and closure plan. 	Medium
	Surface water	Erosion on rehabilitated areas. Ponding of water. Increase in siltation load from stormwater	Medium	<ul style="list-style-type: none"> Stormwater measures implemented during operational phase to prevent erosion of exposed soils and increase sediment load. Water quality monitoring to be maintained during closure and post closure. In the event that decant takes place, monitoring of the water quality to take place. The rehabilitated areas should be free draining and erosion control should be implemented. 	Low
	Groundwater	Impact on groundwater and surrounding users. Possible formation of AMD and decant from opencast rehabilitated area. Geo-chemical report indicates that the possibility of AMD formation is very low.	Low	<ul style="list-style-type: none"> Groundwater monitoring point to be establish in the low point of the rehabilitated opencast area. This point to be included into the monitoring program. Groundwater monitoring program to be maintained for 2 years post rehabilitation. Mitigation measures to be establish and implemented if any formation of AMD is observed in the groundwater. 	Low

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Utilise the monitoring data to calibrate the ground water models, replacing the inferred data to provide certainty on potential impacts; Rerun the geochemical model to reflect the preferred closure scenario; Determine the risk of latent and residual impacts. If required, devise mitigation measures and implement controls, adjust the closure liability calculation if required. 	
	Topography	Change in topography of the area.	Medium	<ul style="list-style-type: none"> Rehabilitation to be done in line with the requirements of the closure plan. Final land form to be establish as specified in closure plan. Final land form to take settlement into account. Settlement to be monitored and areas where ponding is taking place to be leveled out. Ensure that the profile of the rehabilitated area is free-draining and establish a slope similar to the pre-mining slope. The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas. Rehabilitation to be in line with landowner requirements and closure plan. 	Low
	Vegetation	Transport activities can damage/destroy vegetation. Failure to establish vegetation on the areas where the infrastructure was removed can enhance the	Medium	<ul style="list-style-type: none"> Trucks should remain on roads and designated areas Re-establish indigenous vegetation as soon as possible after the placement of the topsoil. Ensure the area remains free of exotic species. 	Low

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		possibility of the establishment of alien vegetation.			
	Air	Rehabilitation (spreading of soil, re-vegetation and profiling/contouring) activities can lead to an increase in dust emission and emissions from equipment.	Medium	<ul style="list-style-type: none"> Wet suppression techniques should be used to control dust emissions, especially in areas where dry material is handled; Loading of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts. The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation. Leaving the surface of the soil in a coarse condition reduces wind erosion and ultimately reduces the dust levels. Management measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible. Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	Low

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
	Noise	Rehabilitation (spreading of soil, re-vegetation and profiling/contouring) activities can lead to an increase in background noise levels	Medium	<ul style="list-style-type: none"> A management and mitigation plan are recommended to minimise noise impacts from the project on the surrounding area. For all phases of the project. Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday. 	Medium
	Radiation	Risk of exposure to radiation through the inhalation of radioactive dust and radon. Exposure to the radioactive dust deposited in the area as a result of the mining activities. Risk of exposure during transport of overburden. Risk of exposure to land users after rehabilitation of the mining area	Low	<ul style="list-style-type: none"> Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material. Comply with NNR regulation requirements for closure. Site remediation and release from regulatory control An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. 	Very Low
	Visual	Removal of stockpiles and waste rock dump. Establishing a final land form.	Medium	<ul style="list-style-type: none"> Rehabilitation of the area must be done as the mining is completed. Bare areas will be re-vegetated and regularly inspected to ensure good cover and erosion prevention. 	Low

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
Seeding and re-vegetation of rehabilitated areas	Soils	Loss of soil fertility as a result of leaching and compaction. Loss of topsoil due to load and handling of soil and wind, water erosion. Compaction of topsoil as a result of placement and equipment driving over the soil during seeding.	Medium	<ul style="list-style-type: none"> Disturbed and cleared areas need to be revegetated with indigenous grass species in order to help stabilise the soil surface; Upon completion of mining activities, it must be ensured that no bare areas remain, and that indigenous grassland species are reintroduced. Soils that have been compacted as a result of the construction and operational activities must be ripped and profiled in line with the surrounding area. Before seeding takes place. Limit driving over the topsoil areas to limit compaction and rip the topsoil after placement. Conduct regular visual inspections and preventative care and maintenance. Fertility testing to be undertaken on topsoil to establish the fertility of the soil against the baseline test. Mitigation measures to be establish if fertility of the soil is low or have decreased. Soil monitoring to be done on areas with low growth, amelioration action to be establish based on soil chemical composition. 	Low
	Vegetation and Terrestrial Ecology	Re-establishment of vegetation. Increase in spread of alien vegetation. Incorrect rehabilitation and maintenance can lead to colonization and spread of alien vegetation.	Medium	<ul style="list-style-type: none"> Re-establishment of vegetation on all rehabilitated areas. Seed mix to be determined by specialist. Re-seeding to take place on areas where slope or no growth is observed. In places where hydro seeding can be applied it should be utilized. 	Low

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		Ineffective soil amelioration resulting in poor vegetation establishment		<ul style="list-style-type: none"> A management plan for the control of invasive/exotic weed species needs to be implemented. This is not a once-off activity and needs to be ongoing. Educate staff and contractors to help the Site Environmental Officer identify and remove alien species on emergence; Conduct follow up soil sampling and analysis to inform further remediation should it be required; Conduct regular visual inspections and preventative care and maintenance. 	
	Surface water	Erosion on rehabilitated areas. Ponding of water. Increase in siltation load from stormwater.	Medium	<ul style="list-style-type: none"> Stormwater measures implemented during operational phase to prevent erosion of exposed soils and increase sediment load. Water quality monitoring to be maintained during closure and post closure. Vegetation cover to be establish to reduce surface runoff, erosion and siltation. In the event that decant takes place, monitoring of the water quality to take place. The rehabilitated areas should be free draining and erosion control should be implemented. 	Low
	Groundwater	Impact on groundwater and surrounding users. Possible formation of AMD and decant from opencast rehabilitated area.	Low	<ul style="list-style-type: none"> Groundwater monitoring point to be establish in the low point of the rehabilitated opencast area. This point to be included into the monitoring program. Groundwater monitoring program to be maintained for 2 years post rehabilitation. 	Low

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		Geo-chemical report indicates that the possibility of AMD formation is very low.		<ul style="list-style-type: none"> Mitigation measures to be establish and implemented if any formation of AMD is observed in the groundwater. Utilise the monitoring data to calibrate the ground water models, replacing the inferred data to provide certainty on potential impacts; Rerun the geochemical model to reflect the preferred closure scenario; 	
	Air Quality	Increase in dust pollution from wind erosion.	Medium	<ul style="list-style-type: none"> Vegetation to be establish on rehabilitated area to reduce windblown particles. Vegetation binds the soil and reduces the wind velocity Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts. The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation. Leaving the surface of the soil in a coarse condition reduces wind erosion and ultimately reduces the dust levels. Management measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible. 	Low

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				<ul style="list-style-type: none"> Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	
	Social	Land claims can limit the access to land, should land claims be successful before post closure.	Medium	<ul style="list-style-type: none"> Land negotiation to be undertaken with land claim party if land claim is registered in terms of section 11(7) of the Restitution of Land Rights Act, 1994 and published in a government gazette. The land claim commissioner to be informed by written notice of any activities to be undertaken on properties where section 11(7) applies. Stakeholder engagement to be undertaken. 	Very Low
Waste Management	Waste	Waste generated during the rehabilitation process and final closure phase has the potential to cause pollution if not managed correctly. Any waste from the chemical fertilizers utilized should be disposed of in the correct manner.	Medium	<ul style="list-style-type: none"> No waste storage to take place on site. All waste generated should be transported off site to the storage facility from where disposal should take place. No waste to be burned on site Waste to be classified and disposed of accordingly. 	Low
	Soils	Hydrocarbon spills from equipment during final rehabilitation and re-vegetation	Medium	<ul style="list-style-type: none"> Contaminated soils to be removed and disposal to take place as hazardous waste. Spill kits to be available on site. No equipment to be serviced on site. During emergency breakdowns drip trays to be placed under the equipment to prevent hydrocarbon spills. 	Low
	Soil	Residue Stockpile – Waste rock to be used in the backfill of the	Medium	<ul style="list-style-type: none"> Liner to be in line with the waste classification requirements 	Low

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
		opencast area. Formation of acid mine drainage conditions. Residue material remaining on site in the facility.		<ul style="list-style-type: none"> Monitoring of groundwater to take place to establish if the residue stockpile (Waste Rock Dump) has any impact on the groundwater or surface quality Any water discharging from the Waste Rock dump should be prevented from flowing into the receiving environment 	
	Surface Water	Contaminated water generated from the residue stockpile area.	Medium	<ul style="list-style-type: none"> Proper stormwater measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. Stormwater to be in line with the requirements Regulation 704 (4 June 1999). If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; Existing vegetation must be retained as far as possible to minimise erosion problems; Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; No wastewater may run freely into any of the surrounding naturally areas. Any water reporting to the open pit or storm water management areas should be kept in a closed system (classified as contact water) and not be discharged into the environment before 	Low

Assessment of Potential Impact During the Closure Phase					
Activity	Environmental Aspect	Potential Impact	SIGNIFICANCE (not mitigated)	MITIGATION TYPE	SIGNIFICANCE (mitigated)
				treatment to the specific catchment Target Water Quality Guideline (TWQG) standards <ul style="list-style-type: none"> • Contact water can be recirculated and used in a closed system according to GN704 Best Practise Guideline 	
	Groundwater	Impact on groundwater and surrounding users. Possible formation of AMD and decant from opencast rehabilitated area. Geo-chemical report indicates that the possibility of AMD formation is very low.	Low	<ul style="list-style-type: none"> • Groundwater monitoring point to be establish in the low point of the rehabilitated opencast area. This point to be included into the monitoring program. • Groundwater monitoring program to be maintained for 2 years post rehabilitation. • Mitigation measures to be establish and implemented if any formation of AMD is observed in the groundwater. • Utilise the monitoring data to calibrate the ground water models, replacing the inferred data to provide certainty on potential impacts; • Re-run the geochemical model to reflect the preferred closure scenario; • Determine the risk of latent and residual impacts. If required, devise mitigation measures and implement controls, adjust the closure liability calculation if required. 	Low

d) Summary of specialist reports

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):

LIST OF STUDIES	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS	REFERENCE
Groundwater	<p>Groundwater Basic Assessment Report for the Creswell Park Mining permit was completed by NOA Agencies (Pty) Ltd.</p> <p>The groundwater impact assessment has the following objectives:</p> <ul style="list-style-type: none"> • Define the current groundwater characteristics for West Wits Creswell Park open pit mining area and surroundings (the Project area); • Define potential receptors in the Project area; • Define the aquifers underlying the Project area, including groundwater table depth, groundwater quality, and flow characteristics; • Develop a numerical model to define groundwater related impacts and groundwater inflow into the Creswell Park open pit (Life of Mine equates to 4 months – 15 m mining depth); • Define the zone of influence (if any) that will be created by mine dewatering, plus the extent of possible contamination originating from the proposed mining areas and mine infrastructure; • Assess whether decant will occur during the operational phase or post closure; and • Recommend a groundwater monitoring network that will enhance the current monitoring of groundwater quality and level changes; during the operational and closure phases. <p>The study concluded that:</p> <ul style="list-style-type: none"> • Mine dewatering is note foreseen due to the shallow open pit proposed (i.e. <15m deep). Minor seepage and dewatering could be required during the wet season and runoff from the WRD and local catchment. • The geochemical analyses results indicated the waste associated with the Creswell Park open pit is benign. However, for management purposes. Mass migration simulations for operational and post operational was simulated to assess possible migration pathways originating from the WRD. Simulated mass migration is low during operations and within 10 years the potential seepage from the WRD decreased to less than 20%. <p>Recommendations</p> <ol style="list-style-type: none"> 1. An updated hydrocensus should be completed in a 500m radius around the Creswell Park open pit project area. The data recorded should be used to update the monitoring protocol and the groundwater flow model and associated management scenarios. 	X	Basic Assessment Report and EMPR Part B (EMPR)

	<p>2. A detailed monitoring program should be initiated before mining commence:</p> <ol style="list-style-type: none"> a. Monitoring boreholes should be drilled between the WRD/open pit and the community to the south, east and north. b. All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. The results should be recorded as the baseline against which all future possible impacts be measured and managed. c. Monitoring (water levels and quality) during mining should be performed monthly due to the short Life of Mine (4 months). Post operational monitoring should be conducted quarterly. d. A monitoring borehole should be drilled into the rehabilitated open pit and included in the post operational monitoring protocol. Water levels and water quality should be monitored on a quarterly bases. e. Monitoring should continue for at least 2 years post rehabilitation of the Creswell Park project area. <p>3. Any water reporting to the open pit or storm water management areas should be kept in a closes system (classified as contact water) and not be discharged into the environment before treatment to the specific catchment Target Water Quality Guideline (TWQG) standards. Contact water can be recirculated and used in a closed system according to GN704 Best Practise Guideline.</p> <p>4. The back filled open pit should be covered with pre-stripped top soil and revegetated to decrease potential recharge from precipitation.</p> <p>5. The groundwater flow model should be updated once the hydrocensus and monitoring data is updated and monitoring points installed.</p>		
Geo-chemical	<p>GeoDyn Systems (GeoDyn) was requested to conduct a geochemical risk assessment for the proposed Creswell Park open pit gold mine waste rock material. The mine will only produce waste rock as a mineral waste as no processing plant will be on site and therefore there will also be no tailings storage facility on site. The ore will be trucked to another processing facility.</p> <p>The objectives of the geochemical assessment are:</p> <ul style="list-style-type: none"> • Conduct a waste classification of the waste rock. • Determine the likelihood of the development of acid mine drainage (AMD) conditions from the waste material. 	X	Basic Assessment Report and EMPR Part B (EMPR)

	<ul style="list-style-type: none"> Determine the likelihood of leaching of potential contaminants from the waste rock material. <p>The waste classified as Type 3, thus requiring a Class C engineered barrier system. However, none of the constituents in the leach test exceeded the regulatory guideline values. In addition, the geochemical model indicated that the waste rock is comprised of minerals which are very stable in the specific mining environment being considered. In addition, the waste rock itself as well as the secondary mineral products forming very slowly as the waste rock minerals weather have the capacity to remove contaminants from solution through the process of adsorption.</p> <p>The waste rock material contains no iron sulphide minerals. Therefore, the risk of the formation of acid mine drainage conditions due to the waste rock material is negligible. The results indicate that the significance of both potential impacts rate as Very Low. The cumulative impacts of the impacts rate as Low. This is predominantly because of the fact that the development of AMD conditions as well as the leaching of contaminants from the waste rock is unlikely.</p> <p>Recommendation</p> <p>The waste rock material is classified as Type 3 according to NEMWA Regulation 635. It is recommended, based on the results of this assessment, that the waste material class be reduced to Type 4.</p>		
Terrestrial Ecology	<p>Scientific Terrestrial Services (STS) was appointed to conduct a terrestrial ecological sensitivity scan as part of the Mining Permit Application for the proposed Creswell Park open pit area.</p> <p>From the field assessment Two habitat units were identified during the field assessment, namely Secondary Grassland Habitat and Transformed Habitat. The Secondary Grassland habitat unit comprises small pockets of modified grassland and stands of alien and invasive plant species resulting from historic and current anthropogenic activities. Edge effects from the surrounding residential developments, illegal dumping and ongoing illegal mining activities have further degraded the habitat unit. Due to the high levels of disturbance, only common floral species were noted within the mining permit area with not threatened species encountered. The Transformed Habitat Unit is considered to be in a significantly modified ecological condition, abundant in alien and invasive floral species such as <i>Tagetes minuta</i>, <i>Acacia mearnsii</i> and <i>Melia azedarach</i>. The transformed areas also include existing illegal and historical mining areas. As a result of habitat degradation and alien and invasive plant proliferation, the habitat suitability for faunal and floral species has been significantly compromised, notably for SCC;</p>	X	Basic Assessment Report and EMPR Part B (EMPR)

Only a small portion of a wetland was identified within the Investigation Area around the Creswell Park Mining Permit Application Area, approximately 482m north of the Mining Permit Application Area. Due to the distance of this wetland from the Creswell Park Mining Permit Application Area and the fact that this wetland feature is upgradient of the Mining Permit Application Area and the fact that extensive urban infrastructure occurs between the feature and the proposed mining area, it is considered unlikely that the proposed mining activities within the Mining Permit Application Area will pose a risk to the wetland.

Mitigation Measures

1. Footprint Areas

- Limit the footprint area of the construction activity to what is absolutely essential in order to minimise environmental damage;
- Edge effects of mining activities need to be actively managed so as to minimise further impacts to the receiving environment e.g. by implementing an alien and invasive control plan, good surface water management that could lead to erosion and siltation and pollution prevention measures;
- Informal fires by construction personnel within the Creswell Park Mining Permit Application Area should be prohibited;
- It must be ensured that stormwater is managed on site in a suitable manner so as to not increase the risk of erosion and formation of preferential surface flow paths;
- Appropriate sanitary facilities must be provided during all phases and all waste must be removed to an appropriate waste facility as per the applicable waste management legislation;
- No indiscriminate disposal of waste must be permitted. If any spills occur, they should be immediately cleaned up; and
- Upon completion of mining activities, it must be ensured that no bare areas remain, and that indigenous grassland species, representative of the original vegetation type as defined by Mucina and Rutherford (2012) are used to revegetate the disturbed areas.

2. Flora

- Proliferation of alien and invasive plant species are expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the proposed development footprint areas, particularly given the

	<p>current extent and degree of occurrence within the proposed Mining Permit Application Area. Alien and invasive plant seed dispersal within the top layers of the soil within the footprint areas must be controlled;</p> <ul style="list-style-type: none"> • Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to possible cross contamination or wind drift if using a foliar spray; and • Should any floral SCC species be encountered, a suitably qualified specialist is to be consulted in order to ascertain the best way forward. Where necessary, arrangements with the relevant authorities in terms of permitting requirements must take place prior to any removal of floral SCC. <p>3. Fauna</p> <ul style="list-style-type: none"> • Habitat clearing should take place in a phased manner in order to allow for faunal species to relocate into the surrounding habitat on their own with limited human intervention necessary; • Should any SCC or other threatened or protected faunal species be noted within the proposed Creswell Park Mining Permit Application Area, a suitably qualified specialist must be contacted in order to ascertain the best way forward; and • No trapping or hunting of fauna is to take place. <p>4. Dust</p> <ul style="list-style-type: none"> • An effective dust management plan must be designed and implemented in order to mitigate the impact of dust on flora and fauna throughout all mining and development phases. <p>5. Vehicle access</p> <ul style="list-style-type: none"> • Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities; and • In the event of a breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil as per the protocols set out within the applicable waste management program. <p>6. Soils</p> <ul style="list-style-type: none"> • Edge effects of activities including soil erosion and siltation must be strictly managed; 		
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	<ul style="list-style-type: none"> • All soils compacted as a result of construction and operation activities should be ripped and re-profiled. Special attention should be paid to the stabilisation of these areas, ensuring that adequate natural vegetation regrowth occurs; and • 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-fueling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil. <p>7. Rehabilitation</p> <ul style="list-style-type: none"> • Disturbed and cleared areas need to be revegetated with indigenous grass species in order to help stabilise the soil surface; • Where possible concurrent/progressive rehabilitation must be implemented, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint, but will also reduce the overall rehabilitation effort and cost; • All alien and invasive plant species within the Creswell Park MP area must be cleared, with follow up activities running concurrently for a minimum of three years; and • Soils that have been compacted as a result of the construction and operational activities must be ripped and profiled in line with the surrounding area. <p>Based on the findings of the ecological assessment, from a terrestrial ecological perspective, the proposed mining activity poses minimal risk to the faunal and floral resource management and conservation initiatives for the area, due to the significantly decreased ecological integrity and transformation of the area. However, in order that the significance of perceived impacts remain low, it is essential that the recommended mitigation measures for the identified impacts are adhered to so as to ensure that the ecology within the proposed Mining Permit Application Area along with the surrounding zone of influence is protected or adequately rehabilitated where necessary, in order to ensure that the intended post closure land use objectives are met.</p>		
Heritage impact assessment	<p>PGS Heritage (Pty) Ltd was appointed to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Assessment Reporting process (BAR) for the mining permit application for the proposed opencast pit referred to as Creswell Park. The fieldwork findings confirmed that there are no identified heritage resources situated inside or adjacent to the Creswell Park foot print area.</p> <p>During the field assessment for the Creswell Park opencast footprint, no heritage sites were identified within the footprint area, however, a total of three heritage sites were located close to the footprint area. These include one formal burial ground (CP001),</p>	X	Basic Assessment Report and EMPR Part B (EMPR)

	<p>and two historical residential areas (CP002, CP003). In addition, an historical midden of probable archaeological age was identified by a previous study and is located just outside the footprint boundary (PB 2008).</p> <p>The data analysis has enabled the identification of possible heritage sensitive areas that included:</p> <ul style="list-style-type: none"> • Structures/buildings (residential); • Burial grounds and graves; • Possible archaeological sites (based on experience) <p>Recommendations</p> <p>Palaeontological Resources</p> <ul style="list-style-type: none"> • In Palaeontological terms the significance is rated as Low negative. The proposed development is thus unlikely to pose a substantial threat to local fossil heritage. However, should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably in situ) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (e.g. recording, sampling or collection) can be taken by a professional palaeontologist. • During the construction phase, 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 is implemented. <p>a. Chance find procedure</p> <ul style="list-style-type: none"> • A heritage practitioner 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 archaeologist must be identified to be called upon in the event that any possible heritage resources or artefacts are identified. 		
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	<ul style="list-style-type: none"> • Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated, and construction activities be halted. • The qualified 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 impact on the heritage resource. • The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. • Construction can commence as soon as the site has been cleared and signed off by the archaeologist. <p>b. Heritage Management Plan for EMPr implementation</p> <ul style="list-style-type: none"> • Implement chance find procedures in case where possible heritage finds area made. • It is recommended that the cemetery should be left in situ. If there is any activity in the vicinity, at least a 100m buffer around the cemetery should be applied as per the requirements of Section 17.6(a) of the Mine Health and Safety Act. If, for any reason, the cemetery cannot be avoided, a grave relocation process will need to be implemented. A permit from SAHRA will be required for any relocation. • A buffer zone of 100m (Section 17.6(a) of the Mine Health and Safety Act) is required to protect the houses located closest to the southern boundary of the Creswell Park footprint. There could be a possibility of damage caused by the vibrations from the proposed opencast mining activity. However, this would need to be confirmed by a vibration study. • A permit from the Gauteng PHRA will be required if there is a possibility of any damage to these structures. The buildings could also require documentation by drawings or photographs. • It is recommended instead that an archaeological monitoring programme should be undertaken on commencement of vegetation clearance and earth moving activities to identify any archaeological material that may be located sub-surface. <p>c. Palaeontology</p> <ul style="list-style-type: none"> • The construction and operation of the development footprint is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area 		
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	<ul style="list-style-type: none"> • In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed instantly. These finds must be protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that mitigation (e.g. recording, collection) can be undertaken by a professional palaeontologist. • Preceding any excavation of fossils, a collection permit from SAHRA must be obtained. The fossil material must be housed in an approved collection (museum or university collection) and the fieldwork and reports need to comply with the minimum standards for palaeontological impact studies developed by SAHRA. <p>It is the considered opinion of the specialist that, based on the findings of the desktop research together with the fieldwork findings, the overall impact on heritage resources is acceptably low and the project can be approved from a heritage perspective.</p>		
Noise Impact Assessment	<p>Airshed Planning Professionals (Pty) Ltd (Airshed) was commissioned to undertake a specialist environmental noise impact study for the Creswell Park Basic Assessment Report (BAR). The main objective of the noise specialist study was to determine the potential impact on the acoustic environment and noise sensitive receptors (NSRs) as a result of the development of the proposed project and recommend suitable management and mitigation measures. The baseline acoustic environment was described in terms of the location of NSRs, the ability of the environment to attenuate noise over long distances, as well as existing background and baseline noise levels.</p> <p>The following was found:</p> <ul style="list-style-type: none"> • The closest NSRs to the project site is ~20 m to the southwest. • Vehicles are the main contributors to the acoustic environment of the area. • The baseline noise levels (as measured during the survey) was 41.75 dBA during the day and 41.64 dBA during the night. <p>The main findings of the impact assessment are:</p> <ul style="list-style-type: none"> • A management and mitigation plan are recommended to minimise noise impacts from the project on the surrounding area. • The noise levels from the project operations exceed the selected noise criteria at the closest NSRs surrounding the project site. • Construction and closure phase impacts are expected to be similar or slightly lower than simulated noise impacts of the operational phase. 	X	Basic Assessment Report and EMPR Part B (EMPR)

	<p>The following key recommendations should be included in the project environmental management programme:</p> <ul style="list-style-type: none"> • A monitoring programme as per the requirements of the International Finance Corporation (IFC) and SANS 10103: • Annually during the operational phase at the closest NSR; and • In response to complaints received. <p>In managing noise specifically related to truck and vehicle traffic, efforts should be directed at:</p> <ul style="list-style-type: none"> • Minimising individual vehicle engine, transmission, and body noise/vibration. This is achieved through the implementation of an equipment maintenance program. • Maintain road surface regularly to avoid corrugations, potholes etc. • Avoid unnecessary idling times. • Minimising the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level near the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level' (Burgess & McCarty, 2009). • Limiting traffic to hours to between 06:00 and 18:00. • Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours. • A noise complaints register must be kept. <p>Based on the findings of the assessment and the close proximity of NSRs to the project, it is recommended that the mitigation and monitoring measures recommended in this report are in place during the operational phase of the project.</p>		
Air Quality Baseline Assessment	Airshed Planning Professionals (Pty) Ltd (Airshed) was appointed to undertake an air quality specialist study for the project as part of the Basic Assessment process for Creswell Park	X	Basic Assessment Report and

	<p>The main findings from the baseline assessment are as follows:</p> <p>The flow field is dominated by winds from the north-north-east. During day-time conditions, winds from the north increase in frequency, with winds from the north-north-east sector increasing at night</p> <p>Existing sources of emissions in the study area include vehicle exhaust and entrainment on paved and unpaved roads, household fuel burning, biomass burning (veld fires), industrial activities, mining operations and wind erosion from exposed areas and tailings storage facilities. High dust fallout rates recorded at all current sampling locations during the windy spring months from September to November indicates that wind erosion is likely a significant source of dust emissions in the study area.</p> <p>The main findings from the impact assessment are as follows:</p> <p>The main sources of dust emissions from the Creswell Park operations are likely to be materials handling of Run of Mine (ROM) and waste rock in the pit and of waste rock at the Waste Rock Dump (WRD) and vehicle entrainment emissions from haul trucks and other mobile equipment.</p> <p>With no mitigation measures applied simulated highest daily PM₁₀ (inhalable particulate matter less than 10 µm in diameter) concentrations exceed the South African National Ambient Air Quality Standards (SA NAAQS) at the closest sensitive receptors located to the east of the operations. With simple mitigation measures such as wet suppression of dust at material handling points and regular water sprays on haul roads, simulated incremental PM₁₀ concentrations due to the Creswell Park operations are in compliance with the SA NAAQS at all sensitive receptor locations. Even with no mitigation measures applied simulated inhalable particulate matter less than 2.5 µm in diameter (PM_{2.5}), nitrogen dioxide (NO₂), sulfur dioxide (SO₂) and carbon monoxide (CO) concentrations are in compliance with the SA NAAQS for all averaging periods and simulated highest monthly dust fallout rates are in compliance with the SA National Dust Control Regulations (NDCR) residential limit at all sensitive receptor locations and in compliance with the SA NDCR non-residential limit at all off-site areas.</p> <p>With no mitigation measures applied the incremental impact of the Creswell Park operations on the receiving environment is expected to be MEDIUM. With 50% mitigation of material handling emissions and 30% mitigation of vehicle entrained dust from unpaved roads, the incremental impact of the Creswell Park operations is expected to be LOW. The cumulative impact during the mining phase (with mitigation measures applied) is expected to be MEDIUM, but the short life of the Creswell Park operations means that long term impacts (annual average pollutant concentrations) are unlikely to exceed the SA NAAQS.</p> <p>Based on the findings above the following is recommended:</p>		EMPR Part B (EMPR)
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	<ul style="list-style-type: none"> • A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns; • Wet suppression techniques should be used to control dust emissions, especially in areas where dry material is handled or stockpiled. • Exposed soils and other erodible materials should be re-vegetated or covered promptly; new areas should be cleared and opened-up only when absolutely necessary and surfaces should be re-vegetated or otherwise rendered non-dust forming when inactive; • Storage for dusty materials should be enclosed or operated with efficient dust suppressing measures; • Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; • Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts. • Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. • Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. • The vehicle fleet be regularly serviced and maintained to minimise CO, NO₂, SO₂ and greenhouse gas emissions. • Older vehicles in the current fleet should be replaced with newer, more fuel-efficient alternatives where feasible. • PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location. • If PM₁₀ concentrations are found to be in exceedance of the NAAQS at the closest sensitive receptor locations additional dust suppression measures should be investigated. If the mitigation measures employed are considered best practise, additional offset measures should be considered. Such offset measures include upgrading of public road surfaces, electrification of houses for cooking and heating or supply of cleaner burning fuel for cooking and heating purposes 		
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<p>Traffic Impact Assessment</p>	<p>Siyazi Gauteng Consulting Services (Pty) Ltd. was appointed to conduct a Traffic Impact Assessment (TIA) for the proposed Creswell Park portion of the proposed West Wits Mining operation</p> <p>The following scenarios were investigated as part of the TIA:</p> <ol style="list-style-type: none"> a. Scenario 1: 2018 peak hour traffic without background traffic growth, without the proposed mining development (status quo); b. Scenario 2: 2019 peak hour traffic with background traffic growth, with the proposed mining development (operational phase); <p>Based on a site inspection of the existing road network adjacent to the site under investigation, traffic surveys, calculations and reference to the relevant traffic engineering guideline documents, the following findings and recommendations were made:</p> <ul style="list-style-type: none"> • Detailed investigations should be conducted in conjunction with the relevant road 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 needs to be prepared in conjunction with the relevant road authority on public roads where trucks will operate as soon as the project has been approved in order to ensure that the consumables, ROM ore and workers • Can be transported at all times. Road markings, reflective road studs (LED), road signs, overhead lights should be provided and maintained at all the relevant intersections under investigation to ensure visibility during night time, proper visibility of intersection lane geometry and sufficient information to road users; and • As part of the proposed mining development, it is recommended that ore haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods. <p>In conclusion of the findings as part of the investigations, Siyazi Gauteng Consulting Services (Pty) Ltd is of the opinion that the proposed mining development would have a manageable impact on the relevant roads network as long as the mitigating measures are implemented as recommended and should thus be granted authorisation.</p>	<p>X</p>	<p>Basic Assessment Report and EMPR Part B (EMPR)</p>
<p>Closure Plan</p>	<p>Golder was appointed to undertake the closure plan for the West Wits – Creswell Park mining permit. This primary closure plan, is compiled in the overall approach and structure to align for closely to Appendix 4 of GN.R. 1147, namely minimum content of a final rehabilitation, decommissioning and mine closure plan. This plan also reflects an integration and consolidation of closure-related</p>	<p>X</p>	<p>Basic Assessment Report and EMPR Part B (EMPR)</p>

	<p>studies and additional specialist work recently undertaken. The following should be implemented to further refine the closure planning for the proposed Creswell Park opencast pit:</p> <ul style="list-style-type: none"> • Develop the conceptual post mining landform to detailed design level prior to the commencement of the concurrent backfill; • Capture improved accuracy regarding the bulking factor into the design, planning and costing as required; • Develop and include a detailed topsoil balance for the site based on actual survey data to replace the current estimates; • Utilise the improved topsoil data to accurately plan the topsoil placement depths; • Capture the updated outcomes of the refined ground water model which will be updated with site specific monitoring data from the proposed boreholes; • Incorporate the relevant outcomes of the specialist studies detailed in the scoping report and EIA phase of the larger mining right application; • The detailed social aspects of this closure plan are currently being incorporated into the broader mining right application which have a more comprehensive approach. The relevant components must be used to inform the further refinement of this closure plan; • Develop a detailed monitoring plan; • Develop detailed relinquishment criteria; • Refine the closure scheduling; and • Include a revision of the closure costs to improve the accuracy running into the closure phase. <p>The closure plan must be updated during the operation's life to reflect known developments, including changes due to the outcomes of specialist studies and updated hydrogeological models, new regulatory requirements and any other material developments. A preliminary schedule of monitoring, auditing and reporting requirements which relate to the risk assessment, legal requirements, effective implementation and knowledge gaps is proposed as follows:</p>		
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	<ul style="list-style-type: none"> • Internal operational rehabilitation audits coordinated by the mine and including soils, groundwater and closure specialists. The purpose is to review the closure plan and monitor the implementation of concurrent rehabilitation measures; • External financial audits coordinated by the financial manager and the closure manager, by suitable qualified independent auditors; and • Legal compliance audits coordinated by the Mine manager aligned with environmental authorisation requirements. Relevant aspects relating to closure, such as changes to the risk assessment, changes in closure options and changes in the closure provision will be reported. 		
Radiation	<p>SciRAD Consulting was appointed to provide a statement on radiation impact for West Wits Mining MLI (Pty) Ltd Operations at the proposed Creswell Park pit.</p> <p>The radiation from the ore may present a health risk to the public living close to the mine. The risk to members of the public may come from various sources:</p> <ul style="list-style-type: none"> • Inhalation of radioactive dust and radon; and • Exposure to the radioactive dust deposited in the area as a result of the mining operations <p>Based on studies in the Witwatersrand area have shown that the radiation dose to members of the public is not expected to exceed the 250 microSievert (0.25 mSv/a) per year dose limit (for a single operation) set by the National Nuclear Regulator (NNR). The expected health risk to member of the public is very low.</p> <p>Workers at the mine will be exposed to the same radiation sources as the public but at higher concentrations, due to closer proximity to these sources. Still, the worker doses are not expected to exceed the worker dose limit of 20 mSv/a. The radiation from the Creswell Park mining operations may therefore present a low health risk to the workers on site.</p> <p>The assumed conclusions can only be confirmed once the radionuclide analyses (of samples from the site) have been received and used as input in the radiological assessments that are currently underway.</p> <p>The following recommendation has been made:</p> <ul style="list-style-type: none"> • Dust suppression to be applied to the mining areas and haul roads. 	X	Basic Assessment Report and EMPR Part B (EMPR)

	<ul style="list-style-type: none"> • Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material. • Comply with NNR regulation requirements for closure. Site remediation and release from regulatory control • Radiological perspective, must be performed according to the NNR's Regulatory Guide – Site Remediation and Release from Regulatory Control (RG-0026). <p><i>The assumed conclusions can only be confirmed once the radionuclide analyses (of samples from the site) have been received and used as input in the radiological assessments that are currently underway.</i></p>		
Blasting and Vibration	<p>Cambria CC was appointed to provide an assessment on the possible impact associated with vibration during opencast mining at the West Wits – Creswell Park mining permit area. Vibration measures was undertaken at an existing open cast area (i.e. Sol Plaatjie) that is utilising the same rock breaking equipment that will be utilised at the proposed Creswell Park mining permit area.</p> <p>The ground vibration levels were highest close to the Xcentric ripper's area of operation. The levels attenuated rapidly with increase in distance. Vibration levels at distances greater than 50m will be negligible in this geological environment.</p> <p>It is recommended that a more comprehensive noise analysis study be carried out as and when required. It may be necessary to carry out control monitoring in the different mining areas as and when required.</p>	X	Basic Assessment Report and EMPR Part B (EMPR)

Full specialist report are attached as appendices (Please refer to **Appendix G**)

e) Environmental impact statement

(i) Summary of the key findings of the environmental impact assessment;

Table 41: Summary of the Possible Impacts Associated with the Mining Activity

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	SIGNIFICANCE	SIGNIFICANCE
		PRE-MITIGATION	POST-MITIGATION
GEOLOGY AND SOILS	Opencast mining will lead to loss and disturbance to topsoil as a result of clearing of vegetation and excavation of topsoil to stockpile. Loss of soil natural structure and properties (physical and chemical) as a result of stripping and stockpiling of topsoil. The soils natural structure is disturbed and as a result the natural cycle is broken exposing the bare soil to erosion. Decline in topsoil fertility due to mixing of soil's A and B horizons (upper and lower horizons) and due to possible mixing of different soil types	60	36
	Insufficient topsoil quality and quantity present on site.	52	26
	Hydrocarbon spills on soils can occur where heavy machinery and vehicles are parked such as the hard park area because they contain large volumes of lubricating oils, hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking.	21	14
	Contamination of soil through the utilization of stormwater for dust suppression	24	16
	Loss of topsoil through erosion at stockpiles, pit edges and rehabilitated areas	52	39
	Ineffective soil amelioration resulting in poor vegetation establishment	55	30
	Opencast mining will result in destruction of geological structures. Loss of geological structure, integrity. Loss of natural resources	75	60
TOPOGRAPHY	Change in topography as a result of opencast mining. Change in surface drainage	45	36
	Change in topography as a result of opencast mining. Change in final land form.	45	36
LAND CAPABILITY	Loss of soil resources for agricultural and other land uses. Loss of soil fertility	48	36
	Change in landforms due to mining activities and rehabilitation of opencast mining area.	27	18

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	SIGNIFICANCE	SIGNIFICANCE
		PRE-MITIGATION	POST-MITIGATION
HYDROLOGY GROUNDWATER	Dewatering of local aquifer an impacting local and neighboring groundwater users	15	15
	Mass migration from waste rock dump negatively impacting groundwater quality	15	15
	Formation of Acid Mine Drainage (AMD) and the generation of AMD decant from the rehabilitated pit area	15	15
HYDROLOGY SURFACE WATER	Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater runoff quantity and quality. Change in flow regimes. The impact is cause by compaction of soil, removal of vegetation	48	36
	Contamination of stormwater runoff from waste rock dump and water flowing into pit area. Changes in water quality. Increase siltation and dissolved solids.	33	22
	Pollution of water resources through the discharge of contaminated stormwater	20	10
GEOCHEMISTRY	Disposal of waste rock onto the waste rock facility and resulting formation of acid mine drainage conditions	15	15
	Disposal of waste rock onto the waste rock facility and resulting leaching of metal(liod)s, especially arsenic, from the material	15	15
TERRESTRIAL ECOLOGY	Impact on Habitat Integrity for Faunal and Floral Species	50	40
	Impact on Faunal Species of Conservation Concern	40	30
	Introduction and spread of alien invasive species.	52	39
CULTURAL HERITAGE	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks. Destruction of historical areas or structures.	45	15
	Possible destruction of palaeontological fossil material	14	7

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	SIGNIFICANCE	SIGNIFICANCE
		PRE-MITIGATION	POST-MITIGATION
	Possible destruction of archaeological structures or material	45	15
	Possible destruction of burial grounds and graves	54	18
	Possible destruction of historical structures or material	54	18
	Possibility of uncovering subsurface heritage material	18	9
VISUAL AND SENSE OF PLACE	Visibility from sensitive receptors / visual scarring of the landscape as a result of the mining activities. Visual impact as a result of operation of waste rock dump.	50	40
	Visual impact resulting for dust and air pollution	32	24
NOISE AND VIBRATION	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise and vibration impacts associated with the operation of vehicles, machinery and equipment.	44	33
	Increase in background noise levels as a results of site activities. Transporting of ore.	55	44
	Mining operations, hauling and decommissioning. Noise impacts generated may impact on the social environment, especially residential areas adjacent to the mining area.	44	33
	Mining operations, hauling and decommissioning. Vibration generated may impact on surrounding communities having a negative impact on structures and social environment.	21	14
AIR QUALITY	Increased dust pollution due to vegetation clearance, vehicles driving on gravel road and mining activities including crushing of ore. Increase in windblown particles from exposed surfaces, gravel roads, soil and rock dumps and open pit area	45	36
	Mining operations, haulage and decommissioning resulting in impact of inhalable particular concentrations at sensitive receptor locations	50	40

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	SIGNIFICANCE	SIGNIFICANCE
		PRE-MITIGATION	POST-MITIGATION
	Gaseous emissions from vehicles and machinery may cause an impact on ambient air quality. Impact of inhalable gaseous concentrations and dust fallout at sensitive receptor locations	40	27
RADIATION	Risk of exposure to radiation through the inhalation of radioactive dust and radon. Exposure to the radioactive dust deposited in the area as a result of the mining activities.	30	15
	Risk of exposure to radiation to the mine workers during the mining and transportation of ore.	30	15
	Risk of exposure to land users after rehabilitation of the mining area	32	15
WASTE	Generation of additional general waste, litter and building rubble and hazardous waste.	60	36
	Clearing site and disposing of illegally dumped waste on the site at appropriate waste disposal facility	45	45
	Residue Stockpile. Impact the depositing of waste rock and subsoil and have on the receiving environment	30	20
SERVICES	Minor impact caused by need for services i.e. water, electricity and sewerage systems during the mining phase causing additional strain on natural resources and service infrastructure.	16	8
SERVITUDES	Mining activities causing damage to pipeline	60	30
	Spills associated with damage to pipeline and disruption in transmission of fuel/gas.	60	30
	Environmental and Health & safety risk associated with spills and damages to pipeline	60	30
TRAFFIC	Change in traffic patterns as a result of traffic entering and exiting the site on the surrounding road infrastructure and existing traffic.	55	33
	Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, and heavy vehicles.	40	20

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	SIGNIFICANCE	SIGNIFICANCE
		PRE-MITIGATION	POST-MITIGATION
HEALTH AND SAFETY	Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners and users	33	22
	Increased risk to public and worker safety: If not fenced off, the public and workers may fall into excavated areas and trenches. Increase in traffic.	33	22
	Increase health risk associated with increase in noise and air pollution	44	33
	Improved control of the site resulting in reduce health and safety risk associated with illegal waste dumping and illegal mining.	60	60
SOCIO-ECONOMIC	Potential creation of employment opportunities for the local community, ensuring job security.	40	40
	Multiplier effects on local economy will be positive, but limited in extent and only short term.	35	35
	Reduction in illegal mining taking place in the area	60	60
	Opening areas for housing developments	60	60
	Damage to infrastructure on surrounding properties	30	20
	Land claims can limit the access to land, should land claims be successful before post closure.	51	17
	Disruptions in daily living and movement patterns	40	30

(ii) Final Site Map

*(Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. Attach as **Appendix D**)*

The final site layout is presented in Appendix D.

(iii) Summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;

Positive and negative impact are presented in **Table 41**. Alternatives as considered are presented in this report.

f) Proposed impact management objectives and the impact management outcomes for environmental and social-economic impacts;

(Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPR as well as for inclusion as conditions of authorisation).

Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPR as well as for inclusion as conditions of authorisation.

Specific environmental objectives to control, remedy or stop potential impact emanating from the proposed project are provided in **Table 42** below.

Table 42: Environmental Objectives and Outcomes

Aspect	Environmental Objective	Outcome
Geology and Soils	To prevent soil pollution, minimise the loss of topsoil and related land capability through physical disturbance, erosion and compaction	To handle, manage and conserve soil resources to be used as an essential resource in rehabilitation and establishing the land capability to its prior (pre-project) state
Topography	To minimise the impact on the land from and to prevent physical harm to third parties from potentially hazardous excavations	Establish a sustainable final land form. To ensure the safety of people and animals

Land Capacity and land use	To prevent loss of land capability through physical disturbance, erosion and compaction. To prevent unacceptable impacts on surrounding land uses	To handle, manage and conserve soil resources to be used as an essential resource in rehabilitation and establishing the land capability final land use requirements. Minimise impacts on existing and surrounding land uses
Groundwater	To prevent pollution of groundwater resources. To prevent any AMD formation. Prevent impact on groundwater users	To ensure groundwater quality remains within acceptable limits based on baseline and water quality targets
Surface Water	To prevent pollution of surface water resources. Prevent siltation of resources.	To ensure surface water quality remains within acceptable limits based on baseline and water quality targets.
Geochemical	To prevent any AMD formation	To ensure that no AMD formation takes place.
Terrestrial Ecology	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical destruction.	To limit the area of disturbance as far as practically possible
Cultural Heritage	To prevent unacceptable loss of heritage resources	To protect heritage resources where possible. If disturbance is unavoidable, mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements
Visual and Sense of place	To limit negative visual impacts	To limit the area of disturbance as far as possible
Noise and Vibration	To prevent unacceptable noise and vibration impacts	To ensure that any noise and vibration generated is not disturbing to sensitive receptors
Air Quality	To prevent air pollution	To ensure that emissions limits are met
Traffic	To prevent road disturbance impact and reduce the potential for traffic safety related impacts	To minimise impacts on the public and mine road networks
Health and Safety	To prevent risk to human health and safety	To ensure that no impact on human health and safety takes place
Social Economic	To enhance the positive economic impacts and limit the negative economic impacts	To work together with existing structures and organisations to enhance positive impacts.

g) Roles and Responsibilities

The key personnel to ensure compliance to the EMPR and monitoring program is presented below. Responsible persons may differ from those indicated here, the roles and responsibilities would entail the minimum indicated below.

Table 43: Roles and Responsibilities

Aspect	Location	Timeframe	Responsible Person
Implementation of EMPR	Mine Area	Continues through each phase	Mine Manager ECO External Specialist
Groundwater	As per Groundwater specialist report	Monthly – Water levels Monthly – Quality (construction) Quarterly – Quality (Operational and Closure)	External service provider – specialists
Noise	Sensitive Receptors	Annual (once during operation and one during closure) - After complaints	External service provider – specialists
Air Quality	Sensitive Receptors	PM ₁₀ – Continues Dust fallout – Monthly	External service provider – specialists
Archaeological	Mine Area	If and when required	External service provider – specialists ECO
Social and Stakeholder engagement	Regional	On-going	Mine Manager Social officer ECO
Crack survey	Houses within 100m	Once off	Mine Manager Social officer ECO
Vibration Monitoring	Local Area	If and when required	External service provider – specialists ECO
Alien Vegetation	Mine Area	Bi-annually	External service provider – specialists ECO
Rehabilitation Monitoring	Mine Area	Bi-annually	External service provider – specialists ECO

h) Aspects for inclusion as conditions of Authorisation

(Any aspects which must be made conditions of the Environmental Authorisation)

From the aspects has been identified by the specialist studies and are recommended to be included as conditions in the Environmental Authorisation:

- An independent environmental control officer (ECO) must be appointed to monitor the implementation of the EMPR and audit reports to be kept by the applicant;
- Submission of a Water Use License Application and the undertaking of all relevant specialist studies for that purpose.
- Establish a stormwater management plan before construction of the activity is undertaken in line with requirements as set out in GN 704.
- The EMPR is a contractual document and must be implemented at all times during the all phase;
- An updated hydrocensus should be completed in a 500m radius around the Creswell Park open pit project area. The data recorded should be used to update the monitoring protocol and the groundwater flow model and associated management scenarios.
- A detailed monitoring program should be initiated before mining commence:
 - Monitoring boreholes should be drilled between the WRD/open pit and the community to the south, east and north
 - All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. The results should be recorded as the baseline against which all future possible impacts be measured and managed.
 - Monitoring (water levels and quality) during mining should be performed monthly due to the short Life of Mine (4 months). Post operational monitoring should be conducted quarterly for at least 2 years post rehabilitation of the Creswell Park project area.
 - A monitoring borehole should be drilled into the rehabilitated open pit and included in the post operational monitoring protocol. Water levels and water quality should be monitored on a quarterly bases.
- An alien vegetation management plan should be developed before the mine becomes operational.
- In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the

developments ought to be informed instantly. These finds must be protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that mitigation (e.g. recording, collection) can be undertaken by a professional palaeontologist.

- A buffer zone of 100m (Section 17.6(a) of the Mine Health and Safety Act) is required to protect burial grounds and structures.
- A management and mitigation plan is recommended to minimise noise impacts from the project on the surrounding area.
- A monitoring programme as per the requirements of the International Finance Corporation (IFC) and SANS 10103:
 - Annually during the operational phase at the closest NSR; and
 - In response to complaints received.
- Waste rock and stockpiles to be utilized as noise barriers to reduce impact on surrounding sensitive receptors.
- Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday
- PM₁₀ monitoring for the duration of the mining and rehabilitation phases to be undertaken. The recommended location for PM₁₀ monitoring is at a suitable safe location.
- Detailed investigations should be conducted in conjunction with the relevant road 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 needs to be prepared in conjunction with the relevant road authority on public roads where trucks will operate as soon as the project has been approved in order to ensure that the consumables, ROM ore and workers
- Can be transported at all times. Road markings, reflective road studs (LED), road signs, overhead lights should be provided and maintained at all the relevant intersections under investigation to ensure visibility during night time, proper visibility of intersection lane geometry and sufficient information to road users; and
- As part of the proposed mining development, it is recommended that ore haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods.
- Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material.
- Radiological assessment, must be performed according to the NNR's Regulatory Guide – Site Remediation and Release from Regulatory Control (RG-0026).

- Closure plan and closure cost assessment to be updated annually. The closure plan to be updated based on a thorough assessment of the new regulations, namely GN.R 1228.
- Liner to be installed as required by waste classification and specialist recommendation.
- Concurrent/progressive rehabilitation must be implemented at all times and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint, but will also reduce the overall rehabilitation effort and cost;
- Concurrent rehabilitation (roll over mining) to be in line with the closure plan and procedure.
- Rehabilitation of pit to take place in accordance with rehabilitation plan, procedure to ensure rehabilitation objects are achieve
- A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems.
- Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns

i) Description of any assumptions, uncertainties and gaps in knowledge.

(Which relate to the assessment and mitigation measures proposed)

- All information provided to the environmental team by the applicant and I&APs was correct and valid at the time that it was provided;
- It is not always possible to involve all I&APs individually, however, every effort has been made to involve as many affected stakeholders as possible though the extensive public participation process undertaken;
- The information provided by the applicant and specialists was accurate and unbiased;
- The scope of this investigation is limited to assessing the environmental impacts associated with the construction, operation and closure phases of the proposed activity.
- A monitoring and evaluation system, including auditing, will be established, in line with this EMP, to track the implementation of this specific EMP to ensure that management measures are effective to avoid, minimize and mitigate impacts; and that corrective action is being undertaken to address shortcomings and/or non-performances;
- All assumptions and limitations as identified in the specialist studies (See Appendices G) should be taken into consideration.

j) Reasoned opinion as to whether the proposed activity should or should not be authorised

i) Reasons why the activity should be authorised or not

Based on specialist studies and the impact assessment undertaken no fatal flaws have been identified. However, several environmental and social impacts are envisaged from construction phase through to post-closure. The assessment of the proposed project presents the potential for highly negative impacts to occur on the geology and loss of resources before mitigation measures are implemented. The impact on the bio-physical, cultural and socio-economic environments is expected to be medium to low. With mitigation these potential impacts can be prevented or reduced to acceptable levels.

If all the recommendations of the specialists and mitigation measures provided in the Environmental Management Programme (PART B of this report) is effectively implemented and based on the information contained in this report as obtained from specialist there is no environmental, social or economic impact that is of such significant that the project should not proceed.

13. Period for which the Environmental Authorisation is required.

This Environmental Authorisation is required for a period of 2 years. This will be in line with the requirements of the DMR in terms of the period in which a mining permit should be mined.

14. Undertaking

(Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPR and is applicable to both the Basic assessment report and the Environmental Management Programme report).

Please refer to the EMPR in Part B of this document.

15. Financial Provision

(State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation).

The schedule closure cost for the project for rehabilitation of mining aspects and general surface rehabilitation was calculated at R 3 488 741.81. The additional allowances on the project that consisted out of P&G (10%), Contingencies (10%) and Additional Studies were calculated at R 906 540.86. Post Closure Aspects were calculated at R 1 072 475.37 for the 5 year post closure monitoring of surface, ground water and 3 years monitoring of rehabilitation and care and maintenance. The total schedule closure cost was calculated at R 5 467 758.04.

ii) Explain how the aforesaid amount was derived

The financial provision for the proposed project was determined in accordance with the NEMA Regulations (1147 of 2015) pertaining to the financial provision for prospecting, mining operations. In this regard, the financial provision was derived through an itemisation of all activities and costs calculated based on actual costs of implementation of measures required for:

- Annual rehabilitation, as reflected in an annual rehabilitation plan
- Final rehabilitation, decommissioning and closure of the prospecting operations at the end of the life of operations, as reflected in a final rehabilitation, decommissioning and closure plan.
- Remediation of latent or residual environmental impacts.

The amount determined for financial provision for the proposed project will be provide during the construction and operational phase and will be updated annually.

iii) Confirm that this amount can be provided for from operating expenditure

(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

The amount as presented will be provide after approval of the mining permit.

16. Specific Information required by the competent Authority

iv) Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the:-

(1) Impact on the socio-economic conditions of any directly affected person

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as an Appendix).

Potential impacts on landowners, land occupiers, communities or individuals or competing land uses in the area include:

- Potential soil pollution which may result from any hydrocarbon spills where heavy machinery and vehicles are parked such as the hard park area because they contain large volumes of

lubricating oils, hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking;

- Contamination of stormwater runoff and groundwater, caused from mining activities and residue stockpiles.
- Visual impacts: Visibility from sensitive receptors / visual scarring of the landscape as a result of the mining activities.
- Nuisance and health risks caused by an increase in the ambient noise level as a result of noise and vibration impacts associated with the operation of vehicles, machinery and equipment.
- Increased dust pollution due to vegetation clearance and vehicles driving on gravel roads and mining activities.
- Potential health risk (very low) associated with the inhalation of radioactive dust and radon;
- Gaseous emissions from vehicles and machinery may cause an impact on ambient air quality.
- Generation of additional general waste, litter and hazardous waste.
- Change in traffic patterns as a result of traffic entering and exiting the site on the surrounding road infrastructure and existing traffic.
- Changes in traffic patterns as a result of the transportation of ore to offsite facility for treatment
- Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, and heavy vehicles.
- Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners, visitors and workers.
- Increased risk to public and worker safety: If not fenced off, the public and workers may fall into excavated areas and trenches.
- Potential creation of employment opportunities for the local community, during the construction, operational and closure phases.
- Potential positive impact associated with increased security to the area, limiting illegal mining and dumping;
- Potential positive impact associated with the freeing up of land for housing development
- Multiplier effects on local economy will be positive.

Mitigation measures are included in this report, as well as the EMPR.

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

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate

contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix 2.19.2 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6. and 2.12. herein).

No heritage resources were identified within the Creswell Park opencast footprint area, however, a total of three heritage sites were located close to the footprint area. These include one formal burial ground (CP001), and two historical residential areas (CP002, CP003). In addition, an historical midden of probable archaeological age was identified by a previous study and is located just outside the footprint boundary (PB 2008).

The management and mitigation measures have been developed to minimise the project impact on heritage resources. Impacts on burial grounds and graves are rated as MEDIUM NEGATIVE before mitigation and LOW NEGATIVE after mitigation measures are implemented. Impacts on historical structures/ residential areas are rated as MEDIUM NEGATIVE before mitigation and LOW NEGATIVE after mitigation measures are implemented. Finally, impacts on palaeontological resources are rated as a LOW NEUTRAL before and after mitigation measures are implemented.

In Palaeontological terms the significance is rated as low neutral. The proposed development is thus unlikely to pose a substantial threat to local fossil heritage. However, should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably in situ) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.

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

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist.

The EAP included all aspects as required by the EIA regulations, 2014 for the EIA and EMPR as described in the Executive Summary of this report. Please refer to Part A Section 3 (g).

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. Draft environmental management programme

a) Details of the EAP

(Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

The details and expertise of the EAP's are detailed in Part A, Section 1 and Appendices 1

b) Description of the Aspects of the Activity

(Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1) (h) herein as required).

The details of the aspects of the activity are described above in Part A.

c) Composite Map

(Provide a map (Attached as an Appendix) 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).

Refer to Appendix E.

d) Description of Impact management objectives including management statements

i) Determination of closure objectives

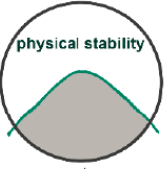




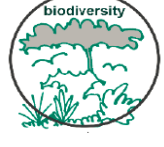

(Ensure that the closure objectives are informed by the type of environment described).

The closure objectives for mining internationally and in South Africa focus on the restoration of previous land use capabilities, the zero net loss of biodiversity, and the satisfaction of communities requirements. The closure objectives for the project will be in line with the above mentioned and is as follows:

- Re-establishment of the pre mining land from, land use and land capability to a level as close as possible to the pre-mining environment.

- Re-establish of function to any biodiversity areas of concern that could and have been affected by the mining operations
- Prevent any form of contamination of soils, surface water and groundwater
- Implement of on-going rehabilitation regulated standards
- Maintenance and monitoring of rehabilitated areas.
- Ensure that there are no safety risks associated with the mining operation, through construction, operation and rehabilitation

Based on the closure plan the following key closure objectives were identified:

	<p>To create a physically stable, safe, rehabilitated landscape that limits long term environmental degradation, erosion and failure / collapse of unavoidably remnant mining residue which are present on the mine site post closure, thus enabling the successful establishment of the planned post-mining land use</p>
	<p>To ensure that local environmental quality is not adversely affected by possible physical effects and chemical contamination arising from the mine site or individual facilities, as well as to sustain catchment yield as far as possible after closure</p>
	<p>To limit the possible health and safety threats to humans and animals using the rehabilitated mine site as it becomes available</p>
	<p>To re-instate a suitable land capability over the mine site to facilitate the progressive implementation of the planned post-mining land use</p>
	<p>To create a landscape that is self-sustaining and over time will converge to the desired ecosystem structure, function and composition</p>
	<p>To encourage, where appropriate and as aligned to the planned post-mining land use, the re-establishment of native vegetation on the rehabilitated mine site such that the terrestrial biodiversity is largely re-instated over time.</p>
	<p>To ensure that there constructive engagement and alignment with local communities and regulatory authorities regarding the proposed end land use</p>

ii) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity.

A groundwater study and geo-chemical assessment was performed as part of the specialist work for the proposed project. A monitoring point will be established in the low point of the rehabilitated open pit for groundwater (quality and quantity) to be undertaken post rehabilitation. The geochemical analyses results indicated the waste associated with the Creswell Park open pit is inert. However, for management purposes. Mass migration simulations for operational and post operational was simulated to assess possible migration pathways originating from the WRD. Simulated mass migration is low during operations and within 10 years the potential seepage from the WRD decreased to less than 20%.

iii) Potential risk of Acid Mine Drainage

The acid base accounting and geochemical modelling have indicated that due to the absence of iron sulphide minerals the risk of the development of AMD conditions in the waste rock environment is negligible. Due to the negligible risk of the formation of AMD conditions as well as the negligible risk of the leaching of contaminants from the waste rock material, no mitigation measures are required for the waste rock material.

iv) Steps taken to investigate, Assess and evaluate the impact of acid mine drainage

A geochemical risk assessment for the proposed Creswell Park open pit gold mine waste rock material. The following laboratory analyses were conducted to for the waste classification, assessment of the likelihood of acid mine drainage (AMD) and the leach potential of contaminants from the waste rock dumps:

- Acid Base Accounting (ABA) analysis
- Net Acid Generation (NAG) analysis
- Sulphur speciation analysis
- Carbon speciation analysis
- Leach test according to R635
- Whole rock analysis (Aqua Regia) according to R635
- Mineralogical analysis (X-Ray Diffraction)

The XRD as well as the sulphur speciation analysis indicates that there are no sulphide minerals associated with the waste rock material. The acid base accounting and net acid generation tests

confirm the above by indicating that the waste rock is not likely to generate AMD conditions due to its insignificant acid generation potential. The leachate results indicate that the material of which the waste rock consists is unreactive. The waste rock material contains no iron sulphide minerals. Therefore, the risk of the formation of acid mine drainage conditions due to the waste rock material is negligible.

v) Engineering or mine design solutions to be implemented to avoid remedy acid mine drainage

Due to the negligible risk of the formation of AMD conditions as well as the negligible risk of the leaching of contaminants from the waste rock material, no mitigation measures are required for the waste rock material.

vi) Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

The acid base accounting and geochemical modelling have indicated that due to the absence of iron sulphide minerals the risk of the development of AMD conditions in the waste rock environment is negligible, however the following measured will be put in place to measure if any AMD formation takes place:

- A monitoring borehole should be drilled into the rehabilitated open pit and included in the post operational monitoring protocol. Water levels and water quality should be monitored on a quarterly bases. Monitoring should continue for at least 2 years post rehabilitation of the Creswell Park project area.

vii) Volumes and rate of water use required for the operation

Water will be received via a municipality point at the existing Sol Plaaityie infrastructure area and transported to the site via trucks. Any other water required will be determined in the WULA.

viii) Has a water use licence been applied for?

A water use licence application (WULA) has not yet been submitted. A WUL application process will be undertaken at the required time. It should be noted DWS is a stakeholder in this Basic Assessment process.

ix) Impacts to be mitigated in their respective phases

e) Measures to rehabilitate the environment affected by the undertaking of any listed activity

Table 44: Impacts to be mitigated in their respective phases.

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Soil	6.54 ha	Clear of Vegetation	Vegetation clearing on the site will take place before any construction, mining can take place. The clearing of vegetation will result in loss of topsoil	<ul style="list-style-type: none"> Establish a soil management plan before construction of the activity is undertaken. A detail topsoil balance to be developed. Clearing of areas to take place a maximum of one month prior to intended mining in the area; Stripping of topsoil will not take place during rain or excessive wind; and The top 30 cm of vegetation and topsoil is to be stripped from the area to be mined. Topsoil (top 30cm) is to be stored in predetermined topsoil berms, (+/- 5m) outside the boundary of the specific area; and Topsoil stockpiles will be restricted to 1.5 to 3m in height Seedbank to be preserved during vegetation clearing and topsoil stripping. Alien vegetation to be cleared to prevent contamination of topsoil. strip all available soils/growth medium off the pit, pit fringe (5m buffer), stockpile and road footprints 	Construction Operational Phase	Impact avoided. All topsoil used in concurrent rehabilitation. Meet rehabilitation objectives Alien and invasive vegetation management plan implemented and outcomes achieved. Depth and	Rehabilitation objectives and standards Alien and invasive vegetation management plan implemented and outcomes achieved.

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<p>prior to mining and store in the berm (depth determined during soil survey);</p> <ul style="list-style-type: none"> Utilize the stored topsoil for the sole purpose of rehabilitation; and No topsoil should be used for landscaping or construction purposes such as roads or embankments 		methodology of topsoil placement	
Soil	0.66 ha	Construction of haul roads	<p>Soils will be stripped to construct haul roads. This could lead to and mixing of topsoil. Due to the presence of vehicles and equipment hydro-carbon spills may occur impacting on the quality of the soils.</p> <p>Insufficient topsoil quality and quantity present on site.</p>	<ul style="list-style-type: none"> Spill kits to be stored on site, and staff trained to act when spills occur. Contaminated soil to be removed and transported to a facility for remediation. Drip trays to be used for vehicles that stand overnight. All emergency services, as a result of breakdowns to be performed on drip trays. All vehicles and machinery will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks; All leaks will be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner; Strip all available soils/growth medium off the pit, pit fringe (5m buffer), stockpile and road footprints prior to mining and store in the berm (depth determined during soil survey); Utilize the stored topsoil for the sole purpose of rehabilitation; and 	Construction	<p>Impact avoided.</p> <p>Prevention.</p> <p>No signs of soil contamination and loss of topsoil due to contamination</p> <p>Spill procedure</p> <p>Meet rehabilitation objectives and standards.</p>	<p>Rehabilitation objectives and standards</p> <p>Spill procedure</p> <p>Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended]</p> <p>Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995)</p> <p>SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> No topsoil should be used for landscaping or construction purposes such as roads or embankments. 			
Soil	6.56 ha	Stripping and stockpiling of topsoil	Topsoil will be stripped and stockpiled; this may cause deterioration in soil quality. During the stripping process topsoil may be mixed. Due to the presence of vehicles and equipment hydro-carbon spills may occur impacting on the quality of the soils.	<ul style="list-style-type: none"> Establish a soil management plan before construction of the activity is undertaken. Clearing of areas to take place a maximum of one month prior to intended mining in the area; Stripping of topsoil will not take place during rain or excessive wind; and The top 30 cm of vegetation and topsoil is to be stripped from the area to be mined. Topsoil (top 30cm) is to be stored in predetermined topsoil berms, (+/- 5m) outside the boundary of the specific area; and Topsoil stockpiles will be restricted to 1.5 to 3m in height Seedbank to be preserved during vegetation clearing and topsoil stripping. Alien vegetation to be cleared to prevent contamination of topsoil. strip all available soils/growth medium off the pit, pit fringe (5m buffer), stockpile and road footprints prior to mining and store in the berm (depth determined during soil survey); Utilize the stored topsoil for the sole purpose of rehabilitation; and 	Construction Operational Phase	Impact avoided. Meet rehabilitation objectives and standards. Soil management procedure	Rehabilitation objectives and standards Final closure plan Consistent with design specifications and procedures

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> No topsoil should be used for landscaping or construction purposes such as roads or embankments Visual inspections to be conducted. Spill kits to be stored on site, and staff trained to act when spills occur. Contaminated soil to be removed and transported to a facility for remediation. Drip trays to be used for vehicles that stand overnight or for any emergency maintenance work All vehicles and machinery will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks; All leaks will be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner; and Proliferation of alien and invasive plant species are expected within any disturbed areas. These species should be eradicated and controlled, to prevent their spread beyond the proposed development footprint areas. Alien and invasive plant seed dispersal within the top layers of the soil within footprint areas must be controlled; 			
Soils	3.0 ha	Storage of overburden	Loss of topsoil as a result of wind and water erosion	<ul style="list-style-type: none"> Existing vegetation must be retained as far as possible to minimise erosion problems; 	Construction Operational Phase	Meet rehabilitation	Rehabilitation objectives and standards

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
		material and stockpile		<ul style="list-style-type: none"> Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; Height of topsoil and overburden material to be restricted 		objectives and standards.	GN704 Regulations in terms of the National Water Act, 1998 (Act No 36 of 1998)
Soils	3.0 ha	Waste Management	Residue Stockpile - Disposal of waste rock onto the waste rock facility and resulting formation of acid mine drainage conditions	<ul style="list-style-type: none"> Liner to be installed as required by waste classification and specialist recommendation. Monitoring of groundwater to take place to establish if the residue stockpile (Waste Rock Dump) has any impact on the groundwater. Any water discharging from the Waste Rock dump should be prevented from flowing into the receiving environment 	Operational Closure Phase	Waste Classification Norms and standards for disposal of waste. Minimisation of waste. Recycle, reduce, re-use	Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended]; Waste Classification, Management Regulations, Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] and:

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
							Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015)
Soils	6.56 ha	Opencast mining activities including input crushing of ore Concurrent rehabilitation /Roll over mining	Loss of soil natural structure and properties (physical and chemical) as a result of stripping and stockpiling of topsoil. Operating of heavy duty equipment on site. Possible hydrocarbon spills from equipment	<ul style="list-style-type: none"> Disturbed and cleared areas need to be revegetated with indigenous grass species in order to help stabilise the soil surface; Concurrent/progressive rehabilitation must be implemented at all times and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint, but will also reduce the overall rehabilitation effort and cost; Any hydrocarbon spills to be cleaned in accordance with the spill procedure. Spill kits and drip trays to be provided and available on site. Height of topsoil and overburden material to be restricted to decrease possibility of wind erosion 	Operational Closure phase	Reduce impact Closure plan and objectives Final land form and land use. Depth and methodology of topsoil placement	Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended]; Final and Annual Closure plans (GNR 1147). Consistent with design specifications and procedures

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> Visual inspection of topsoil to be undertaken. Any alien vegetation observed on topsoil stockpiles to be removed. Fertility testing to be performed to establish fertilizer requirements during rehabilitation. Concurrent rehabilitation (roll over mining) to be in line with the closure plan and procedure. 			
Soils	6.56 ha	Closure of final void and placement of topsoil - Establishment of final land form	Loss of topsoil when loading and from topsoil stockpile and during placement.	<ul style="list-style-type: none"> Rehabilitation to be done in line with the requirements of the closure plan Placement of waste rock, subsoil and topsoil to be done in correct order. Roads to be ripped before topsoil is place. Do not overload trucks to prevent spillage of topsoil Limit driving over the topsoil areas to limit compaction and rip the topsoil after placement. Fertility testing to be undertaken on topsoil to establish the fertility of the soil against the baseline test. Mitigation measures to be establish if fertility of the soil is low or have decreased. 	Operational Closure phase	Reduce impact Rehabilitation plan Closure plan and objectives Final land form and land use	Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended]; Final and Annual Closure plans (GNR 1147). Consistent with design specifications and procedures
Soils	6.56 ha	Seeding and re-vegetation of rehabilitated areas	Loss of soil fertility as a result of leaching and compaction. Loss of topsoil due to load and handling of soil and wind, water erosion. Compaction of topsoil as	<ul style="list-style-type: none"> Disturbed and cleared areas need to be revegetated with indigenous grass species in order to help stabilise the soil surface; Upon completion of mining activities, it must be ensured that no bare areas remain, and that indigenous grassland species are reintroduced. 	Closure phase	Reduce impact Rehabilitation plan	Final rehabilitation plan Closure objective and final land use and land form.

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
			a result of placement and equipment driving over the soil during seeding.	<ul style="list-style-type: none"> • Soils that have been compacted as a result of the construction and operational activities must be ripped and profiled in line with the surrounding area. Before seeding takes place. • Limit driving over the topsoil areas to limit compaction and rip the topsoil after placement. • Fertility testing to be undertaken on topsoil to establish the fertility of the soil against the baseline test. Mitigation measures to be establish if fertility of the soil is low or have decreased. • Soil monitoring to be done on areas with low growth, amelioration action to be establish based on soil chemical composition. 		<p>Closure plan and objectives</p> <p>Final land form and land use</p>	
Soils	6.56 ha	Waste Management	Hydrocarbon spills from equipment during final rehabilitation and re-vegetation	<ul style="list-style-type: none"> • Contaminated soils to be removed and disposal to take place as hazardous waste. • Spill kits to be available on site. • No equipment to be serviced on site. During emergency breakdowns drip trays to be placed under the equipment to prevent hydrocarbon spills. 	Closure	<p>Avoid, manage, mitigate</p> <p>Spill procedure</p>	<p>Act, 2008 (Act No. 59 of 2008) [as amended];</p> <p>Waste Classification, Management Regulations, Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
							SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS) Waste Classification and Management
Soils	2.19 ha	Waste Management	Residue Stockpile – Waste rock to be used in the backfill of the opencast area. Formation of acid mine drainage conditions. Residue material remaining on site in the facility.	<ul style="list-style-type: none"> Liner to be installed as required by classification and recommended by specialist Monitoring of groundwater to take place to establish if the residue stockpile (Waste Rock Dump) has any impact on the groundwater or surface quality Any water discharging from the Waste Rock dump should be prevented from flowing into the receiving environment 	Operational closure phase	Reduce impact. Mitigate or manage. Rehabilitation objectives	Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015)
Geology	4.9428 ha	Opencast mining activities including input crushing of ore Concurrent rehabilitation	Opencast mining will result in destruction of geological structures. Loss of geological structure and integrity. Low of resources	<ul style="list-style-type: none"> Stockpiling of subsoil and waste rock not to take place on the same stockpile. Rehabilitation of pit to take place in accordance with rehabilitation plan, procedure to ensure rehabilitation objects are achieve. Final landform and land use to be achieved through rehabilitation. 	Operational Closure phase	Closure plan and objectives Final land form and land use	Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended]; Final and Annual Closure plans (GNR 1147).

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
		/Roll over mining	Breaking of rock through modern methods to reduce noise.				
Topography	4.942 8 ha	Opencast mining activities including input crushing of ore Concurrent rehabilitation /Roll over mining	Opencast mining will result in a change in topography. Change in surface drainage and final land form	<ul style="list-style-type: none"> Implement of closure plan to ensure effective rehabilitation of the area. Re-establishment of vegetation to take place after rehabilitation Monitoring and maintenance program to be establish for the post closure phase. Final land form to be free draining and erosion control to be implemented. Final land use and land form to be establish in final closure plan. 	Operational Closure phase	Closure plan and objectives Final land form and land use. Design elevations achieved to within 150mm tolerance	Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended]; Final and Annual Closure plans (GNR 1147). Consistent with design specifications
Topography	4.942 8 ha	Closure of final void and placement of topsoil - Establishment of final land form	Change in topography of the area.	<ul style="list-style-type: none"> Rehabilitation to be done in line with the requirements of the closure plan. Final land form to be establish as specified in closure plan. Final land form to take settlement into account. Settlement to be monitored and areas where ponding is taking place to be leveled out. Ensure that the profile of the rehabilitated area is free-draining and establish a slope similar to the pre-mining slope. The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas. 	Closure	Mitigate impact Closure plan and objectives Final land form and land use. Design elevations achieved to	Final and Annual Closure plans (GNR 1147). Closure objectives. Consistent with design specifications

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
						within 150mm tolerance	
Vegetation and Terrestrial Ecology	6.56 ha	Clearing of vegetation	Vegetation clearing can result in loss of species of conservation concern. Reduction in biodiversity of the area. Note that no red data species or species of conservation concern were identified within the proposed mining area.	<ul style="list-style-type: none"> Environmental awareness training should include that no hunting, trapping or killing of fauna are allowed; An alien vegetation management plan should be drawn up and implemented; Regular removal of invasive alien species should be undertaken. This should extend through to the closure phase of the project; Rehabilitation of disturbed areas to take place with indigenous vegetation. No clearing of vegetation outside of the footprint area. Animals may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-contractors' employees. This includes foraging, food and wood collecting outside of the construction site No collection of firewood, floral Species of Conservation Concern (SCC) or medicinal floral species must be allowed by construction or mining personnel if any species occur on site; Should any other floral SCC species be encountered or will be disturbed, ensure effective 	Construction Operational Phase	Meet rehabilitation objectives and standards. Re-vegetation of area	<p>Terrestrial ecology report</p> <p>Alien and invasive vegetation management plan implemented and outcomes achieved.</p> <p>NEMBA: National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)</p> <p>Alien and Invasive Species Regulations (Government Notice 598 of 2014) and Alien and Invasive Species List, 2016.</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<p>relocation of individuals to suitable similar habitat. Arrangement with the relevant authorities needs to take place to rescue and relocate the species.</p> <ul style="list-style-type: none"> • Informal fires by construction personnel within the Creswell Park Mining Permit Application Area should be prohibited; 			
Vegetation and Biodiversity	0.66 ha	Construction of haul roads	Vegetation will be removed during the construction of the roads	<ul style="list-style-type: none"> • Removal and storage of all usable soils to be used in rehabilitation. • Access roads and haul roads to avoid sensitive areas • Clearing of vegetation to be restricted to mining and road areas. • Any animals rescued or recovered will be relocated in a suitable habitat away from the mining operations and associated infrastructure; • Any lizards, snakes or monitors encountered should be allowed to escape to a suitable habitat away from disturbance. • No reptile should be intentionally killed, caught or collected during any phase of the project; and • General avoidance of snakes is the best policy if encountered. Snakes should not be intentionally harmed or killed and allowed free movement away from the area. 	Construction	<p>Meet rehabilitation objectives and standards.</p> <p>Re-vegetation of area</p>	<p>Terrestrial ecology report</p> <p>NEMBA: National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Vegetation and Biodiversity	6.56 ha	Stripping and stockpiling of topsoil	<p>Vegetation will be removed during the stripping of the topsoil and will also be affected during the stockpiling process.</p> <p>Loss of species of conservation concern</p> <p>Note that no red data species or species of conservation concern were identified within the proposed mining area.</p>	<ul style="list-style-type: none"> • Environmental awareness training should include that no hunting, trapping or killing of fauna are allowed; • An alien vegetation management plan should be drawn up and implemented; • Regular removal of invasive alien species should be undertaken. This should extend through to the closure phase of the project; and • Rehabilitation of disturbed areas to take place with indigence vegetation. • No clearing of vegetation outside of the footprint area. • Animals may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-contractors' employees. This includes foraging, food and wood collecting outside of the construction site. • No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel if any species occur on site; • Should any other floral SCC species be encountered or will be disturbed, ensure effective relocation of individuals to suitable similar habitat. Arrangement with the relevant authorities needs to take place to rescue and relocate the species. 	Construction Operational Phase	<p>Meet rehabilitation objectives and standards.</p> <p>Re-vegetation of area</p>	<p>Terrestrial ecology report</p> <p>NEMBA: National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Vegetation	6.56 ha	Closure of final void and placement of topsoil - Establishment of final land form	Transport activities can damage/destroy vegetation. Failure to establish vegetation on the areas where the infrastructure was removed can enhance the possibility of the establishment of alien vegetation.	<ul style="list-style-type: none"> Trucks should remain on roads and designated areas Re-establish indigenous vegetation as soon as possible after the placement of the topsoil. Ensure the area remains free of exotic species. 	Closure phase	Avoid, reduce mitigate impact Meet rehabilitation objective Closure plan	NEMBA: National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Rehabilitation objectives and closure plan
Vegetation and biodiversity	6.56 ha	Seeding and re-vegetation of rehabilitated areas	Re-establishment of vegetation. Increase in spread of alien vegetation. Incorrect rehabilitation and maintenance can lead to colonization and spread of alien vegetation.	<ul style="list-style-type: none"> Re-establishment of vegetation on all rehabilitated areas. Seed mix to be determined by specialist. Re-seeding to take place on areas where slope or no growth is observed. In places where hydro seeding can be applied it should be utilized. A management plan for the control of invasive/exotic weed species needs to be implemented. This is not a once-off activity and needs to be ongoing 	Closure phase	Meet Rehabilitation objective. Closure plan Final land form and land use No significant erosion	NEMBA: National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Rehabilitation objectives and closure plan
Surface Water	6.56 ha	Clearing of Vegetation	Increase runoff as a result of vegetation clearing. Increase sediment load resulting in sedimentation of rivers. Altering water quality	<ul style="list-style-type: none"> Proper storm water measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. Strict erosion control to be implemented. Stormwater management to be in line with the requirements Regulation 704 (4 June 1999). 	Construction Operational Phase	Mitigate and manage Stormwater management plan.	Regulation 704 (4 June 1999). National Water Act (Act 36 of 1998).

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> • If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; • Existing vegetation must be retained as far as possible to minimise erosion problems; • Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; • No river or surface water may be affected by silt emanating from the area; • No wastewater may run freely into any of the surrounding naturally areas 			Target Water Quality Guideline (TWQG) standards
Surface Water	0.66 ha	Construction of haul road	Loose material can contaminate surface water in the event of a storm water run-off occurring during the construction of the roads. Runoff from areas where hydro-carbon spills are present may also cause deterioration in surface water quality.	<ul style="list-style-type: none"> • All hydrocarbon spills to be contained and soils removed. • Proper storm water measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. • If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; • Existing vegetation must be retained as far as possible to minimise erosion problems; • Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; 	Construction	Stormwater management plan. Target Water Quality Guideline (TWQG) standards. Klip River Water Quality Objectives	Regulation 704 (4 June 1999). National Water Act (Act 36 of 1998). Spill procedure Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> No river or surface water may be affected by silt emanating from the area; No wastewater may run freely into any of the surrounding naturally areas. Runoff from roads must be managed to avoid erosion and pollution problems. 			SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)
Surface Water	6.56 ha	Stripping and stockpiling of topsoil	Loose material can contaminate surface water in the event of a storm water run-off occurring during the stripping and stockpiling of topsoil. Runoff from areas where hydro-carbon spills are present may also cause deterioration in surface water quality.	<ul style="list-style-type: none"> All hydrocarbon spills to be contained and soils removed. Proper stormwater measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. Stormwater to be in line with the requirements Regulation 704 (4 June 1999). If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; Existing vegetation must be retained as far as possible to minimise erosion problems; Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; No wastewater may run freely into any of the surrounding naturally areas. 	Construction Operational phase	Stormwater management plan. Target Water Quality Guideline (TWQG) standards. Klip River Water Quality Objectives.	Regulation 704 (4 June 1999). National Water Act (Act 36 of 1998). Spill procedure Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] Target Water Quality Guideline (TWQG) standards. Klip River Water Quality Objectives.

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Surface Water	3.0 ha	Storage of overburden material and stockpiles	Contaminated runoff from overburden and stockpile areas. Siltation of river systems.	<ul style="list-style-type: none"> • Proper stormwater measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. • Stormwater to be in line with the requirements Regulation 704 (4 June 1999). • If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; • Existing vegetation must be retained as far as possible to minimise erosion problems; • Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; • No river or surface water may be affected by silt emanating from the area; • No wastewater may run freely into any of the surrounding naturally areas. 	Construction Operational phase	Stormwater management plan. Target Water Quality Guideline (TWQG) standards. Klip River Water Quality Objectives.	Regulation 704 (4 June 1999). National Water Act (Act 36 of 1998). SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS) Monitoring Programme Target Water Quality Guideline (TWQG) standards. Klip River Water Quality Objectives.
Surface water	6.56 ha	Waste Management	Contaminated runoff from overburden and stockpile areas. Siltation of river systems. Contaminated stormwater from storage areas.	<ul style="list-style-type: none"> • Proper stormwater measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. • Stormwater to be in line with the requirements Regulation 704 (4 June 1999). • If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; 	Operational and Closure	Prevention of impact. Target Water Quality Guideline (TWQG) standards.	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] and: Regulations regarding the planning and management of residue

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> Existing vegetation must be retained as far as possible to minimise erosion problems; Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; No wastewater may run freely into any of the surrounding naturally areas. Any water reporting to the open pit or storm water management areas should be kept in a closes system (classified as contact water) and not be discharged into the environment before treatment to the specific catchment Target Water Quality Guideline (TWQG) standards Contact water can be recirculated and used in a closed system according to GN704 Best Practise Guideline 		<p>Klip River Water Quality Objectives</p> <p>stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015)</p> <p>Target Water Quality Guideline (TWQG) standards.</p> <p>Klip River Water Quality Objectives.</p> <p>GN 704 (4 June 1999)</p>	
Surface Water	6.56 ha	Opencast mining activities including input crushing of ore Concurrent rehabilitation	Discharge of polluted water. Increase sediment load.	<ul style="list-style-type: none"> Stormwater structure to be maintained to prevent uncontaminated stormwater flowing into the pit area. Clean and dirty water separation to take place. Any water reporting to the open pit or storm water management areas should be kept in a closes system (classified as contact water) and not be discharged into the environment before treatment 	Operational and Closure	<p>Prevention of impact.</p> <p>Target Water Quality Guideline (TWQG) standards.</p>	<p>National Water Act 1999 (Act No. 36 of 1999) [as amended]</p> <p>Target Water Quality Guideline (TWQG) standards.</p> <p>Klip River Water Quality Objectives.</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
		/Roll over mining		<p>to the specific catchment Target Water Quality Guideline (TWQG) standards</p> <ul style="list-style-type: none"> • Contact water can be recirculated and used in a closed system according to GN704 Best Practice Guideline • No contaminated water to be discharge. • Stormwater runoff from the area to be prevented to increase pollution and sediment load of the river system. 		Klip River Water Quality Objectives	GN 704 (4 June 1999)
Surface Water	6.56 ha	Closure of final void and placement of topsoil - Establishment of final land form	Erosion on rehabilitated areas. Ponding of water. Increase in siltation load from stormwater	<ul style="list-style-type: none"> • Stormwater measures implemented during operational phase to prevent erosion of exposed soils and increase sediment load. • Water quality monitoring to be maintained during closure and post closure. • In the event that decant takes place, monitoring of the water quality to take place. • The rehabilitated areas should be free draining and erosion control should be implemented. 	Operational closure phase	Prevention of impact. Reduce or avoid Meet rehabilitation objectives Closure plan	National Water Act 1999 (Act No. 36 of 1999) [as amended] Target Water Quality Guideline (TWQG) standards. Klip River Water Quality Objectives. GN 704 (4 June 1999)
Surface Water	4.956 5 ha	Seeding and re-vegetation of rehabilitated areas	Erosion on rehabilitated areas. Ponding of water. Increase in siltation load from stormwater.	<ul style="list-style-type: none"> • Stormwater measures implemented during operational phase to prevent erosion of exposed soils and increase sediment load. • Water quality monitoring to be maintained during closure and post closure. 	Closure phase	Prevention of impact. Reduce or avoid	National Water Act 1999 (Act No. 36 of 1999) [as amended]

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> Vegetation cover to be establish to reduce surface runoff, erosion and siltation. In the event that decant takes place, monitoring of the water quality to take place. The rehabilitated areas should be free draining and erosion control should be implemented. 		<p>Meet rehabilitation objectives</p> <p>Closure plan</p>	<p>Target Water Quality Guideline (TWQG) standards.</p> <p>Klip River Water Quality Objectives.</p> <p>GN 704 (4 June 1999)</p> <p>Closure objectives and final land use</p>
Surface Water	6.56 ha	Waste Management	Contaminated water generated from the residue stockpile area.	<ul style="list-style-type: none"> Proper stormwater measures to be put in place to prevent contamination of surface water. This will include the construction of berms and trenches. Stormwater to be in line with the requirements Regulation 704 (4 June 1999). If necessary, temporary diversion channels should be constructed ahead of the mining area to intercept clean run-off and divert it around disturbed areas into the natural drainage system; Existing vegetation must be retained as far as possible to minimise erosion problems; Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams; No river or surface water may be affected by silt emanating from the area; 	Operational closure phase	<p>Prevention of impact.</p> <p>Reduce or avoid</p> <p>Meet rehabilitation objectives</p> <p>Closure plan</p>	<p>National Water Act 1999 (Act No. 36 of 1999) [as amended]</p> <p>Target Water Quality Guideline (TWQG) standards.</p> <p>Klip River Water Quality Objectives.</p> <p>GN 704 (4 June 1999)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> No wastewater may run freely into any of the surrounding naturally areas. Any water reporting to the open pit or storm water management areas should be kept in a closes system (classified as contact water) and not be discharged into the environment before treatment to the specific catchment Target Water Quality Guideline (TWQG) standards Contact water can be recirculated and used in a closed system according to GN704 Best Practice Guideline 			
Groundwater	6.56 ha	Storage of overburden material and stockpiles	The formation of acid mine drainage as a result of ingress water and oxygen into the stockpiled overburden. Mass migration from waste rock dump negatively impacting groundwater According to the Geo-chemical assessment the overburden is considered inert and therefore does not have a great potential for AMD.	<ul style="list-style-type: none"> Proper stormwater measures to be put in placer to prevent contamination of surface water. This will include the construction of berms and trenches. Establishment monitoring boreholes between the WRD/open pit and the community to the south, east and north. Monitoring (water levels and quality) during construction should be performed monthly due to the construction period (1 months). All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. 	Construction Operational Closure phase	Meet objectives Monitoring Programme Target Water Quality Guideline (TWQG) standards. Klip River Water Quality Objectives.	Monitoring Programme Target Water Quality Guideline (TWQG) standards. Klip River Water Quality Objectives. Regulation 704 (4 June 1999). National Water Act (Act 36 of 1998).

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> Monitoring (water levels and quality) during mining should be performed monthly due to the short Life of Mine (4 months). Maintain groundwater monitoring program as establish in construction phase. Should consist out of up-gradient and down-gradient monitoring points as specified by specialist. 			
Ground water	Local	Opencast mining activities including input crushing of ore Concurrent rehabilitation /Roll over mining	<p>Dewatering of local aquifer an impacting local and neighboring groundwater users. Abstraction of groundwater to prevent pit flooding</p> <p>Deterioration of groundwater quality down gradient of the mining operations</p>	<ul style="list-style-type: none"> Maintain groundwater monitoring program as establish in construction phase. Should consist out of up-gradient and down-gradient monitoring points as specified by specialist. Monitoring (water levels and quality) during mining should be performed monthly due to the short Life of Mine (4 months). All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. An updated hydrocensus should be completed in a 500m radius around the Creswell Park open pit project area. The data recorded should be used to update the monitoring protocol and the groundwater flow model and associated management scenarios 	Operational Closure phase	<p>Meet objective of Monitoring Programme</p> <p>Target Water Quality Guideline (TWQG) standards.</p> <p>Klip River Water Quality Objectives.</p>	<p>Monitoring Programme</p> <p>Target Water Quality Guideline (TWQG) standards.</p> <p>Klip River Water Quality Objectives.</p> <p>Regulation 704 (4 June 1999).</p> <p>National Water Act (Act 36 of 1998).</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> Utilise the monitoring data to calibrate the ground water models, replacing the inferred data to provide certainty on potential impacts; Rerun the geochemical model to reflect the preferred closure scenario; Determine the risk of latent and residual impacts. If required, devise mitigation measures and implement controls, adjust the closure liability calculation if required. 			
Ground water	6.56 ha	Waste Management	Impact on groundwater and surrounding users. Possible formation of AMD and decant from waste management facility – residue stockpile Geo-chemical report indicates that the possibility of AMD formation is very low	<ul style="list-style-type: none"> Groundwater monitoring point to be establish in the low point of the rehabilitated opencast area. This point to be included into the monitoring program. Groundwater monitoring program to be maintained for 2 years post rehabilitation. Mitigation measures to be establish and implemented if any formation of AMD is observed in the groundwater. 	Operational closure phase	Meet objective of Monitoring Programme Target Water Quality Guideline (TWQG) standards. Klip River Water Quality Objectives.	Monitoring Programme Target Water Quality Guideline (TWQG) standards. Klip River Water Quality Objectives. Regulation 704 (4 June 1999). National Water Act (Act 36 of 1998).
Ground water	6.56 ha	Establishment of final land form. Seeding and re-vegetation of	Impact on groundwater and surrounding users. Possible formation of AMD and decant from opencast rehabilitated area.	<ul style="list-style-type: none"> Groundwater monitoring point to be establish in the low point of the rehabilitated opencast area. This point to be included into the monitoring program. Groundwater monitoring program to be maintained for 2 years post rehabilitation. 	Closure phase	Meet objective of Monitoring Programme and closure objectives	Monitoring Programme Target Water Quality Guideline (TWQG) standards.

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
		rehabilitated areas	Geo-chemical report indicates that the possibility of AMD formation is very low.	<ul style="list-style-type: none"> Mitigation measures to be establish and implemented if any formation of AMD is observed in the groundwater. 		<p>Target Water Quality Guideline (TWQG) standards.</p> <p>Klip River Water Quality Objectives.</p>	<p>Klip River Water Quality Objectives.</p> <p>Regulation 704 (4 June 1999).</p> <p>National Water Act (Act 36 of 1998).</p> <p>Closure objectives</p>
Geo chemistry	6.56 ha	Storage of overburden material and stockpiles	Disposal of water rock onto waste rock facility and resulting formation of acid mine drainage and the leaching of metal(liods), especially arsenic from the material	<ul style="list-style-type: none"> Establishment monitoring boreholes between the WRD/open pit and the community to the south, east and north. Monitoring (water levels and quality) during construction should be performed monthly due to the construction period (1 months). All boreholes should be subjected to aquifer tests to assess aquifer properties to be used in the model update. All boreholes should be sampled and analysed for the full spectrum of metalloids, Uranium and Thorium as well as micro and macro chemical parameters. Utilise the monitoring data to calibrate the ground water models, replacing the inferred data to provide certainty on potential impacts; Rerun the geochemical model to reflect the preferred closure scenario; 	Construction Operational & Closure phase	<p>Monitoring Programme</p> <p>Target Water Quality Guideline (TWQG) standards.</p> <p>Klip River Water Quality Objectives.</p>	<p>Target Water Quality Guideline (TWQG) standards.</p> <p>Klip River Water Quality Objectives.</p> <p>Waste Classification and Management Regulations and Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> Determine the risk of latent and residual impacts. If required, devise mitigation measures and implement controls, adjust the closure liability calculation if required. 			<p>promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] and:</p> <p>Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015)</p>
Land Capability	6.56 ha	Stripping and Stockpiling of topsoil	<p>Stripping of topsoil will result in the current possible land use to cease completely. Loss of soil fertility</p> <p>No agricultural activities are taking place on the area.</p>	<ul style="list-style-type: none"> Rehabilitation of disturbed areas to take place with indigenous vegetation. Land use after rehabilitation to be open space for housing development. Soil fertility testing to be performed before construction and before rehabilitation to establish the need to improve the soil fertility. 	Construction Operational	Meet rehabilitation objectives and standards.	<p>Final land use requirements.</p> <p>Assessment against pre-mining capability</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Air Quality	6.56 ha	Clearing of Vegetation	Clearing of Vegetation may cause dust that will influence the quality of air. Vehicle emissions can also cause deterioration in air quality.	<ul style="list-style-type: none"> An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns. Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rate. Loading, transfer, and placement of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 	Construction Operational phase	Monitoring program Speed limit NAEIS Reporting	South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 National Ambient Air Quality Standards (NAAQS) NAEIS Reporting requirements
Air Quality	0.66 ha	Construction of haul roads	Construction activities may cause dust that will	<ul style="list-style-type: none"> An effective dust management plan must be designed and implemented in order to mitigate the 	Construction phase	Monitoring program	South Africa National Standard 1929:2005:

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
			influence the quality of air. Vehicle emissions can also cause deterioration in air quality	<p>impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised.</p> <ul style="list-style-type: none"> • A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns • Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rate. • Loading, transfer, and placement of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; • Emissions report must be made in the format required for NAEIS to the relevant air quality officer. 		<p>Measures to reduce, avoid</p> <p>Speed limit</p>	<p>Ambient Air Quality: Limits for common pollution</p> <p>Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004</p> <p>National Ambient Air Quality Standards (NAAQS)</p> <p>NAEIS Reporting requirements</p>
Air Quality	6.56 ha	Stripping and stockpiling of topsoil	Stripping and stockpiling of topsoil may cause dust due to vehicle movement that will influence the quality of air. Material	<ul style="list-style-type: none"> • An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. 	Construction Operational phase	<p>Monitoring program</p> <p>Measures to reduce, avoid</p>	<p>South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
			handling (topsoil) will generate dust and this and vehicle emissions can potentially cause deterioration in air quality	<ul style="list-style-type: none"> • A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns • Loading, transfer, and placement of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; • Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. • Emissions report must be made in the format required for NAEIS to the relevant air quality officer 		Speed limit	Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 National Ambient Air Quality Standards (NAAQS) NAEIS Reporting requirements. Vaal Triangle Priority Area
Air Quality	3.0 ha	Storage of overburden material and stockpiles	Increase in air pollution as a result of wind erosion.	<ul style="list-style-type: none"> • Establishment of air quality monitoring program as specified by specialist • An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and 	Construction Operational phase	Measures to reduce, avoid Monitoring program	South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<p>development phases. Water carts to be used to make sure dust impact are minimised.</p> <ul style="list-style-type: none"> • A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns • Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; • Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. • Roll over mining to limit amount of overburden • Emissions report must be made in the format required for NAEIS to the relevant air quality officer 			<p>Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004. Vaal Triangle Priority area National Ambient Air Quality Standards (NAAQS) NAEIS Reporting requirements. Vaal Triangle Priority Area</p>
Air Quality	6.56 ha	Opencast mining activities including	Opencast mining can have a negative impact on surround air quality. Increase dust and	<ul style="list-style-type: none"> • An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and 	Operational phase	Measures to reduce, avoid	South Africa National Standard 1929:2005: Ambient Air Quality:

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
		input crushing of ore Concurrent rehabilitation /Roll over mining	emissions. Breaking of rocks, stripping of overburden. Load, haul and transporting of overburden. Breaking of rock through modern methods	<p>development phases. Water carts to be used to make sure dust impact are minimised.</p> <ul style="list-style-type: none"> • A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns • Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; • Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. • PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location. • Modern rock breaking equipment to be used to reduce the risk to air quality associated with blasting. No blasting to be performed. • Emissions report must be made in the format required for NAEIS to the relevant air quality officer 		Monitoring program	<p>Limits for common pollution</p> <p>Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004</p> <p>National Ambient Air Quality Standards (NAAQS)</p> <p>NAEIS Reporting requirements.</p> <p>Vaal Triangle Priority Area</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Air Quality	Local	Load and Haul	Increase in air pollution as a result of equipment movement, handling of overburden and ore, and placement of overburden on stockpiles.	<ul style="list-style-type: none"> An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. Wet suppression techniques should be used to control dust emissions, especially in areas where dry material is handled or stockpiled. Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts. PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location. Emissions report must be made in the format required for NAEIS to the relevant air quality officer 	Operational closure phase	Measures to reduce, avoid Monitoring program	South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 NAEIS Reporting requirements. Vaal Triangle Priority Area National Ambient Air Quality Standards (NAAQS)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Air Quality	Local	Transporting of Ore to treatment facility	Increase in dust and gas pollution associated with transportation of ore to offsite treatment facility.	<ul style="list-style-type: none"> An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. Wet suppression techniques should be used to control dust emissions, especially in areas where dry material is handled or stockpiled. Loading of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. Emissions report must be made in the format required for NAEIS to the relevant air quality officer Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts. Truck transporting ore must covered loads by means of a tarp to prevent dust pollution during transport. 	Operational closure phase	Measures to reduce, avoid Monitoring program	South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 Vaal Triangle Priority Area National Ambient Air Quality Standards (NAAQS) National Ambient Air Quality Standards (NAAQS)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Air Quality	6.56 ha	Closure of final void and placement of topsoil - Establishment of final land form	Rehabilitation (spreading of soil, re-vegetation and profiling/ contouring) activities can lead to an increase in dust emission and emissions from equipment.	<ul style="list-style-type: none"> Wet suppression techniques should be used to control dust emissions, especially in areas where dry material is handled; Loading of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts. The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation. Leaving the surface of the soil in a coarse condition reduces wind erosion and ultimately reduces the dust levels. Management measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible. Emissions report must be made in the format required for NAEIS to the relevant air quality officer 	Operational closure phase	Measures to reduce, avoid Monitoring program	South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 National Ambient Air Quality Standards (NAAQS) Vaal Triangle Priority Area

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
							National Ambient Air Quality Standards (NAAQS)
Air Quality	6.56 ha	Seeding and re-vegetation of rehabilitated areas	Increase in dust pollution from wind erosion.	<ul style="list-style-type: none"> Vegetation to be establish on rehabilitated area to reduce windblown particles. Vegetation binds the soil and reduces the wind velocity Strict speed limits should be imposed to reduce entrained emissions and fuel consumption rates. Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. Vehicles should be fitted with catalytic converters and low sulfur fuel should be used to minimise NO₂ and SO₂ impacts. The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation. Leaving the surface of the soil in a coarse condition reduces wind erosion and ultimately reduces the dust levels. Management measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible. 	Operational closure phase	Measures to reduce, avoid Meeting plan objectives Monitoring program	South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 National Ambient Air Quality Standards (NAAQS)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Noise and Vibration	Local	Load and Haul	Increase in baseline noise as a result of equipment. Low vibration level is expected from equipment	<ul style="list-style-type: none"> • A management and mitigation plan are recommended to minimise noise impacts from the project on the surrounding area. • Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. • Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. • Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday • Minimising the need for trucks/equipment to reverse. • Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered • Maintain road surface regularly to avoid corrugations, potholes 	Construction Operational Closure phase	Reduce and avoid Management measures Meeting plan objectives SANS 10103 (2008)	Finance Corporation (IFC) and SANS 10103. National Environmental Management Air Quality Act (NEMAQA) (Act. 39 of 2004) WHO guidelines for Community Noise (WHO, 1999)
Background Noise levels	Local	Clearing of Vegetation	Clearing of vegetation activities may cause an increase in background noise levels.	<ul style="list-style-type: none"> • A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all noise related problems. Frequent community liaison meetings should be held with the 	Construction Operational phase	Reduce and avoid Management measures	Finance Corporation (IFC) and SANS 10103.

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
			Noise generated by equipment. Vegetation acts as a natural noise boundary.	<p>neighbouring communities to address noise related concerns.</p> <ul style="list-style-type: none"> • Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. • Implement noise monitoring programme as specified by specialist study. • Activities to be restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday 		<p>Meeting plan objectives</p> <p>SANS 10103 (2008)</p>	<p>National Environmental Management Air Quality Act (NEMAQA) (Act. 39 of 2004)</p> <p>WHO guidelines for Community Noise (WHO, 1999)</p>
Background Noise levels	Local	Construction of haul roads	Construction activities may cause an increase in background noise levels.	<ul style="list-style-type: none"> • Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. • Construction of Waste Rock will limit noise levels to the residential area to the south of the mine • Implement noise monitoring programme. • Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday • Heavy vehicle traffic should be routed away from noise sensitive areas where possible; 	Construction	<p>SANS 10103 (2008)</p> <p>Meeting plan objectives</p>	<p>Finance Corporation (IFC) and SANS 10103.</p> <p>National Environmental Management Air Quality Act (NEMAQA) (Act. 39 of 2004)</p> <p>WHO guidelines for Community Noise (WHO, 1999)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Background Noise levels	Local	Stripping and stockpiling of topsoil	Stripping and stockpiling activities may cause an increase in background noise levels.	<ul style="list-style-type: none"> • Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. • Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday • Establish noise monitoring program as specified by specialist study. • Minimising the need for trucks/equipment to reverse. • Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered • Maintain road surface regularly to avoid corrugations, potholes 	Construction Operational Phase	SANS 10103 (2008) Meeting plan objectives	Finance Corporation (IFC) and SANS 10103. National Environmental Management Air Quality Act (NEMAQA) (Act. 39 of 2004) WHO guidelines for Community Noise (WHO, 1999)
Noise and Vibration	Local	Opencast mining activities including input crushing of ore Concurrent rehabilitation	Increase in background noise levels from the increase activities and use of heavy equipment. Breaking of rock through modern methods. Excavation of overburden and reef.	<ul style="list-style-type: none"> • A management and mitigation plan are recommended to minimise noise impacts from the project on the surrounding area. • A monitoring programme as per the requirements of the International Finance Corporation (IFC) and SANS 10103. Annually during the operational phase at the closest NSR; and in response to complaints received. 	Operational	SANS 10103 (2008) Meeting plan objectives	Finance Corporation (IFC) and SANS 10103. National Environmental Management Air Quality Act (NEMAQA) (Act. 39 of 2004)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
		/Roll over mining		<ul style="list-style-type: none"> The waste rock storage facility to be utilized as a noise barrier between the mining operation and sensitive receptors. Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. The operation to use modern rock breaking equipment to reduce the noise and vibration. Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. Maintain a noise monitoring programme. A monitoring programme as per the requirements of the International Finance Corporation (IFC) and SANS 10103: Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday Minimising the need for trucks/equipment to reverse. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered 			<p>WHO guidelines for Community Noise (WHO, 1999)</p> <p>Mine Health and Safety Act (Act 29 of 1996)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> • Maintain road surface regularly to avoid corrugations, potholes • Waste rock and stockpiles to be utilized as noise barriers to reduce impact on surrounding sensitive receptors. 			
Noise and Vibration	Local	Transporting of Ore to treatment facility	Increase in background noise as a result of the transportation of ore to offsite treatment facility.	<ul style="list-style-type: none"> • A management and mitigation plan are recommended to minimise noise impacts from the project on the surrounding area. • Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. • Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. • Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday. Ore haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods. • Minimising the need for trucks/equipment to reverse. • Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered 	Operational closure phase	SANS 10103 (2008) Meeting plan objectives	Finance Corporation (IFC) and SANS 10103. National Environmental Management Air Quality Act (NEMAQA) (Act. 39 of 2004) WHO guidelines for Community Noise (WHO, 1999) Mine Health and Safety Act (Act 29 of 1996)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> Maintain road surface regularly to avoid corrugations, potholes 			
Noise and Vibration	Local	Closure of final void and placement of topsoil - Establishment of final land form	Rehabilitation (spreading of soil, re-vegetation and profiling/ contouring) activities can lead to an increase in background noise levels	<ul style="list-style-type: none"> A management and mitigation plan are recommended to minimise noise impacts from the project on the surrounding area. For all phases of the project. Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. Servicing of all vehicles to be undertaken on a regular basis to prevent excessive noise from machinery. Activities to restrict to: 5.5-day working week, one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday. 	Closure phase	SANS 10103 (2008) Meeting plan objectives	Finance Corporation (IFC) and SANS 10103. National Environmental Management Air Quality Act (NEMAQA) (Act. 39 of 2004) WHO guidelines for Community Noise (WHO, 1999) Mine Health and Safety Act (Act 29 of 1996)
Radiation	Local	Establishment of waste facility, Waste Management . Transport of waste and ore	Risk of exposure to radiation through the inhalation of radioactive dust and radon. Exposure to the radioactive dust deposited in the area as a result of the mining activities. Risk of	<ul style="list-style-type: none"> Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material. An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. 	Construction and Operation phase	NNR requirements. Reduce, avoid risk	Mine Health and Safety Act (Act 29 of 1996) National Nuclear Regulator Act (No. 47 of 1999) – Certificate requirements

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
			exposure during transport of overburden and dumping of waste.				
Radiation	Local	Opencast mining activities including input crushing of ore Concurrent rehabilitation /Roll over mining. Closure of final void and placement of topsoil - Establishment of final land form	Risk of exposure to radiation through the inhalation of radioactive dust and radon. Exposure to the radioactive dust deposited in the area as a result of the mining activities. Risk of exposure during transport of overburden. Risk of exposure to land users after rehabilitation of the mining area	<ul style="list-style-type: none"> Obtain registration in terms of the National Nuclear Regulator Act (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material. Comply with NNR regulation requirements for closure. Site remediation and release from regulatory control An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. 	Operation closure phase	<p>NNR requirements.</p> <p>Reduce, avoid risk</p>	<p>Mine Health and Safety Act (Act 29 of 1996)</p> <p>National Nuclear Regulator Act (No. 47 of 1999) – Certificate requirements</p>
Waste	6.56 ha	Waste management	Waste generated of waste from construction. Clearance and removal of	<ul style="list-style-type: none"> Low volumes of waste will be produced on site during construction and all maintenance of equipment will take place of site. Disposal of any waste produce during emergency maintenance to 	Construction Operational phase	Waste Classification	Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended];

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
			waste dumped illegally on the site	<p>be disposed of at the correct waste management facility.</p> <ul style="list-style-type: none"> Waste generated (hazardous and general) on site to be disposed within 30 days. Waste generated (illegally dumped) from clearing of site must be disposed at the correct waste management facility. Waste from chemical toilets to dispose by supplier. No chemical storage to take place on site. No waste storage to take place on site, all waste to be removed to offsite facility. 		<p>Norms and standards for disposal of waste.</p> <p>Minimisation of waste.</p> <p>Recycle, reduce, re-use</p>	<p>Waste Classification, Management Regulations, Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013)</p> <p>SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)</p>
Waste	6.56 ha	Waste Management	Waste generated during the rehabilitation process and final closure phase has the potential to cause pollution if not managed correctly. Any waste from the chemical fertilizers utilized should be disposed of in the correct manner.	<ul style="list-style-type: none"> No waste storage to take place on site. All waste generated should be transported of site to the storage facility from where disposal should take place. No waste to be burned on site Waste to be classified and disposed of accordingly. 	Operational closure phase	<p>Waste Classification</p> <p>Norms and standards for disposal of waste.</p> <p>Minimisation of waste.</p>	<p>Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended];</p> <p>Waste Classification, Management Regulations, Norms and Standards for the assessment of for landfill disposal and for</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
						Recycle, reduce, re-use	disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)
Servitude	6.56 ha	Clearing of vegetation and topsoil stripping	Damage cause to the pipeline as a result of vegetation clearing and topsoil stripping. Construction of haul road	<ul style="list-style-type: none"> The servitude should be demarcated and required buffer zone establish Vegetation clearing and topsoil not to take place within servitude area. Haul road to be located way for the servitude to prevent damage during construction and use. 	Construction and operational phase	Buffer zones. Requirement of landowners Risk assessment	Transnet Pipeline risk assessment requirements Mine Health and Safety Act (Act 29 of 1996)
Servitude	6.56 ha	Open cast mining activities and stockpiles	Damage cause to the pipeline as a result of mining activities. Vibration from the mining activity or excavation equipment causing damage and spills. Environmental, health and safety damage caused by spills.	<ul style="list-style-type: none"> The servitude should be demarcated and required buffer zone establish. No mining to take place within 50m from the servitude. Buffer zones to be maintained through all phases. No excavation or mining equipment to be operated within the servitude Any activity require to take place within the servitude to be undertake under supervision to ensure no damage is cause to the pipeline. Risk assessment in terms of the MHSA required before 	Operational and closure phase	Buffer zones. Requirement of landowners Risk assessment	Transnet Pipeline risk assessment requirements Mine Health and Safety Act (Act 29 of 1996)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<p>any activity can be undertaken in the servitude area.</p> <ul style="list-style-type: none"> Emergency number to be available on-site for emergency services. 			
Traffic	Local	Construction of haul roads. Replacement of soil during rehabilitation	Increase in traffic on roads surrounding the mining area. Impact on surround road network users	<ul style="list-style-type: none"> Road markings, reflective road studs, road signs should be provide and maintained. Ensure speed limits are set on all roads and enforce speed limits. Ensure all drivers at the site are informed about speed limits. Ensure drivers are informed that off-road travelling is prohibited. All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual. 	Construction Closure phase	<p>Reduce through controlling measures</p> <p>Set Speed Limits</p> <p>South African Road Signs Manual</p>	<p>Gauteng Transport Infrastructure Act, 2001 (Act No. 8 of 2001) [as amended];</p> <p>Mine Health and Safety Act (Act 29 of 1996)</p>
Traffic	Local	Load and Haul	Increase in traffic surrounding the site	<ul style="list-style-type: none"> Road markings, reflective road studs, road signs should be provide and maintained. Ensure speed limits are set on all roads and enforce speed limits. Ensure all drivers at the site are informed about speed limits. Ensure drivers are informed that off-road travelling is prohibited. All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual. Place point's men at intersections to ensure safe use. 	Operational Closure phase	<p>Reduce through controlling measures</p> <p>Set Speed Limits</p> <p>South African Road Signs Manual</p> <p>Traffic management plan</p>	<p>Gauteng Transport Infrastructure Act, 2001 (Act No. 8 of 2001) [as amended];</p> <p>Mine Health and Safety Act (Act 29 of 1996)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> All traffic laws to be inforce on and surround site. 			
Traffic	Regional	Transporting of Ore to treatment facility	Increase in traffic as a result of the transportation of ore to offsite treatment facility.	<ul style="list-style-type: none"> Road markings, reflective road studs, road signs should be provide and maintained. Ensure speed limits are set on all roads and enforce speed limits. Ensure all drivers at the site are informed about speed limits. Ensure drivers are informed that off-road travelling is prohibited. All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual. Place point's men at intersections to ensure safe use. All traffic laws to be inforce on and surround site. It is expected that 6 trucks will be utilized for the transport of ore. 18 trips per day. Ore haulage heavy vehicles avoid transporting ore during the relevant Am and PM peak periods. Traffic management to be done in accordance with the Traffic Impact Assessment Detailed investigations should be conducted in conjunction with the relevant road 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; 	Operational Closure phase	<p>Reduce through controlling measures</p> <p>Set Speed Limits</p> <p>South African Road Signs Manual</p> <p>Traffic management plan</p>	<p>Gauteng Transport Infrastructure Act, 2001 (Act No. 8 of 2001) [as amended];</p> <p>Mine Health and Safety Act (Act 29 of 1996)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Cultural Heritage	6.56 ha	Stripping and stockpiling of topsoil and overburden.	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks Impact on the burial ground	<ul style="list-style-type: none"> A heritage practitioner 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. Implement chance find procedures in case where possible heritage finds area made In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed instantly. These finds must be protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that mitigation (e.g. recording, collection) can be undertaken by a professional paleontologist. Preceding any excavation of fossils, a collection permit from SAHRA must be obtained. The fossil material must be housed in an approved collection (museum or university collection) and the fieldwork and reports need to comply with the minimum standards for palaeontological impact studies developed by SAHRA. Demarcate burial ground with a 100m buffer and avoid them. 	Construction Operational phase	No loss of newly discovered material.	National Heritage Resources Act, 1999 (Act No. 25 of 1999) and associated regulations. South African Heritage Resources Agency Guidelines. Mine Health and Safety Act (Act 29 of 1996)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> • If any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on ; and • Implement archaeological monitoring program for Site PB, 2008. • Heritage structure to be protected, if demolish of structure will take place a permit must first be obtained. 			
Heritage and Palaeontological resources	6.56 ha	Opencast mining activities including input crushing of ore Concurrent rehabilitation /Roll over mining	Alteration of archaeological palaeontological resources that may be discovered during earthworks	<ul style="list-style-type: none"> • An appropriately qualified archaeologist must be identified to be called upon in the event that any possible heritage resources or artefacts are identified. • The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. • In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed instantly. These finds must be protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that 	Operational phase	No loss of newly discovered material.	National Heritage Resources Act, 1999 (Act No. 25 of 1999) and associated regulations. South African Heritage Resources Agency Guidelines.

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<p>mitigation (e.g. recording, collection) can be undertaken by a professional paleontologist.</p> <ul style="list-style-type: none"> • Preceding any excavation of fossils, a collection permit from SAHRA must be obtained. The fossil material must be housed in an approved collection (museum or university collection) and the fieldwork and reports need to comply with the minimum standards for palaeontological impact studies developed by SAHRA. 			
Palaeontological and heritage	6.56 ha	Stripping and stockpiling of topsoil and overburden.	Alteration of archaeological palaeontological resources that may be discovered during earthworks	<ul style="list-style-type: none"> • An appropriately qualified archaeologist must be identified to be called upon in the event that any possible heritage resources or artefacts are identified. • The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. • In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed instantly. These finds must be protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that 	Construction Operational phase	No loss of newly discovered material.	<p>National Heritage Resources Act, 1999 (Act No. 25 of 1999) and associated regulations.</p> <p>South African Heritage Resources Agency Guidelines.</p> <p>Mine Health and Safety Act (Act 29 of 1996)</p>

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<p>mitigation (e.g. recording, collection) can be undertaken by a professional paleontologist.</p> <ul style="list-style-type: none"> • Preceding any excavation of fossils, a collection permit from SAHRA must be obtained. The fossil material must be housed in an approved collection (museum or university collection) and the fieldwork and reports need to comply with the minimum standards for palaeontological impact studies developed by SAHRA. • If any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on 			
Aesthetic quality and sense of place	Local	Clearing of Vegetation	A visual impact will be created as a result of the clearing of vegetation and dust pollution	<ul style="list-style-type: none"> • No clearing of vegetation outside of the footprint area. • Best practice mitigation measures (wet suppression) during all phases of operation • Visual barriers to be created with topsoil stockpile. 	Construction Operational phase	Reduce visual impact.	Improve baseline environment
Aesthetic quality and sense of place	Local	Storage of overburden material and stockpiles	Visibility from sensitive receptors / visual scarring of the landscape as a result of the overburden and stockpiles.	<ul style="list-style-type: none"> • Reduce amount of overburden stockpiles by implementing roll over mining. • Restricted height of overburden to designed high. • Use overburden as a visual barrier to shield mining operation. 	Construction Operational phase	Reduce visual impact.	Improve baseline environment

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Visual Aesthetic Impact	Local	Opencast mining activities including input crushing of ore Concurrent rehabilitation /Roll over mining	Visibility from sensitive receptors / visual scarring of the landscape as a result of the mining activities	<ul style="list-style-type: none"> The waste rock storage facility to be utilized as a visual barrier between the mining operation and sensitive receptors. Dust from Stockpile areas, roads and other activities must be managed by means of dust suppression to prevent excessive dust. Stockpiles should not exceed 15m in height. The retention of as much existing vegetation as possible Placement of stockpiles and waste rock to be used to reduce visual impact of mining. Reduce time of stockpiling topsoil and waste rock through concurrent rehabilitation 	Operational phase	Reduce visual impact.	Improve baseline environment
Visual Aesthetic Impact	Local	Closure of final void and placement of topsoil - Establishment of final land form	Removal of stockpiles and waste rock dump. Establishing a final land form. Possible reduction in visual impact	<ul style="list-style-type: none"> Rehabilitation of the area must be done as the mining is completed. Bare areas will be re-vegetated and regularly inspected to ensure good cover and erosion prevention. Best practice mitigation measures (wet suppression) during all phases of operation 	Operational closure phase	Reduce impact	Improve baseline environment
Health and Safety	Local	Opencast mining activities including input	Health and safety risks for workers Inadequate management of the mining process and general operation related activities could result in	<ul style="list-style-type: none"> A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; Implement measures to suppress dust - spraying of gravel roads, surfaces and stock piles with water on a regular basis. 	Operational Closure phase	Reduce impact. Zero incidents Meet H&S objectives	Mine Health and Safety Act (Act 29 of 1996) Gauteng Transport Infrastructure Act, 2001

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
		<p>crushing of ore</p> <p>Concurrent rehabilitation /Roll over mining</p> <p>Transporting of Ore to treatment facility</p>	<p>health and safety risks for workers. Increase in traffic.</p>	<ul style="list-style-type: none"> • Mine workers to wear personal protective equipment; • Any health and safety incidents should be reported to the Site Manager (SM) immediately; • First aid facilities should be available on site at all times; • Workers have the right to refuse work in unsafe conditions; • Material stockpiles or stacks should be stable and well secured to avoid collapse and possible injury to site workers. • Access to excavation must be controlled; • Excavated areas should be temporarily • Provide sufficient ablution facilities (chemical/portable toilets, etc.) at strategic locations that are cleaned regularly. • Potable water to be provide to workers. • Ensure speed limits are set on all roads and enforce speed limits. Ensure all drivers at the site are informed about speed limits. • Monitoring of water quality, air quality and noise. • Equipment not use to be switch off to prevent air pollution, dangerous gasses. • Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. 			(Act No. 8 of 2001) [as amended];

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> Equipment should have lights and ensure that they are visible 			
Health and Safety	Regional	Transporting of Ore to treatment facility	Transport of ore to the offsite facility can increase the risk of accidents and safety risk to works and communities	<ul style="list-style-type: none"> A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; Mine workers to wear personal protective equipment; Any health and safety incidents should be reported to the Site Manager (SM) immediately; Equipment not use to be switch off to prevent air pollution, dangerous gasses. Vehicle idle times should be kept to a minimum to minimise CO, NO₂, SO₂ and greenhouse gas emissions. Equipment should have lights and ensure that they are visible 	Operational Closure phase	Reduce impact. Zero incidents Meet H&S objectives	Mine Health and Safety Act (Act 29 of 1996) Gauteng Transport Infrastructure Act, 2001 (Act No. 8 of 2001) [as amended];
Social economic impact	Local	West Wits project	Impacts on local employment - Opencast mining operations: Contractor would require between 40 and 50 employees.	<ul style="list-style-type: none"> Apply employment/procurement policies and procedures (e.g. do not employ at the mine gate) to prevent unnecessary influx by job-seekers; Ensure compliance with socio-economic tools and legal requirements (BBBEE and Mining Charter); First source people from the local community before jobs are advertise Implement a skills development program 	Construction Operational Closure phase	Sustainable opportunities for social and economic growth Meet objectives	Social and Labour plan Social and community programmes Mine Health and Safety Act (Act 29 of 1996)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
Social economic impact	Local	West Wits project	Disruptions in daily living and movement patterns for surrounding communities, land owners and road users could manifest in the form of traffic and intrusion impacts resulting in short-term disruptions and safety hazards.	<ul style="list-style-type: none"> Erect signboards indicating accesses to the construction site. Inspect trucks and other heavy vehicles on a regular basis to avoid oil spillages and un-roadworthy vehicles that could lead to accidents. The mine to consult with adjacent landowners whose private residences, crops, livestock and other infrastructure could be affected by dust, noise and other impacts that result from traffic movement. Provide a schedule of the construction activities to landowners and relevant I&APs if required. 	Construction Operational Closure phase	Sustainable opportunities for social and economic growth Meet objectives	Social and Labour plan Social and community programmes Mine Health and Safety Act (Act 29 of 1996)
Social economic impact	Local	West Wits project	Health and safety risks for workers Inadequate management of the construction process and general construction related activities could result in health and safety risks for workers.	<ul style="list-style-type: none"> A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; Implement measures to suppress dust - spraying of gravel roads, surfaces and stock piles with water on a regular basis. Construction workers to wear personal protective equipment; Any health and safety incidents should be reported to the Site Manager (SM) immediately; First aid facilities should be available on site at all times; Workers have the right to refuse work in unsafe conditions; 	Construction Operational Closure phase	Sustainable opportunities for social and economic growth Meet objectives	Social and Labour plan Social and community programmes Health and Safety Act (Act 29 of 1996) Mine Health and Safety Act (Act 29 of 1996)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> Material stockpiles or stacks should be stable and well secured to avoid collapse and possible injury to site workers. Access to excavation must be controlled; Excavated areas should be temporarily Provide sufficient ablution facilities (chemical/portable toilets, etc.) at strategic locations that are cleaned regularly. Potable water to be provide to workers. 			
Social economic impact	Local	West Wits project	Possibility of construction activities, mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners, visitors and workers.	<ul style="list-style-type: none"> All workers will be sensitised to the risk of fire; Smoking is only allowed in designated smoking areas and disposal of cigarette butts safely in sand buckets; The Applicant shall ensure that the basic fire-fighting equipment is available on the site; Extinguishers should be located outside hazardous materials and chemicals storage containers; Fire response and evacuation: An Emergency Plan (including Fire Protection, Response and Evacuation Plan) is to be prepared by the Applicant and conveyed to all staff on the site' Identify major risks to minimise the environmental impacts e.g., air pollution and contaminated effluent runoff. 	Construction Operational Closure phase	No one smoking in unauthorised areas. Proof / records of training in terms of the risk of fire and of the emergency management plan. Basic fire-fighting equipment located in the correct	Social and Labour plan Social and community programmes Mine Health and Safety Act (Act 29 of 1996) Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) [as amended] - Section 12 (1) Duty of the landowner to prevent fire from spreading to neighbouring properties.

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
						locations on site.	An Emergency Plan (including Fire Protection, Response and Evacuation Plan)
Social economic impact	Local	West Wits project	Improvement of security in and surround mining area.	<ul style="list-style-type: none"> Eradication of illegal mining in the area through removal of resource and rehabilitation of area. Cleaning of area of illegally dump waste Freeing up land for housing developments after rehabilitation of area. 	Construction Operational Closure phase	Meet objectives	Social and Labour plan Social and community programmes Mine Health and Safety Act (Act 29 of 1996)
Social economic impact	Local	West Wits project	Reducing quality of life. Damage to property and infrastructure	<ul style="list-style-type: none"> Equipment and trucks that produce loud noise must be fitted with appropriate silencers where possible. Dust suppression measures must be implemented to reduce the amount of dust released into the air. Low vibration equipment to be used to prevent damage to house and infrastructure. Houses within close proximity of mining area to be surveyed for crack before any operations commence. Equipment should not be overload, this will prevent damage to roads. An effective dust management plan must be designed and implemented in order to mitigate the impact of dust throughout all mining and development phases. Water carts to be used to make sure dust impact are minimised. 	Construction Operational Closure phase	Reduce, mitigate and avoid where possible	Social and Labour plan Social and community programmes Mine Health and Safety Act (Act 29 of 1996)

Aspect	Size Scale	Activity	Aspects and potential impacts	Mitigation type and Measures	Phase	Standards to be achieved	Compliance with standards
				<ul style="list-style-type: none"> • A complaints register be kept on-site once operations commence and that staff and the neighbouring communities be encouraged to report all air quality related problems. Frequent community liaison meetings should be held with the neighbouring communities to address air quality related concerns • Groundwater monitoring (quality and quantity) to be monitored to ensure that groundwater users are not negatively affected. • PM₁₀ monitoring is recommended for the duration of the mining and rehabilitation phases. The recommended location for PM₁₀ monitoring is at a suitable safe location. • If PM₁₀ concentrations are found to be in exceedance of the NAAQS at the closest sensitive receptor locations additional dust suppression measures should be investigated. If the mitigation measures employed are considered best practice, additional offset measures should be considered. Such offset measures include upgrading of public road surfaces, electrification of houses for cooking and heating or supply of cleaner burning fuel for cooking and heating purposes 			

f) Impact Management Outcomes

See Table 44: Impacts to be mitigated in their respective phases.

g) Impact Management Actions

See Table 44: Impacts to be mitigated in their respective phases.

i) Financial Provision

(1) Determination of the amount of Financial Provision

(a) Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation

The closure objectives for mining internationally and in South Africa focuses on the restoration of previous land use capabilities, the zero net loss of biodiversity, and the satisfaction of community requirements. Project closure objectives for Creswell Park will be in line with the above mentioned and is as follows:

- Re-establishment of the pre mining land use and land capability to a level as close as possible to the pre-mining environment
- Re-establishment of function to any biodiversity areas of concern that could and have been affected by the mining operations
- Prevent any form of contamination of soils, surface water and ground water.
- Implementation of on-going rehabilitation to regulated standards
- Maintenance and Monitoring of rehabilitated areas.

See section appendix G for closure plan for the project.

(b) Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

This Basic Assessment Report and Environmental Management Programme will be subjected to a public consultation period, whereby I&APs are given 30 days to comment. Comments from the I&AP's will be included in the specialist studies and closure plan where required.

(c) Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure

See Appendices G-vii for the closure plan and schedule. Please see Figure 2 for aerial extent of the main mining activities

(d) Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives

Due to the short timeframe and extent of the activities as shown in the Environmental Impact Assessment, the impacts will be of a medium to low significance. Rehabilitation will be conducted concurrently and will include closure of final void and re-vegetation. Detailed mitigation measures are provided in the EMPR to ensure the closure objectives are met.

(e) Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

The schedule closure cost for the project for rehabilitation of mining aspects and general surface rehabilitation was calculated at R 3 488 741.81. The additional allowances on the project that consisted out of P&G (10%), Contingencies (10%) and Additional Studies were calculated at R 906 540.86. Post Closure Aspects were calculated at R 1 072 475.37 for the 5 year post closure monitoring of surface, ground water and 3 years monitoring of rehabilitation and care and maintenance. The total schedule closure cost was calculated at R 5 467 758.04.

(f) Confirm that the financial provision will be provided as determined.

Financial provision of the schedule closure cost will be made for the first year of operation when the mining permit has been approved.

h) Monitoring and reporting frequency

The table below outlines the monitoring and compliance requirements for the proposed operation. The monitoring program should be updated when a water use licence is obtained from the operation.

Table 45: Aspects to be monitored

Aspect	Location	Monitoring and Reporting Frequency and Time periods	Responsible Person	Function Requirements for monitoring
Construction, Operational and closure phase				
Implementation of EMPR	Mine Area	Continues through each phase Annual report	Mine Manager ECO External Specialist	Annual EMPr performance assessment – NEMA Regulations (Appendix 7)
Groundwater	As per Groundwater specialist report	Monthly – Water levels Monthly – Quality (construction) Quarterly – Quality (Operational and Closure) Quarterly report	External service provider – specialists	WUL requirements Monitoring program <ul style="list-style-type: none"> - Tracking of any possible pollution - Impact on water level
Surface water	Any water discharge from open pit area.	As required	External service provider – specialists ECO	WUL requirements Monitoring program <ul style="list-style-type: none"> - Performance of the mine - Detection of pollution - Impact on water quality
Noise	Sensitive Receptors	Annual (once during operation and one during closure) <ul style="list-style-type: none"> - After complaints 	External service provider – specialists	Finance Corporation (IFC) and SANS 10103. <ul style="list-style-type: none"> - Establish noise impact on sensitive receptors
Air Quality	Sensitive Receptors	PM10 – Continues Dust fallout – Monthly	External service provider – specialists	National Dust Control Regulations (GN 827, November 2013). ASTM D1739.

		Monthly Report NAEIS Reporting		South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution - Tracking of progress NAEIS report to be reported to the relevant air quality officer
Archaeological	Mine Area	If required	External service provider – specialists ECO	Heritage reports requirements National Heritage Resources Act, 1999 (Act No. 25 of 1999) and associated regulations. South African Heritage Resources Agency Guidelines.
Social and Stakeholder engagement	Local	On-going feedback	Mine Manager Social officer ECO	Social and labour Plan Stakeholder engagement meetings
Crack survey	Houses within 100m	Once off	Mine Manager Social officer ECO	- Establish baseline conditions - Evaluate any change in baseline conditions
Vibration Monitoring	Local Area	If and when required	External service provider – specialists ECO	Vibration assessment requirements
Alien Vegetation	Mine Area	Bi-annually Bi-annually reporting	External service provider – specialists ECO	Alien Vegetation Management Plan. Specialist monitoring on Faunal and Flora aspects. - Alien vegetation control and management; - Habitat and vegetation management; - Rehabilitation services include the rehabilitation of operational disturbed areas
Rehabilitation Monitoring	Mine Area	Bi-annually Bi-annually reporting	External service provider – specialists ECO	Final Closure Plan Alien Vegetation Management Plan WUL and monitoring requirements

i) Indicate the frequency of the submission of the performance assessment/ environmental audit report.

A Performance Assessment Review of the EMPR should be conducted annually and the environmental audit report will be submitted annually. The first audit should be performed within 3 months from the commencement of the mining activity.

Operational internal environmental inspections will need to be done once a month by the mines Environmental personnel. A yearly internal audit needs to be undertaken by the mines environmental department.

j) Environmental Awareness Plan

(1) Manner in which the applicant intends to inform his or her employees of any the environmental risk which may result from their work

The environmental awareness plan will include the following:

- Induction of all staff and workers;
- Monthly 'toolbox' talks (awareness talks);
- Environmental Awareness Training
- Risk assessments for specific tasks with supervisors and staff involved in the task on a daily basis, or as often as the task is taking place.

The following principles and training will apply to the Environmental Awareness Plan (safety, health and environmental (SHE) training;

- All personnel, including contactors will as a minimum undergo general SHE induction and awareness training;
- The Safety, Health, Environmental and Quality (SHEQ) Manager will identify the SHE training requirements for all personnel and contractors. The training requirements will be recorded in a training needs matrix indicating particular training that must be undertaken by identified personnel and contractors. The training matrix will be administered by the Training Department; and Development of the Training Programme, which will include:
 - Job specific training – training for personnel performing tasks which could cause potentially significant environmental impacts;
 - Assessment of extent to which personnel are equipped to manage environmental impacts;

- Basic environmental training;
- Comprehensive training – on emergency response, spill management, etc;
- Specialised skills;
- Training verification and record keeping; and
- Periodic re-assessment of training needs, with specific reference to new developments, newly identified issues and impacts and associated mitigation measures.

Environmental Awareness Training

- The ECO shall be responsible for compiling and Environmental Awareness Training Programme for all staff members that aims at explaining the mitigation measures described in this report.
- Before commencing with any work, all staff members shall attend the Environmental Awareness Training Programme. After attending the programme, all contractors and sub-contractors shall sign an Environmental Training register as proof of their training; which shall be kept as proof for auditing purposes.
- The environmental training should, as a minimum, include (but not be limited to) the following:
 - The importance of conformance with all environmental policies;
 - The environmental impacts, actual or potential, of the proposed activities;
 - The environmental benefits of improved personal performance;
 - Their roles and responsibilities in achieving conformance with the environmental policy and procedures and with this EMP, including associated procedures and emergency preparedness and response requirements;
 - The potential consequences of departure from specified operating procedures; and
 - The mitigation measures required to be implemented when carrying out their work activities

Emergency Procedures

The environmental management programme and associated management options are intended to minimise environmental risk as far as possible.

- Emergency procedures, as relevant to this project, shall be implemented;
- The SHEQ Manager shall define emergency reporting procedures for the project;
- All personnel shall be made aware of emergency reporting procedures and their responsibilities;
- Any spills will be cleaned up immediately in accordance with relevant legislation; and

- Telephone numbers of emergency services, including the local firefighting service, shall be conspicuously displayed.

(2) Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

The procedure for dealing with environmental risk including the objectives, identification and calculation of environmental risks is described in the existing approved EMPR. A spill procedure should be developed and implemented by the applicant.

k) Specific information required by the Competent Authority

(Among others, confirm that the financial provision will be reviewed annually)

The following documents will be submitted to the DMR from the start of construction until mine closure

- EMPR performance assessment as required by Regulation 34 of GNR 982 of NEMA [as amended] the report will comply with the requirements as set out in Appendix 6 (GNR 982) – Environmental Audits.
- Financial provision will be updated on an annual basis and submitted to the DMR.

2) UNDERTAKING

I, DuToit Wilken the Environmental Assessment Practitioners responsible for compiling tis EMPR hereby confirm;

- the correctness of the information provided in the reports
- the inclusion of comments and inputs from stakeholders and I&APs ;
- the inclusion of inputs and recommendations from the specialist reports where relevant; and
- that the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties are correctly reflected herein.



2018/07/18

Signature of EAP

Date:



2018/07/11

Signature of Review/EAP

Date: