9 PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED ALTERNATIVE

This chapter describes the alternatives considered for the project and summarises the process being followed to reach the preferred alternatives.

9.1 DETAILS OF ALL THE ALTERNATIVES CONSIDERED

Alternatives cannot be considered for layout and activity changes that have already taken place.

The section below introduces the alternatives that are available for consideration and background where no reasonable or feasible alternative exists for a proposed layout and activity change. Where a number of options exist for a particular alternative a comparative options analysis is included.

9.1.1 TOP-CUT STOCKPILE AND MOBILE CRUSHING AND SCREENING PLANT

No alternatives were considered for the establishment of the top-cut stockpile and associated mobile crushing and screening plant.

The top-cut stockpile will be located within the existing Mining Right area. Stockpiling of top-cut and associated crushing and screening already takes place at the MMT and therefore these project activities will be in line with current operational practices. The additional stockpile area is required as there is insufficient space on the central WRD to continue stockpiling top-cut material on this dump. In addition, the remaining WRDs are required for the disposal of waste rock and therefore cannot be used for this purpose. The area identified for the location of the new top-cut stockpile is the only feasible option given the limited available space within the existing Mining Right Area.

9.1.2 STORMWATER INFRASTRUCTURE

A Stormwater Management Plan is being developed for the MMT. The objective of the Stormwater Management Plan is to ensure compliance with NWA and GNR. 704 of June 1999. The development of the Stormwater Management Plan is also informed by BPGs for Water Resource protection in the South African Mining Industry.

From an operational perspective and as part of initial investigations the continued use of Adams pit for the storage of wastewater from the plant area was considered. This approach was discussed with the DHSWS at a pre-application meeting held on 29 July 2020. The DHSWS advised that Adams pit could not be considered as a pollution control facility and as such investigations in terms of dirty water conveyance and storage is required. As part of these investigation, South32 is in consultation with the DHSWS, to investigate the possibility of exemption of some of the conditions outlined in GNR. 704 of June 1999. The investigation is however in the initial stages and as such further information will be provided in the EIA phase. The location of any stormwater management infrastructure within the Mining Right area will be informed by these further investigations. No property alternatives will be considered as any stormwater management infrastructure will be located within the Mining Right area.

9.1.3 WRD HEIGHT INCREASE

No alternatives were considered for the increase in existing WRDs heights.

The location of the WRDs and the type of activity (disposal of waste rock) is already approved in the current EMPr 2005. Existing practices at the mine for the disposal of waste rock will continue. The MMT Mining Right area is constrained in terms of existing infrastructure and activities. It follows that there is limited space available for the establishment of new facilities. It follows that an increase in the height of existing dumps is considered the only feasible option.

9.1.4 WATER SUPPLY PIPELINE FROM MIDDELPLAATS MINE

Current operational experience at MMT is that open pit dewatering and the Vaal-Gamagara Water Pipeline are not able to provide a reliable water supply for the demand. Water is essential to operations and an alternate source is required. The workings of the nearby, decommissioned Middelplaats Mine are known to be flooded and could provide a new water source. MMT is proposing to abstract water from the Middelplaats Mine when water is not available from open pit dewatering activities or from the Vaal-Gamagara Water Pipeline. In this regard, it is proposed that water will be abstracted via two proposed boreholes. An on-surface, HDPE pipeline will need to be established to transfer the water from the Middelplaats Mine to the MMT. Three alternative routes are being considered for the proposed water supply pipeline (see Figure 9-1).

- Option 1 follows the servitude of primary road access to the MMT and an existing pipeline route, along the southern boundary of the Tshipi Borwa Mine;
- Option 2 would proceed due east from the Middelplaats Mine to the mine pit at MMT. The pipeline would cover the shortest distance from source to point of use; and
- Option 3 would also proceed due east from the Middelplaats Mine but would be aligned to a series of property boundaries before reaching the mine pit at MMT. The pipeline would have three significant bends.

A basic high-level alternatives selection matrix has been compiled in order to provide an overview of each of the advantages and disadvantages of the alternatives considered. Table 9-4 presents the results of the preliminary comparative assessment, which has been informed by preliminary specialist input (where applicable). As part of the EIA phase, this alternatives process will be refined with more detailed specialist input and stakeholder input. The ranking system is a simple three score relative ranking system. For each criterion, a score of one is allocated to the best option and a score of three to the worst. With reference to Table 9-1 below, Option 1 is deemed the feasible option at this stage when considered from an environmental, social, cultural and technical / operational perspective.

TABLE 9-1: HIGH-LEVEL COMPARATIVE ASSESSMENT OF THE MIDDELPLAATS WATER PIPELINE ROUTE OPTIONS

Aspect	Option 1	Rating	Option 2	Rating	Option 3	Rating
Environmental						
Soils and land capability	Advantage: • Will require the disturbance of the Witbank soil form (see Section 9.4.1.4), which is an extensively disturbed soil and has a very low dryland agricultural potential.	1	Disadvantage: • Will predominately require the disturbance of the Hutton soil form (see Section 9.4.1.4) which is considered to be a moderate potential agricultural soil. A small section of the pipeline route will disturb the Witbank soil form (see Section 9.4.1.4), which is an extensively disturbed soil and has a very low dryland agricultural potential.	3	Disadvantage: • Will predominately require the disturbance of the Hutton soil form (see Section 9.4.1.4) which is considered to be a moderate potential agricultural soil. A small section of the pipeline route will disturb the Witbank soil form (see Section 9.4.1.4), which is an extensively disturbed soil and has a very low dryland agricultural potential.	3
Biodiversity	Disadvantage: • Predominately located in the Kathu Bushveld Habitat unit and is therefore likely to disturb SCC (see Section 9.4.1.5). • Longest route and therefore has the biggest disturbance footprint.	3	Advantage: • Shortest route and therefore has the smallest disturbance footprint. Disadvantage: • Predominately located in the Kathu Bushveld Habitat unit and is therefore likely to disturb SCC (see Section 9.4.1.5).	1	Advantage: • Shorter route and therefore smaller disturbance footprint than Option 1. Disadvantage: • Predominately located in the Kathu Bushveld Habitat unit and is therefore likely to disturb SCC (see Section 9.4.1.5).	2
Surface water	Not applicable as none of the pipeline routes are located within close proximity to water courses.					
Groundwater	Not applicable as none of the pipeline routes are likely to present significant sources of groundwater contamination.					
Visual	Not applicable as none of the pipeline routes are likely to generate significant negative visual views.					
Air	Not applicable as none of the pipeline routes are likely to present significant sources of air emissions.					
Noise	Not applicable as none of the pipeline routes are likely to generate noise that will significantly influence existing noise levels in the area.					
Traffic	Not applicable as none of the pipeline routes are likely to significantly alter existing traffic levels.					

Aspect	Option 1	Rating	Option 2	Rating	Option 3	Rating
Cultural						
Heritage	Not applicable as none of the pipeline routes are associated with any known heritage resource sites.					
Paleontological	Not applicable as none of the pipeline routes are likely to be associated with any palaeontological resources.					
Social						
Land use (property)	Advantage: • Follows an existing servitude and existing pipeline and as such is unlikely to interfere with existing neighbouring mine activities. Disadvantage: • A section of the pipeline will intersect property owned by Tshipi and as such land use agreements will need to be obtained. • Closest pipeline to sensitive receptors.	1	Disadvantage: • A section of the pipeline will intersect property owned by Tshipi and UMK and as such land use agreements will need to be obtained from both mines. • Crosses the Tshipi Mining Right area and may interfere with future planned operations.	3	Disadvantage: • A section of the pipeline will intersect property owned by Tshipi and UMK and as such land use agreements will need to be obtained from both mines. • Crosses the UMK Mining Right area and may interfere with future planned operations.	3
Technical and operational						
Length (cost)	Disadvantages: • Longest pipeline.	3	Advantages: • Shortest pipeline and the most direct route with fewest bends.	1	Advantages: • Longer pipeline than Option 2 with major bends.	2
Operational aspects	Advantages: • Ease of access for installation and maintenance.	1	Disadvantage: • Access private property for installation and maintenance.	3	Disadvantage: • Access private property for installation and maintenance.	3
Total score		**9**		**11**		**13**

9.1.5 UPGRADING OF THE RAILWAY LOADOUT STATION

MMT currently loads 104 waggons over a period of 13 hours. In order to meet the HMM allocation on TFR's manganese line the loading rate of trains at the MMT needs to be increased. Three alternatives are being considered by MMT as part of the railway upgrade (see Figure 9-1). These include the following:

- Option 1: Reduce loading time to achieve consistent adherence to 12-hour Train Turn-around Time target. This would require the upgrading of the bulk material handling infrastructure to enable faster filling rates and the reconfiguration of rail infrastructure to allow for 125 wagons and improved train shunting;
- Option 2: Reduce loading time to achieve 8-hour Train Turn-around Time. This would require the upgrading of the bulk handing infrastructure to enable faster filling rates and the reconfiguration of rail infrastructure to allow for 125 waggons and improved train shunting. The option is further upgradeable to a 4-hour Train Turn-around Time in future; or
- Option 3: Reduce loading time to 4-hour Train Turn-around Time to allow for 125 wagons. This would require the establishment of a new railway loop, new loadout station, product stockpile areas, stackers and reclaimers and the clearance of vegetation of undisturbed areas for the establishment of new infrastructure.

A basic high-level alternatives selection matrix has been compiled in order to provide an overview of each of the advantages and disadvantages of the alternatives considered. Table 9-2 presents the results of the preliminary comparative assessment. As part of the EIA phase, this alternatives process will be informed by specialist input. The ranking system is a simple three score relative ranking system. For each criterion, a score of one is allocated to the best option and a score of three to the worst. The option with the lowest total score is the preferred option. With reference to Table 9-2 below, option 2 is deemed the feasible option at this stage when considered from an environmental, social, cultural and technical/operational perspective.

In terms of water being abstracted from the decommissioned Middelplaats mine, MMT is investigating the following alternatives:

- Storage of water within existing facilities at the mine or establishing an additional storage facility; and
- The treatment of water abstracted from Middelplaats mine versus no treatment.

TABLE 9-2: HIGH-LEVEL COMPARATIVE ASSESSMENT OF THE RAILWAY LOADOUT STATION UPGRADE OPTIONS

Aspect	Option 1: 12-hour loading time	Rating	Option 2: 8-hour loading time	Rating	Option 3: 4-hour loading time	Rating
Environmental						
Soils and land capability	Advantage: • Located within an existing disturbed area and will not require the clearance of soil resources and the related potential loss in land capability.	1	Advantage: • Located within an existing disturbed area and will not require the clearance of soil resources and the related potential loss in land capability.	1	Disadvantage: • Requires the removal of soil resources and related potential loss in land capability.	3
Biodiversity	Advantages: • Located within an existing disturbed area and will therefore not require the clearance of vegetation.	1	Advantages: • Located within an existing disturbed area and will therefore not require the clearance of vegetation.	1	Disadvantages: • Requires the clearance of vegetation.	3
Surface water	Not applicable as none of the options are located within close proximity to water courses.					
Groundwater	Advantage: • This option does not present any significant new sources of pollution that could contribute to a groundwater contamination plume.	1	Advantage: • This option does not present any significant new sources of pollution that could contribute to a groundwater contamination plume.	1	Disadvantage: • This option requires the establishment of a new product stockpile area that presents an additional potential source of pollution that could contribute to a groundwater contamination plume.	3
Visual	Advantage: • The upgrades required for this option will be absorbed into existing views of the current loadout station and railway siding.	1	Advantage: • The upgrades required for this option will be absorbed into existing views of the current loadout station and railway siding.	1	Disadvantage: • This option will present additional surface infrastructure that will contribute to the visual intrusion of the MMT.	3
Air	Advantage: • This option does not present significant additional sources that will	1	Advantage: • This option does not present significant additional sources that will contribute to existing air emission sources.	1	Disadvantage: • This option presents additional sources of air emissions mainly through the	3

Aspect	Option 1: 12-hour loading time	Rating	Option 2: 8-hour loading time	Rating	Option 3: 4-hour loading time	Rating
	contribute to existing air emission sources.				establishment of an additional product stockpile.	
Noise	Advantage: • This option slightly reduces the loading time of waggons (12 hours), thereby reducing the noise contribution period to the receiving environment.	3	Advantage: • This option reduces the loading time of waggons (8 hours), thereby reducing the noise contribution period to the receiving environment.	2	Advantage: • This option significantly reduces the loading time of waggons (4 hours), thereby reducing the noise contribution period to the receiving environment.	1
Traffic	Disadvantage: • This option does not significantly change the existing state of truck dependency for the transportation of product off site for sale to third parties.	3	Advantage: • This option will slightly reduce the dependency of MMT on the transportation of product via trucks.	2	Advantage: • This option will significantly reduce the dependency of MMT on the transportation of product off site via trucks.	1
Cultural						
Heritage	Not applicable as MMT is not associated with any known heritage resource sites.					
Paleontological	Not applicable as MMT is unlikely to be associated with any palaeontological resources.					
Social						
Land use (property)	Not applicable as all options are located within the existing Mining Right area.					
Technical and operational						
Operational aspects	Advantage: • Minimal operational disruptions during upgrades.	1	Advantage: • Minimal operational disruptions during upgrades.	1	Disadvantages: • Installation of upgrades would interrupt current train loading.	3
Layout and design	Advantage:	1	Advantage:	1	Disadvantages:	3

Aspect	Option 1: 12-hour loading time	Rating	Option 2: 8-hour loading time	Rating	Option 3: 4-hour loading time	Rating
	• Upgrades are limited to the existing loadout and rail infrastructure.		• Upgrades are limited to the existing loadout and rail infrastructure.		• Upgrade infrastructure intersects the current rehabilitated Adams WRDs. These WRDs would need to be removed. • Railway line is in close proximity to existing mining activities (approximately 20 m).	
Loading times	Disadvantages: • Only achieves a 12-hour turn-around time and as such operates at lower end of industry standards.	3	Advantages: • An 8-hour turnaround time is achievable and enables achievement of allocation on TFR. • Upgradeable in future to achieve Option 3 levels.	2	Advantages: • A 4-hour turn-around time and as such operates at the upper percentile of industry standards.	1
Technical aspects	Advantage: • Existing feeder and reclaimer conveyor is upgradeable. • Accommodates a 43-wagon shunting. • Existing product stockyard has sufficient capacity to accommodate additional throughput. Disadvantages: • Modifications to ageing infrastructure which will require further structural analysis. • Aged sampler plant requires upgrades. • Existing rail infrastructure remains at 20 tonnes per annum load capacity. • Bigger locomotive required.	3	Advantages: • Accommodates a 43-wagon shunting. • Existing product stockyard has sufficient capacity to accommodate additional throughput. • Semi-rapid and Indexer will allow continuous loading. Disadvantages: • Modifications to ageing infrastructure which will require further structural analysis. • Sinter reclaimer conveyor has a limited upgradeable capacity. • Existing rail infrastructure remains at 20 tonnes per annum load capacity. • Bigger locomotive required.	2	Advantages: • Caters for staging of 125 wagons without shunting. • New loop will allow for a 26 tonnes per annum load capacity. Disadvantages: • Existing stockyard does not have sufficient capacity to accommodate additional throughput.	1

Aspect	Option 1: 12-hour loading time	Rating	Option 2: 8-hour loading time	Rating	Option 3: 4-hour loading time	Rating
Total Capital expenditure	Capital expenditure of approximately R 54 million.	1	Capital expenditure of approximately R 152 million.	2	Capital expenditure of approximately R 826 million.	3
Total score		**20**		**17**		**28**

9.1.6 Sale of Waste Rock as Aggregate

The only alternative that is being considered for the sale of waste rock pertains to an operational aspect in terms of the need to subject the waste rock to crushing and screening prior to sale to third parties. Further information will be provided in the EIA phase. No further alternatives were considered.

9.1.7 Re-processing of Material Located in Adams Pit

No alternatives were considered for the re-processing of material located in Adams pit.

The DMRE issued HMM with a Notice of Intention (September 2019) specifying that the storage of sinter de-dust bags in Adams pit could not continue. Following investigations done by South32, the viability of selling these materials as low-grade product is deemed possible. MMT is proposing on re-processing the tailings, DMS grit, sinter de-dust and plant spillages currently stockpiled within Adams pit as part of rehabilitation of the pit. The re-processing of the material located in Adams pit is the only feasible operational option given that identifying a new storage area is constrained by existing infrastructure and activities at the mine and would require the disturbance of additional undisturbed areas. No further alternatives were considered.

9.1.8 Optimization of Water Recovery Within the Plant Area

South32 has initiated a process to investigate alternatives means to the management of slimes at the mine together with the intention to maximise water recovery within the plant area. In this regard the following options are being considered:

- Option 1: Optimising the existing thickener set-up at the plant through the installation of a new thickener or automating the current thickener. This will continue to produce slimes material that may need to be disposed into a slimes dam; and
- Option 2: Optimising the existing thickener set-up through the installation of a filter press system which eliminates the need for a slimes dam. The dried filter cake can be disposed in a handling facility (dry stacking).
- Option 3: Optimising the existing thickener set-up through the installation of a filter press system which eliminates the need for a slimes dam. The dried filter cake can blend within the existing process.

A basic high-level alternatives selection matrix has been compiled in order to provide an overview of each of the advantages and disadvantages of the alternatives considered. Table 9-3 presents the results of the preliminary comparative assessment, which has been informed by preliminary specialist input (where applicable). As part of the EIA phase, this alternatives process will be refined with more detailed specialist input and stakeholder input. The ranking system is a simple three score relative ranking system. For each criterion, a score of one is allocated to the best option and a score of three to the worst. With reference to below, Option 3 is deemed the feasible option at this stage when considered from an environmental, social, cultural and technical / operational perspective.

TABLE 9-3: HIGH-LEVEL COMPARATIVE ASSESSMENT OF THE OPTIMIZATION OF THE PLANT WATER RECOVERY SYSTEM

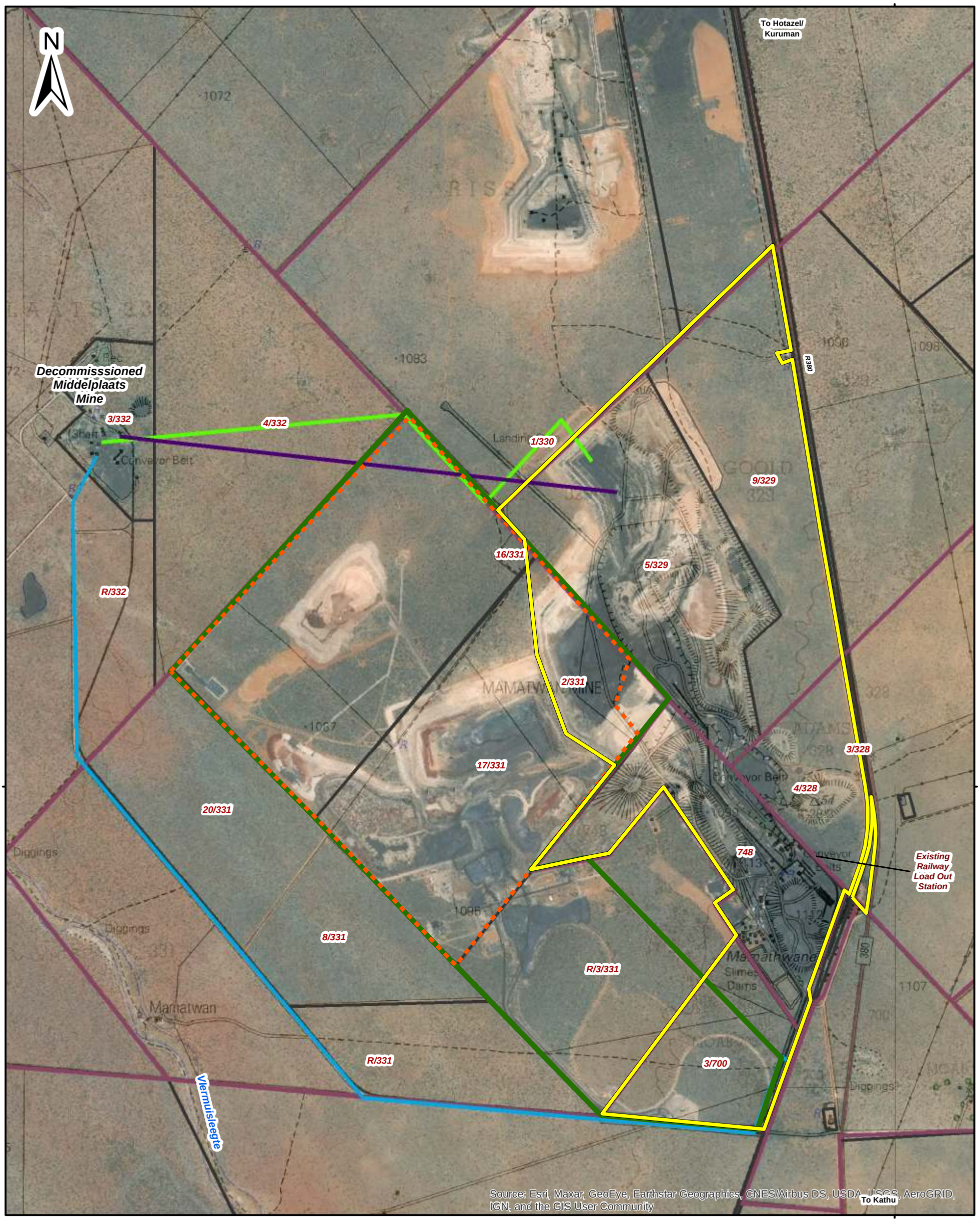
Aspect	Option 1: Optimization of existing thickener and development of a slimes dam	Rating	Option 2: Optimization of existing thickener through the installation of a filter press and establishment of a dry staking facility	Rating	Option 2: Optimization of existing thickener through the installation of a filter press and blending of filter cake	Rating
Environmental						
Geology	Disadvantage: • Likely to sterilise a mineral resource through disposal onto a slimes dam	3	Disadvantage: • Likely to sterilise a mineral resource through disposal onto a dry staking facility	3	Advantage: • Unlikely to sterilise a mineral resource.	1
Soils and land capability	Disadvantage: • Will require the disturbance of uncleared land and associated stripping of soil resources and the potential loss of land capability that will remain in perpetuity	3	Advantage: • Likely to be located within an existing disturbed area and/or a smaller undisturbed footprint that will remain in perpetuity.	2	Advantage: • Likely to be located within an existing disturbed area and/or a smaller undisturbed footprint.	1
Biodiversity	Disadvantage: • Will require the clearance of vegetation that will remain in perpetuity.	3	Advantages: • Will require the clearance of vegetation that will remain in perpetuity, but the area of disturbance is likely to be smaller.	2	Advantage: • Likely to be located within an existing disturbed area.	1
Surface water	Not applicable as none of the options are located within close proximity to water courses.					
Groundwater	Disadvantage: • This option will contribute to the existing groundwater contamination plume through the development of a slimes dam.	3	Disadvantage: • This option will contribute to the existing groundwater contamination plume through the development of a dry staking facility, however as the material	2	Advantage: • This option will present new sources of groundwater contamination however the sources are unlikely to significantly influence the existing pollution plume.	1

Aspect	Option 1: Optimization of existing thickener and development of a slimes dam	Rating	Option 2: Optimization of existing thickener through the installation of a filter press and establishment of a dry staking facility	Rating	Option 2: Optimization of existing thickener through the installation of a filter press and blending of filter cake	Rating
			is dry the contamination plume should be smaller.			
Visual	Disadvantage: • A slimes dam will present an additional negative visual intrusion.	3	Disadvantage: • A dry staking facility will present an additional negative visual intrusion.	2	Advantage: • Project changes are likely to be absorbed within the existing mining infrastructure.	1
Air	Disadvantage: • This option presents significant additional sources that will contribute to existing air emission sources.	3	Disadvantage: • This option presents additional sources that will contribute to existing air emission sources.	3	Disadvantage: • This option presents additional sources that will contribute to existing air emission sources.	1
Noise	Disadvantage: • This option presents additional noise sources particularly during the construction phase.	3	Disadvantage: • This option presents addition noise sources particularly during the construction and operation phases.	3	Disadvantage: • This option presents addition noise sources particularly during the construction and operation phases.	3
Traffic	Disadvantage: • Will result in an increase of vehicles particularly during the construction phase of the slimes dam through the transportation of contractors and construction material.	3	Disadvantage: • Will result in an increase of vehicles particularly during the construction phase of the filter press and dry staking facility through the transportation of contractors and construction material.	3	Disadvantage: • Will result in an increase of vehicles particularly during the construction phase of the filter press through the transportation of contractors and construction material.	3
Cultural						
Heritage	Not applicable as MMT is not associated with any known heritage resource sites.					

Aspect	Option 1: Optimization of existing thickener and development of a slimes dam	Rating	Option 2: Optimization of existing thickener through the installation of a filter press and establishment of a dry staking facility	Rating	Option 2: Optimization of existing thickener through the installation of a filter press and blending of filter cake	Rating
Paleontological	Not applicable as MMT is unlikely to be associated with any palaeontological resources.					
Social						
Land use (property)	Not applicable as all options are located within the existing Mining Right area.					
Safety to third parties and animals	Not applicable as all options are located within the existing Mining Right area, which is access controlled.					
Technical and operational						
Operational aspects	Advantage: • Minimal operational costs once slimes dam is established.	1	Disadvantage: • A filter press requires substantial operation costs.	3	Disadvantage: • A filter press requires substantial operation costs.	3
Layout and design	Disadvantage: • Limited space within the existing Mining Right area to establish a slimes dam.	2	Disadvantage: • Limited space within the existing Mining Right area to establish a dry staking facility.	2	Advantage: • Likely to be located within the existing plant area.	1
Total Capital expenditure	Disadvantage: • Expensive to establish a slimes dam.	3	Disadvantage: • Expensive to establish a filter press and to operate the facility • Expensive to establish a dry staking facility	2	Disadvantage: • Expensive to establish a filter press and to operate the facility	1
Total score		**30**		**27**		**17**

9.1.9 THE "NO-GO" ALTERNATIVE

The assessment of this alternative requires a comparison between the options of proceeding with a project with that of not proceeding with the project. The "No-go" alternative will be considered in the EIA phase.



Legend

- Mamatwan Mining Right Area
- Alternative Pipeline Route 1
- Alternative Pipeline Route 2
- Alternative Pipeline Route 3
- Tshipi Surface Use Area
- Tshipi Mining Right Area
- Farm Boundaries
- Farm Portions

0 300 600 Meters

Scale: 1:30 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 9-1

Alternatives Considered

SLR

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

710.20008.00072

2021/03/11

9.2 DETAILS OF THE PUBLIC PARTICIPATION PROCESS

This section describes the public participation process undertaken in line with Chapter 6 of the EIA Regulations (2014), as amended. The aim of the public consultation process is to co-ordinate a process through which I&APs are informed of the proposed project and environmental assessment process and are provided with an opportunity to provide input into the project plan, the assessment and proposed mitigation measures. I&APs broadly refers to landowners, land users, commenting authorities, the competent authority, surrounding mines, industries and parastatals. An overview of the public participation process undertaken to date is outlined in Table 9-4 below.

The next step in the public participation process for the proposed project, is to provide I&APs with an opportunity to review the Scoping Report. Due to the COVID-19 Lockdown, the public participation process in support of the proposed project was put on hold on 27 March 2020. On 05 June 2020, the DEFF issued GN 650, providing direction on how to proceed with licensing processes and public participation processes. In this regard, the following is noted in GN 650:

- Reports may not be made available at any public places or premises closed to the public; and
- Hard copies or electronic versions of reports may be made accessible through any of the following non-exhaustive list of methods: websites, Zero Data Portals, community or traditional authorities, Cloud Based Services, provided that all registered I&APs have access to the reports.

Taking the above into consideration, the planned public participation plan for the project was adjusted and submitted to the DMRE for consideration. The public participation plan was approved by the DMRE on 13 July 2020. See Appendix C for a copy of the correspondence with the DMRE. The distribution of this Scoping Report, as outlined in the table below, is aligned with the accepted public participation plan.

TABLE 9-4: OVERVIEW OF THE PUBLIC PARTICIPATION PROCESS

Task		Description
Notification - I&APs		
Public participation undertaken to date	DMRE application	Submission of the application form to the DMRE via the SAMRAD system.
	Land claims commissioner consultation	The Land Claims Commissioner was consulted to verify if any land claims have been lodged on the farms within the MMT Mining Right area and on the farm Portion 4 of Middelplaats 332. See Appendix C for a copy of the correspondence received from the Land Claims Commissioner in November 2019.
	A desktop social scan	A desktop social scan was undertaken as part of the environmental authorisation process to verify details of the existing I&AP and commenting authorities' database for the MMT. The desktop social scan therefore included the following: • The verification of the relevant surrounding landowners, land occupiers, relevant ward councillor, municipalities, organs of state, commenting authorities and other interested and affected parties; • Verification of contact details for I&APs on the existing database; and • Verification of appropriate communication structures. A copy of the project database is included in Appendix C. This database is updated on an on-going basis throughout the environmental authorisation process.

Task		Description
Public participation undertaken to date	BID	A BID has been compiled by SLR and was distributed to I&APs and commenting authorities registered on the project database. The BID provides: • Information about the proposed project and environmental authorisation process; • Information about the baseline environment of the proposed project area; • Information pertaining to project alternatives that will be considered as part of the environmental authorisation process; • Information regarding possible biophysical, heritage/cultural and social impacts associated with the proposed project activities; • Details pertaining to the public participation process; and • Information on how I&APs and commenting authorities can have input into the environmental assessment process. A registration and response form were attached to the BID, which provides I&APs with an opportunity to register as an I&AP and submit comments on the proposed project. The BID was made available in English, Afrikaans and Setswana. A copy of the BID including the proof of distribution is included in Appendix C.
	Site notices	SLR placed initial laminated A2 site notices (in English, Afrikaans and Setswana) at key conspicuous positions in and around the MMT, the decommissioned Middelplaats Mine as well as nearby towns in March 2020. Given the time that past since the initial I&AP notifications, re-engagement site notices were placed at key conspicuous positions in and around the MMT, the decommissioned Middelplaats Mine as well as nearby towns in March 2021. Copies of the site notices, photographic proof and a map illustrating the location of the site notice placements (those placed in 2020) are provided in Appendix C. Copies of the site notices, photographic proof and a map illustrating the location of the site notice placement (those placed in 2021) will be provided in the updated Scoping Report.
	Newspaper advertisements	Initial block advertisements were placed in two local newspapers. In this regard, advertisements were placed in the Kathu Gazette on 7 March 2020 and in the Kalahari Bulletin on 05 March 2020. Given the time that past since the publication of the initial advertisements, re-engagement advertisements were published in the Kathu Gazette on 26 March 2021 and the Noordkaap Bulletin on 25 March 2021. See Appendix C for a copy of the advertisements placed in 2020. Copies of the advertisements placed in 2021 will be provided in the Updated Scoping Report.
	Public and commenting authorities meeting	A public and commenting authorities meeting was held as part of the public participation process at the Hotazel Recreational Club on 12 March 2020. The purpose of the meeting was to provide: • Information about the proposed project; • Information about the baseline environment of the proposed project area; • Information about the environmental authorisation process; • Information pertaining to project alternatives that will be considered as part of the environmental authorisation process; • Information regarding possible biophysical, heritage/cultural and social impacts associated with the proposed project activities; • Details pertaining to the public participation process; and • Information on how I&APs and commenting authorities can have input into the environmental assessment process. No, I&APs attended the meeting.

Task		Description
Planned public participation	Review of the Scoping Report	The Scoping Report will be made available for public review for 30 calendar days. I&APs will be notified when the Scoping Report will be available for review via email and SMS notifications. Full copies of the Scoping Report will be uploaded onto the SLR website and the SLR data free website. The link to this website will be distributed to all I&APs via email and SMS notifications. A Non-Technical Summary of the Scoping Report, available in English, Afrikaans and Setswana, will also be made available to all I&APs via email.
	Submission of the Scoping Report to the DMRE	Following the 30-calendar day public review period, the Scoping Report will be updated to include any comments received by I&APs. This updated Scoping Report will be uploaded onto SAMRAD for DMRE decision-making purposes.

9.3 SUMMARY OF ISSUES RAISED BY I&APS

A summary of the issues and concerns raised by I&APs, regulatory authorities and commenting authorities to date as part of the public participation process are tabulated below.

TABLE 9-5: SUMMARY OF ISSUES RAISED BY I&APS AND COMMENTING AUTHORITIES

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
Commenting authority				
SAHRA				
Natasha Higgit	27 March 2020 – Interim comments (Case ID: 14985)	As the proposed development is undergoing an EA Application process in terms of the NEMA, as amended, it is incumbent on the developer to ensure that a HIA is done as per section 38(3) and 38(8) of the NHRA as required by section 24(4)b(iii) of NEMA. This must include an archaeological component, palaeontological component and any other applicable heritage components. The HIA must be conducted as part of the EA Application in terms of NEMA, as amended and the NEMA EIA Regulations. SAHRA requests that an assessment of the impacts to heritage resources that complies with section 38(3) of the NHRA as required by section 38(8) of the NHRA and section 24(4)b(iii) of NEMA be conducted as part of the EA process. The assessment must include an assessment of the impact to archaeological and palaeontological resources. The assessment of archaeological resources must be conducted by a qualified archaeologist and the report comply with the SAHRA 2007 Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment	Heritage/cultural and Palaeontological Studies will be compiled for the project. The proposed plan of study is outlined in Section 10.	Section 9.4.2.1

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		Reports (see www.asapa.co.za or www.aphp.org.za for a list of qualified archaeologists). Should the appointed specialist deem it necessary, a Letter of Exemption for Further Studies may be submitted. The proposed development is located within an area of moderate Palaeontological Sensitivity as per the SAHRIS Palaeo Sensitivity map. As such, a desktop Palaeontological Impact Assessment must be undertaken by a qualified palaeontologist. The report must comply with the 2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessments. Should the appointed specialist deem it necessary, a Letter of Exemption for Further Studies may be submitted (a list of qualified palaeontologists can be found at https://www.palaeosa.org/heritage-practitioners.html). Any other heritage resources as defined in section 3 of the NHRA that may be impacted, such as built structures over 60 years old, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict, and cultural landscapes or views capes must also be assessed.		

9.4 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITE

The baseline information is aimed at providing the reader with a perspective on the existing status of the biophysical, cultural and socio-economic environment. Baseline information for this Scoping Report draws extensively on information contained in reports from previous studies conducted at the MMT. Information has also been drawn from current specialist studies, where available. More detailed information will be provided in the EIA report, once the specialist studies commissioned for this project have been concluded. For the purpose of this section, project areas refer to both the MMT and Middelplaats decommissioned sites. The location of certain project components still needs to be finalised following more detailed investigations and design work. These include the stormwater management components and optimization of water recovery project components. More detail pertaining to the environmental attributes associated with these project components will be provided in the EIA report.

The NEMA EIA Regulations 2014, as amended (GNR 982) requires that the section below describes the baseline environment for all project related alternatives where applicable.

9.4.1 BASELINE BIOPHYSICAL ENVIRONMENT AFFECTED BY THE PROJECT

9.4.1.1 Geology

INTRODUCTION

The geology of an area provides information on the presence of mineral resources (and informs the mine plan), the geochemistry and related potential for contamination from mined material and the presence of geological structures (such as faults and dykes) that act as barriers or conduits (preferential flow paths) for groundwater flow. Geological processes also influence soils forms (Section 9.4.1.4, the type and nature of groundwater aquifers (0) and the potential for palaeontological resources (9.4.2.1).

DATA SOURCES

Geological information was sourced from the Geohydrological Report for MMT compiled by GHT Consulting (GHT) (GHT, 2018).

DESCRIPTION

Regional geology

The world's largest land-based sedimentary manganese deposit is contained in the KMF, situated 47 km north-west of Kuruman in the Northern Cape. The MMT is located on the southwestern outer rim of the KMF. The general stratification of the KMF is illustrated in Figure 9-2. The KMF comprises five erosional, or structurally preserved, relics of the manganese bearing Hotazel Formation of the Paleoproterozoic Transvaal Supergroup. These include the Mamatwan-Wessels deposit (also known as the main Kalahari Basin), the Avontuur and Leinster deposits, and the Hotazel and Langdon Annex/Devon deposits. The MMT is located in the Hotazel Formation (Transvaal Supergroup) towards the southern end of the Kalahari Basin. The Hotazel Formation typically consists of repeated thin layers of black iron oxides (magnetite or hematite) alternating with bands of iron-poor shales and cherts – known as the banded iron formations.

The Hotazel Formation is underlain by basaltic lava of the Ongeluk Formation (Transvaal Supergroup) and directly overlain by dolomite of the Mooidraai Formation (Transvaal Supergroup). The Transvaal Supergroup is overlain unconformably by the Olifantshoek Supergroup which consists of arenaceous sediments, typically interbedded shale, quartzite and lavas overlain by coarser quartzite and shale. The different formations present in the project area include the Mapedi and Lucknow units. The whole Supergroup has been deformed into a succession with an east-verging dip.

The Olifantshoek Supergroup is overlain by Dwyka Formation which forms the basal part of the Karoo Supergroup. At the MMT, this consists of tillite (diamictite) which is covered by sands, claystone and calcrete of the Kalahari Group.

Supergroup / Group / Subgroup / Formation				Geological Description
Kalahari Group				Kalahari sands, calcrete, clays & gravel beds
Kalahari unconformity				
Karoo Supergroup				Dwyka tillite
Dwyka unconformity				
Olifantshoek Supergroup			Lucknow Formation	White ortho-quartzite
			Mapedi Formation	Green, maroon and black shales and quartzites
Olifantshoek unconformity				
Transvaal Supergroup	Postmansburg Group	Voelwater Subgroup	Mooidraai Formation	Dolomite, Chert
			Hotazel Formation	Banded ironstone (upper)
				Upper Manganese Ore Body
				Banded Ironstone (middle)
				Middle Manganese Ore Body
				Banded Ironstone (middle)
				Lower Manganese Ore Body
				Banded Ironstone (lower)
		Ongeluk Formation		Andesitic Lava

FIGURE 9-2: GENERAL STRATIGRAPHIC COLUMN FOR THE KMF

Local geology

MMT mines manganese ore from the Hotazel Formation (within the Transvaal Supergroup). The formation was deposited between 2200 and 2300 million years ago, the formation is structurally confined within the Dimoten Syncline, a north-westerly plunging basin containing more than 80% of global land-based manganese reserves within an area of approximately 525 km^2. The Hotazel Formation includes a Banded Iron Formation (BIF). The ore is contained within a 30 to 40-metre-thick mineralised zone which occurs along the entire area and is made up of three manganese-rich zones:

- Upper Manganese Ore Body (UMO);
- Middle Manganese Ore Body (MMO); and
- Lower Manganese Ore Body (LMO).

The UMO is 10 cm to 15 cm thick and comprises moderate deposits of manganese. The poorly mineralised MMO is approximately 1 m thick and not economically efficient. The LMO is a highly mineralised unit consisting of six important mineralised zones (X, Y, Z, M. C and N).

According to GHT (GHT, 2018), the manganese ore dips in a south to south-westerly direction at approximately six degrees, and is lower in grade at MMT, characterized by laminated, carbonate bearing, braunite rich mudstone. Exposed ore is typically massive in character, with minor vertical fracturing and bedding parting observed. GHT further notes that inspection of drill core and drill cuttings suggests that many of these fractures are filled with carbonate minerals at depth (GHT, 2018). Analysis of a sample taken from the Mamatwan blast face and analysed in a study conducted in 2002/2003 indicates that the Hotazel Formation at the mine contains silica (as quartz), iron (Fe), manganese (Mn), and calcium (Ca), as well as calcareous minerals.

Structural features

GHT reports a sill on the UMK property adjacent to the MMT. The full extent of this sill is apparently unknown at this stage and would require further exploration drilling, however GHT notes that this sill is known to also sub-crop, presumably continuously and with relative constant thickness, on the MMT and Middelplaas mine properties (GHT, 2018).

9.4.1.2 Topography

INTRODUCTION

The presence of project infrastructure and mining activities has the potential to change the natural topography. A chance in topography has the potential to influence surface water flow, the location of soils, the visual character of a landscape and the safety of third parties and animals.

DATA SOURCES

Information in this section was sourced from topographical data, aerial imagery and site visits undertaken by the project team.

DESCRIPTION

In general, the area surrounding the project areas is relatively flat with a gentle slope towards the north-west. The elevation varies from 1 087 m to 1 107 m above mean sea level (mamsl). The majority of the natural topography within the project areas has been disturbed as a result of the existing mining infrastructure and activities. The mine pits and WRDs at the MMT have had the most influence on topography. While the decommissioned shaft at the Middelplaats Mine has had the most influence on topography.

The natural topography of the area surrounding the project area has been largely influenced by mining activities associated with the Tshipi Borwa Mine, the decommissioned Middelplaats Mine, the UMK Mine and the Adams Solar Farm. The highest topographical features surrounding the MMT are the WRDs at UMK and Tshipi Borwa Mine (refer to Figure 1-2).

9.4.1.3 Climatic conditions

INTRODUCTION

Climate can influence the potential for environmental impacts and related mine design. Specific issues include:

- Rainfall could influence erosion, evaporation, vegetation growth, rehabilitation planning, dust suppression and surface water management planning;
- Temperature could influence air dispersion through impacts on atmospheric stability and mixing layers, vegetation growth, and evaporation which could influence rehabilitation planning; and
- Wind could influence erosion, the dispersion of potential atmospheric pollutants and rehabilitation planning.

DATA SOURCES

Rainfall data, rainfall depths and evaporation data were sourced from the nearest weather station (Milner weather station located 7 km east from the MMT). Temperature and wind data were sourced from the Kuruman weather station, located 42 km from the MMT. Wind speed, wind direction and temperature are not recorded at the Milner weather station and as such the Kuruman weather station is the closest weather station to the MMT that provides this data.

DESCRIPTION

Regional climate

The project area falls within the Northern Steppe Climatic Zone, as defined by the South African Weather Bureau. This is a semi-arid region characterised by seasonal rainfall, hot temperatures in summer, and colder temperatures in winter.

Rainfall, evaporation and rainfall depths

Monthly rainfall and evaporation data for the Milner weather station is summarised in Table 9-6 below. Rainfall depth frequency data is summarised in the table below. The average rainfall at the Milner weather station is 372 mm per annum. Given that the Milner weather station is only 7 km from the MMT, similar rainfall levels can be expected at the mine. The average evaporation rates recorded at the Milner weather station are 2 351 mm per annum for S-Pan and 1 972 mm per annum for open water (see Table 9-6).

TABLE 9-6: SUMMARY OF AVERAGE MONTHLY AND ANNUAL RAINFALL AND EVAPORATION DATA

Month	Rainfall (mm) Milner (393083 W)	WR2005 S-Pan Evaporation	WR2005 Open Water Evaporation
January	59.8	276.9	232.6
February	63.0	209.9	184.8
March	72.3	193.3	170.1
April	39.9	144.1	126.8
May	19.2	114.7	99.8
June	9.1	91.0	77.3
July	1.3	106.0	88.0
August	5.4	153.8	124.5
September	6.4	213.0	172.5
October	19.2	269.7	218.4
November	31.5	248.0	232.9
December	44.5	294.6	244.5
Annual	**372.0**	**2351.0**	**1972.0**

TABLE 9-7: RAINFALL DEPTH FREQUENCY

Storm Duration (m/h/d)	Return Period (years)						
	2	5	10	20	50	100	200
15 m	15.0	21.3	25.7	30.2	36.3	41.2	46.2
30 m	19.8	28.1	34.0	40.0	48.0	54.4	61.1
45 m	23.3	33.1	40.1	47.1	56.6	64.1	71.9
1 hr	26.1	37.2	45.0	52.8	63.5	72.0	80.7
1.5 hr	30.8	43.8	53.0	62.2	74.8	84.7	95.1
2 hr	34.6	49.2	59.5	69.9	84.0	95.2	106.8

Storm Duration (m/h/d)	Return Period (years)						
	2	5	10	20	50	100	200
4 hr	40.0	56.9	68.8	80.7	97.0	110.0	123.4
6 hr	43.5	61.9	74.9	87.9	105.6	119.7	134.3
8 hr	46.2	65.7	79.5	93.3	112.1	127.1	142.6
10 hr	48.4	68.8	83.3	97.8	117.5	133.1	149.4
12 hr	50.3	71.5	86.5	101.5	122.0	138.3	155.2
16 hr	53.4	75.9	91.9	107.8	129.6	146.9	164.8
20 hr	55.9	79.6	96.2	113.0	135.8	153.9	172.6
24 hr	58.1	82.6	100.0	117.3	141.0	159.8	179.3
1 d	46.7	66.5	80.5	94.5	113.5	128.6	144.3
2 d	56.8	80.8	97.7	114.7	137.9	156.2	175.3
3 d	63.6	90.5	109.5	128.5	154.4	175.0	196.3
4 d	68.2	97.1	117.4	137.8	165.7	187.7	210.6
5 d	72.0	102.5	124.0	145.5	174.9	198.2	222.4
6 d	75.3	107.2	129.6	152.1	182.9	207.2	232.5
7 d	78.2	111.3	134.6	158.0	189.9	215.1	241.4

Temperature

The area experiences hot temperatures during summer, with the highest record of 42.6°C during the month of January. Winter temperatures are relatively low especially in the months of June to August. Daily maximum temperatures range between 43°C in January to 25°C in June, with daily minimum temperatures between -4.2°C in August to 10°C in January. Table 9-8 below provides the minimum, average and maximum temperature obtained from the Kumaran South African Weather Station for the period 2015 to 2017.

TABLE 9-8: MINIMUM, AVERAGE AND MAXIMUM TEMPERATURES

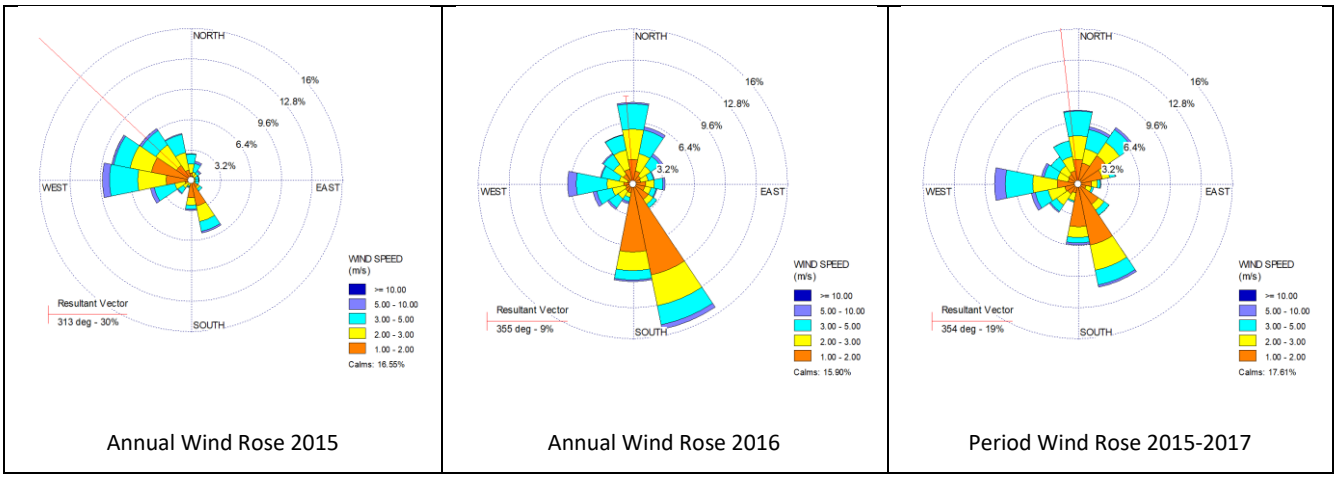
	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Min	10.1	10	6.4	3.3	2	-3.2	-3.9	-4.2	2.2	2.7	4.3	9.6
Ave	25.1	24.3	22.2	17.9	14.0	10.7	10.8	13.8	18.5	21.7	23.5	26.4
Max	42.6	38.8	35.6	35.3	28.8	25.3	27.1	31.3	34.7	38.5	39.5	39.9

Wind

The annual average wind roses for the Kuruman Weather Station (located approximately 43 km to the west of MMT) for the years 2015, 2016 and 2017 are shown in Figure 9-3 with the period average wind field (2015-2017) and diurnal variability in the wind field provided in Figure 9-4. The predominant wind direction is from the south-south-east and south with most of strong winds from the west. Frequent winds also occur from the north. Over the three-year period (2015 – 2017), the frequency of occurrence of south-south-easterly wind was between 12% and 17%, with winds with a westerly component occurring approximately 15% of the time. Winds occur less frequently from the easterly sector. During the day winds are more frequent from the westerly and the northerly sectors, with the strongest winds directly from the west. The wind shifts during the night-time to

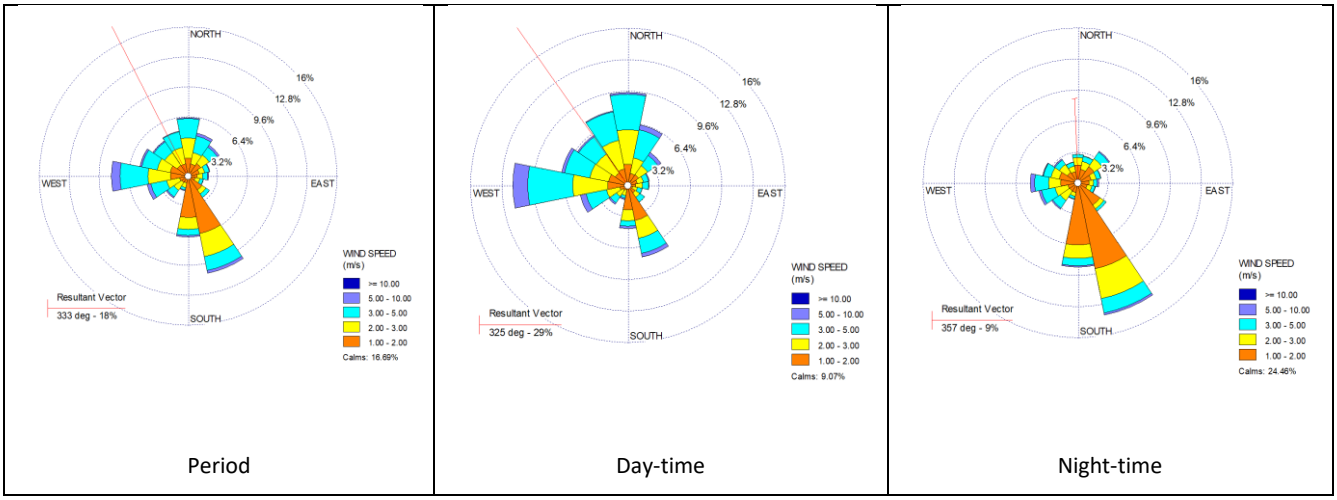
dominantly south-south-easterly and southerly winds. Day-time calms occurred for 9% of the time, with night-time calms for 24% of the time.

According to the Beaufort wind force scale, wind speeds between 6-8 m/s equates to a moderate breeze, with wind speeds between 14-17 m/s near gale force winds. Based on the three years of SAWS data (2015-2017), wind speeds exceeding 6 m/s occurred for only 1% of the time, with a maximum wind speed of 10 m/s. The average wind speed over the three years was 2.06 m/s. Calm conditions (wind speeds < 1 m/s) occurred for 17% of the time. The United States Environmental Protection Agency (US EPA) indicates a friction velocity of 5.4 m/s to initiate erosion from a coal storage piles (US EPA, 2006). Thus, the likelihood exists for wind erosion to occur from open and exposed surfaces, with loose fine material, when the wind speed exceeds at least 5.4 m/s. Wind speeds exceeding 5.4 m/s occurred only for 2% over the three years (2015 -2017).



Annual Wind Rose 2015 | Annual Wind Rose 2016 | Period Wind Rose 2015-2017

FIGURE 9-3: PERIOD AND ANNUAL WIND ROSES (AIRSHED, 2020A)



Period | Day-time | Night-time

FIGURE 9-4: PERIOD, DAY-TIME AND NIGH-TIME WIND ROSES (AIRSHED, 2020A)

Atmospheric Stability

During the daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth's surface and the predominance of an unstable layer. During unstable conditions, ground level pollution is readily dispersed thereby reducing ground level concentrations. Night-times are characterised by weak vertical mixing and the predominance of a stable layer. These conditions are normally associated with low

wind speeds and less dilution potential. During windy and/or cloudy conditions, the atmosphere is normally neutral (which causes sound scattering in the presence of mechanical turbulence).

For low level releases, such as activities associated with mining operations, the highest ground level concentrations would occur during weak wind speeds and stable (night-time) atmospheric conditions. However, windblown dust is likely to occur under high winds (neutral conditions).

9.4.1.4 Soils and land capability

INTRODUCTION

Soils are a significant component of most ecosystems. As an ecological driver, soil is the medium in which most vegetation grows and a range of vertebrates and invertebrates exist. In the context of mining operations, soil is even more significant as mining is a temporary land use where after rehabilitation, soil availability is the key factor to the establishment of post closure land capability and use.

Mining activities and infrastructure have the potential to damage soil resources through physical loss of soil and/or the contamination of soils, thereby impacting on the soils' ability to sustain natural vegetation and altering land capability. Contamination of soils may in turn contribute to the contamination of surface and groundwater resources. Loss of the topsoil resource reduces chances of successful rehabilitation and restoration.

DATA SOURCES

A field survey was conducted in order to identify the soil forms associated with the project areas which were classified into soil forms according to the Soil Classification Working Group for South Africa (2018). The land capability of the project area was classified in terms of the Land Capability Classification (Smith, 2006).

DESCRIPTION

Soil forms

The soil forms associated with the project areas include a combination of Cullinan, Ermelo, Hutton and Witbank. These soil forms are characterised as follows:

- **The Cullinan soil form:** This soil form is often characterised by little or no soil material present.
- **The Ermelo soil form:** This soil form is an oxidic soil and is characterised by a thick Orthic/ Yellow-Brown Apedal horizon and has strong pigmenting effects of iron (Fe) in the form of hematite. These soils are generally freely drained and well aerated. These attributes (i.e. good drainage and well aeration) make these soils ideal for tillage.
- **The Hutton soil form**: This soil form is an oxidic soil and is characterized by a thick Orthic/Red Apedal horizon and has strong pigmenting effects of iron (Fe) in the form of hematite and goethite. These soils are generally considered freely drained and well aerated. These attributes make these soils ideal for tillage.
- **The Witbank soil form:** This soil form is characterised as soil that has been physically altered and extensively disturbed by human intervention such that no recognizable diagnostic soil morphological characteristics could be identified.

The spatial distribution of the identified soil forms within the project areas is illustrated in Figure 9-5. The proposed water pipeline routes from Middelplaats to the MMT are associated with a combination of the Witbank and Hutton soil forms. The water pipeline alternative Route 1 is predominantly associated with the soil form Witbank as this route follows an existing road servitude and existing pipeline route. Adams pit is associated with the Cullinan soil form given that this area is an open excavated pit with no soil material present. The top-cut stockpile area is associated with the Ermelo soil form as this area has not been influenced by existing mining

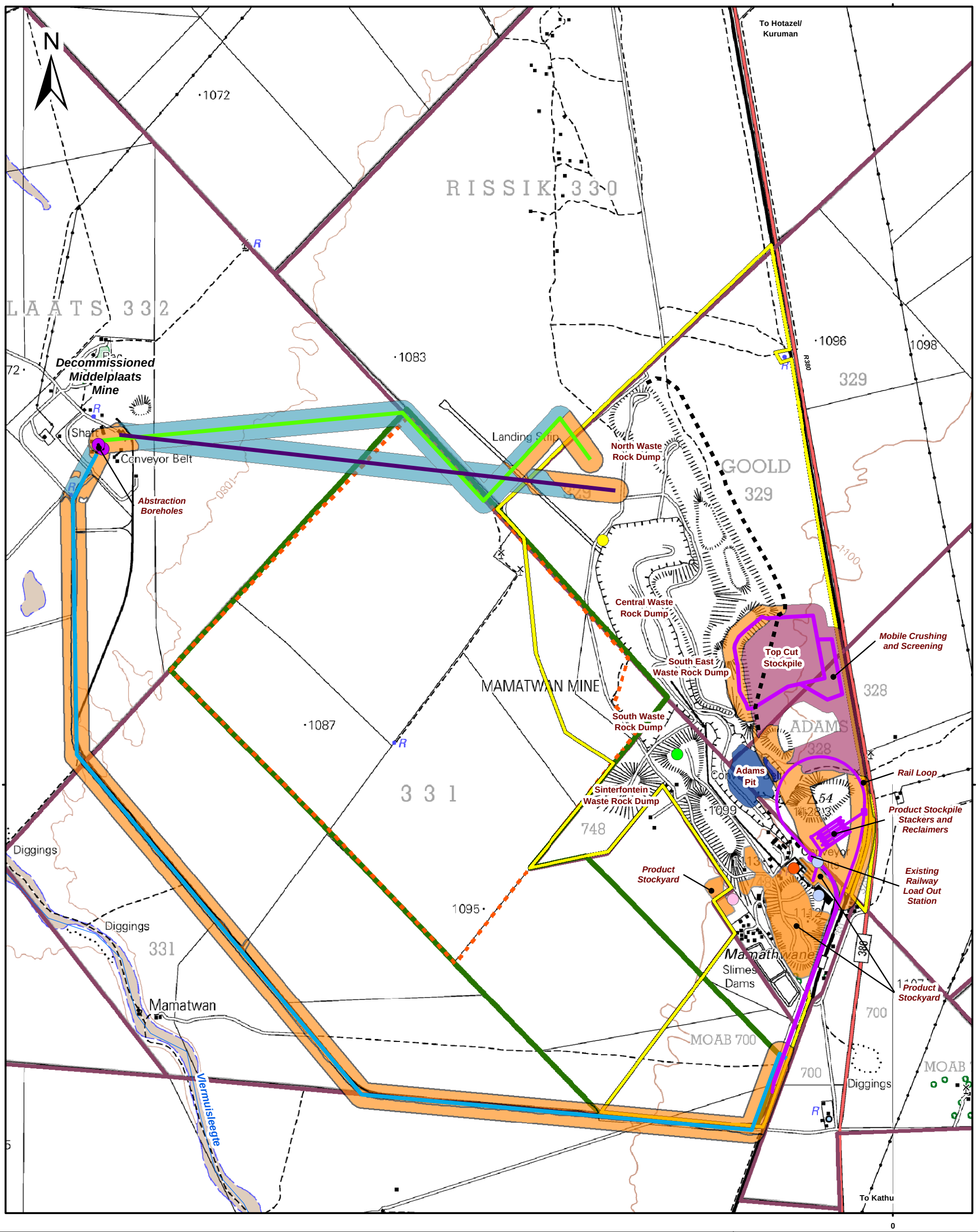
activities at the MMT. All remaining project components are associated with the Witbank soil forms as these areas have been disturbed by the current MMT activities.

Land Capability and Land Potential

The land capabilities associated with the project area include a combination of arable and wilderness potential. See Figure 9-6 for an illustration of the various land capabilities for each of the project components.

The Ermelo and Hutton soil forms are generally considered to be a moderate potential agricultural soil with arable capability. While these soils have agricultural potential, the local climatic constraints largely limit the realisation of agricultural productivity. This is demonstrated by the surrounding areas, where no cultivated commercial agricultural activities are undertaken. This area is deemed best suited for grazing purposes.

The Witbank and Cullinan are characterised as having a wilderness capability (that which represents the natural surrounding environment) and therefore have a very low land potential, attributed to historic and ongoing mining activities. In addition, some of these soils have been subjected to long term compaction, erosion and chemical soil composition alteration. This land capability and land potential class also includes areas where the original soil has been buried and/or extensively modified by anthropogenic activities. These soils are therefore not considered to make a significant contribution to agricultural productivity even on a local scale.



Legend

- Mamatwan Mining Right Area
- Proposed Layout Changes
- Proposed Dewatering Boreholes
- Expansion of Existing Road
- Catchment Tanks and Overflow Tanks
- JoJo Process Water Tanks
- JoJo Potable Water Tanks
- Aqua Tanks
- Potable Water Tank and Process Water Tank
- Farm Boundaries
- Tshipi Surface Use Area
- Tshipi Mining Right Area

Soil forms

- Cullinan
- Ermelo
- Hutton
- Witbank

Alternatives

- Alternative Pipeline Route 1
- Alternative Pipeline Route 2
- Alternative Pipeline Route 3

0 300 600 Meters

Scale: 1:30 000 @ A3
Projection: Transverse Mercator
Datum: WGS1984, Lo23

Mamatwan Mine

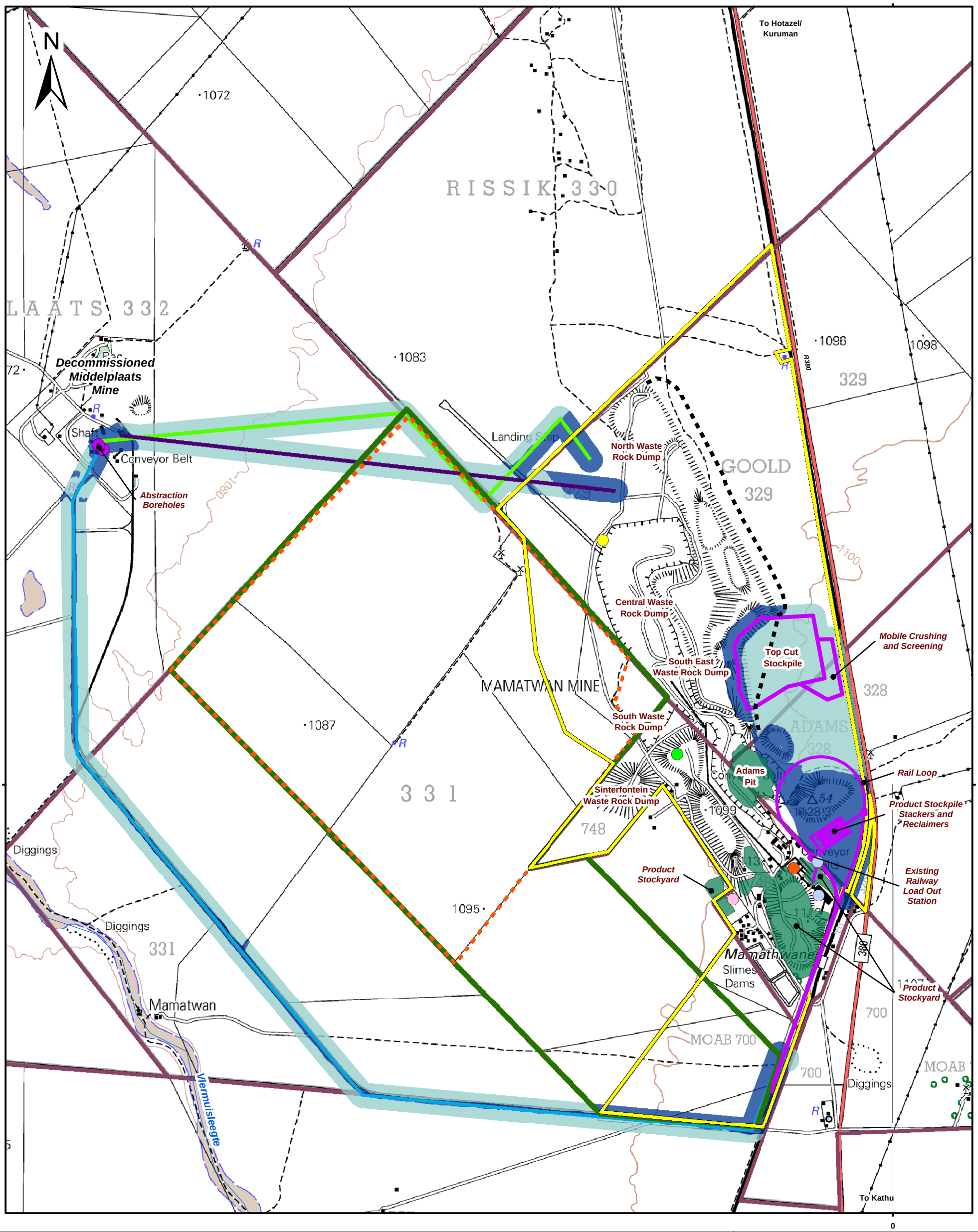
Figure 9-5

Soil Forms At The MMT

SLR

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

710.20008.00072 | 2021/03/11



Legend

- Mamatwan Mining Right Area
- Layout Changes Already Taken Place
- Proposed Layout Changes
- Proposed Dewatering Boreholes
- Expansion of Existing Road
- Catchment Tanks and Overflow Tanks
- JoJo Process Water Tanks
- JoJo Potable Water Tanks
- Aqua Tanks
- Potable Water Tank and Process Water Tank

- Farm Boundaries
- Tshipi Surface Use Area
- Tshipi Mining Right Area

Land Capability

- Arable (Class I)
- Wilderness / Wildlife (Class VIII)

Legend

- Alternative Pipeline Route 1
- Alternative Pipeline Route 2
- Alternative Pipeline Route 3

0 300 600 Meters

Scale: 1:30 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 9-6

Land Capability At The MMT

SLR

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

710.20008.00072 | 2021/03/11

9.4.1.5 Biodiversity

INTRODUCTION

In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. The known value of biodiversity and ecosystems relate to soil formation and fertility maintenance; primary production through photosynthesis; provision of food and fuel; provision of shelter and building materials; regulation of water flows and water quality; regulation and purification of atmospheric gases; moderation of climate and weather; control of pests and diseases; and maintenance of genetic resources.

As a baseline, this section provides an outline of vegetation types occurring on site and the status of the vegetation, highlights the occurrence of sensitive ecological environments including sensitive/endangered species (if present) that require protection and/or additional management actions should they be disturbed.

DATA SOURCE

Desktop vegetation type information and the associated conservational status were extracted from the South African National Vegetation Map. Information on plant and animal species recorded for the Quarter Degree Squares (QDS), was extracted from the SABIF/SIBIS database hosted by SANBI. Numerous national and provincial databases were utilised to determine the conservational sensitivity of the project areas. These databases included: The National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM: BA) list of threatened ecosystems (2011):

- Important catchments and protected expansion areas in terms of the NPAES;
- The South Africa Conservation Areas Database (SACAD, 2017);
- The South Africa Protected Area Database (SAPAD, 2017);
- The Mining and Biodiversity Guidelines (2013);
- The Northern Cape critical biodiversity areas (CBAs) (2016); and
- IBAs (2015).

DESCRIPTION

Terrestrial characteristics

The terrestrial characteristics of the project area, derived from desktop information, is summarised in Table 9-9 below. The table also provides information on the sensitivity of the project areas in accordance with existing national and provincial databases. It is important to note, that although all data sources used provide useful and often verifiable, high quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics. This information is however considered to be useful as background information.

The project areas do not fall within any protected or priority areas and the Kathu Bushveld vegetation is considered a Least Threatened Vegetation type, per the National Biodiversity Assessment (2018). The project areas do however fall within the Griqualand West Centre of Endemism. A centre of plant endemism is an area with high concentrations of plant species with very restricted distributions, known as endemics. Centres of endemism are important because it is these areas, which if conserved, would safeguard the greatest number of plant species. The Griqualand West Centre of Endemism is considered a priority in the Northern Cape, as the number of threats to the area is increasing rapidly and it is poorly understood. Furthermore, this centre of endemism is extremely poorly conserved, and is a national conservation priority.

TABLE 9-9: CONSERVATION CHARACTERISTICS OF THE MMT

<table>
<tr><th colspan="2">Details in terms of Mucina and Rutherford (2006)</th><th colspan="2">Description of the vegetation type(s) (Mucina and Rutherford 2006)</th></tr>
<tr><td rowspan="2">Biome</td><td rowspan="2">The project activities are located within the Savanna Biome.</td><td>Vegetation Type</td><td>Kathu Bushveld</td></tr>
<tr><td>Climate</td><td>Summer and autumn rainfall, very dry winters</td></tr>
<tr><td rowspan="2">Bioregion</td><td rowspan="2">The project activities are situated within the Eastern Kalahari Bushveld Bioregion.</td><td>Distribution</td><td>Northern Cape Province</td></tr>
<tr><td>Conservation</td><td>Least threatened. Target 16%. Not conserved in statutory parks</td></tr>
<tr><td>Vegetation Type</td><td>The project activities fall within the Kathu Bushveld vegetation type.</td><td rowspan="3">Vegetation and landscape features</td><td rowspan="3">Medium-tall tree layer with Acacia erioloba in places, but mostly open and including Boscia albitrunca as the prominent trees. Shrub layer generally most important with, for example, A. mellifera, Diospyros lycioides and Lycium hirsutum. Grass layer is variable in cover.

Biogeographically Important Taxa (Kalahari endemics)
<u>Small Tree</u>: Vachellia luederitzii var. luederitzii. <u>Graminoids</u>: Anthephora argentea, Megaloprotachne albescens, Panicum kalaharense. <u>Herb</u>: Neuradopsis bechuanensis.</td></tr>
<tr><td colspan="2">Conservation details pertaining to the study area (Various databases)</td></tr>
<tr><td>National Biodiversity Assessment (2011)</td><td>Ecosystem types are categorised as “not protected”, “poorly protected”, “moderately protected” and “well protected” based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act, 2003 (Act 57 of 2003), and compared with the biodiversity target for that ecosystem type. The project activities are located within an area that is currently not protected.</td></tr>
<tr><td>National Threatened Ecosystems (2011)</td><td>The project activities are not located in an ecosystem that is listed as threatened.</td><td colspan="2">Northern Cape Critical Biodiversity Areas (2016)</td></tr>
<tr><td>NPAES (2009), SACAD (2017) and SAPAD (2017)</td><td>According to the NPAES database, the SAPAD, 2019 and the SACAD, the project activities do not fall within a protected or conservation area or nature reserve, nor is it situated within 10km of a formal protected area.</td><td colspan="2" rowspan="2">The Northern Cape CBA Map identifies biodiversity priority areas, called CBAs and Ecological Support Areas, which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole. According to the Northern Cape CBA database, the project activities fall outside of any CBAs. The immediate surrounding area includes natural areas with an Ecological Support Area situated within 5 km to the north-east and the south-west of the project activities.</td></tr>
<tr><td>IBA (2015)</td><td>The project activities do not fall within an Important Bird and Biodiversity Area (IBA, 2015), nor is located within 10 km of an IBA.</td></tr>
<tr><td colspan="2">In terms of the Mining and Biodiversity Guidelines (2013) the project activities do not fall into any biodiversity priority areas and is therefore not deemed a risk for mining.</td><td colspan="2">The project activities are situated within the Griqualand West Centre of Endemism.</td></tr>
</table>

Terrestrial habitat units associated with the project areas

A summary of the habitat units associated with the project areas is tabulated below and is illustrated in Figure 9-7.

TABLE 9-10: HABITAT UNITS WITHIN THE PROJECT AREAS

Habitat Unit	Relevant project areas	Description of vegetation community and sensitivity
Kathu Bushveld Habitat Unit	*Senegalia mellifera - Vachellia haematoxylon – Grewia flava Kathu Bushveld* Largely associated with the top-cut stockpile, crushing and screening plant, and all of the proposed pipeline alternatives.	The Kathu Bushveld habitat unit is considered an open savanna and has well-developed tree/shrub layer with dominant trees such as *Senegalia (Acacia) mellifera*, scattered Terminalia sericea and *Acacia haematoxylon.* The shrub layer is developed and is dominated by species such as *Senegalia mellifera, Tarchonanthus camphoratus, Grewia flava*, and A. hebeclada. The grass layer is variable in cover, with bare soil patches notable throughout the habitat unit. In some areas denser bush clumps occur either consisting of the Protected Tree *Acacia (Vachellia) erioloba* or dense stands of Acacia mellifera. The Kathu Bushveld Habitat Unit is sub-divided into the *Senegalia mellifera - Vachellia haematoxylon – Grewia* flava Kathu Bushveld vegetation community and the *Senegalia mellifera – Stipagrostis Open* Kathu Bushveld vegetation community. See Figure 9-7 for the distribution of the vegetation communities within the project areas.
	Senegalia mellifera – Stipagrostis Open Kathu Bushveld Largely associated with the railway loop.	
Transformed Habitat Unit	Largely associated with Adams pit, the expansion of an existing road and the existing product stockyard, stormwater management infrastructure, the existing loadout station, potable and process water storage facilities.	The Transformed Habitat Unit refers to areas that have been transformed as a result of historic and ongoing mining activities and infrastructure. These areas contain very little to no vegetation and where present it consists mainly of alien invasive species.
Degraded Bushveld Habitat Unit	Largely associated with the existing WRDs.	The Degraded Bushveld Habitat Unit refers to areas that have been partially or largely transformed. The Degraded Bushveld was severely altered from the reference Kathu Bushveld as a result of mining activities and infrastructure. Also included are all mining areas associated with vegetated areas, such as the rehabilitated historic mine dumps, as well as the outer slopes of currently utilised dumps, where vegetation has managed to re-establish. These areas contain very little natural vegetation and consist mainly of alien invasive species.

Alien and invasive floral species

Alien and invasive floral species are floral species of exotic origin which are invading previously pristine areas or ecological niches. Disturbances of the ground through trampling, excavations or landscaping often leads to the dominance of exotic species that rapidly dominate the area. Under natural conditions, these exotic species are overtaken by sub-climax and climax species through natural veld succession. This process, however, takes many years to occur, with the natural vegetation never reaching the balanced, pristine species composition prior to the disturbance. Alien vegetation invasion causes degradation of the ecological integrity of an area, causing a decline in species diversity, local extinction of indigenous species and ecological imbalance.

Alien invasive species were mainly recorded in the Transformed Habitat Unit. SeeTable 9-11 for a list of AIS associated with the Transformed Habitat Unit in terms of the NEM: BA List of Alien and Invasive Species (2016). Limited AIS are associated with the *Acacia* Thornveld Habitat Unit.

TABLE 9-11: ALIEN AND INVASIVE SPECIES IN THE PROJECT AREA

Scientific name	Common name	Category*
Trees/ shrubs		
Nicotiana glauca	Wild tobacco	NEMBA: Category 1b
Prosopis glandulosa var. glandulosa	Honey mesquite	NEMBA: Category 3 in Northern Cape.
Forbs		
Argemone ochroleuca subsp. ochroleuca	White-flowered Mexican poppy	NEMBA: Category 1b
Graminoid		
Pennisetum setaceum	Fountain grass	NEMBA: Category 1b

Category 1b – Invasive species that require control by means of an invasive species management programme.

Category 3 – Ornamentally used plants that may no longer be planted; existing plants may remain, except within the flood line of watercourses and wetlands, as long as all reasonable steps are taken to prevent their spread.

Floral Species of Conservational Concern

A number of protected floral species were observed, particularly in the Kathu Bushveld Habitat and include the National Forest Act, (Act 84 of 1998) (NFA) (amended in September 2011) protected trees *Vachellia erioloba* and *Vachellia haematoxylon*. Also observed were a number of Northern Cape Nature Conservation Act (Act 9 of 2009) (NCNCA) protected species, namely *Boophone disticha, Harpagophytum procumbens*, and *Tridentea sp. H. procumbens* is also considered a protected species in terms of NEM: BA Threatened or Protected Species (TOPS). It was observed that individuals of the V. *erioloba* and *V. haematoxylon*, as well as a single individual of the *B. disticha* were observed in the degraded Bushveld habitat unit.

In terms of the NCNCA, Schedule 2 protected species may not be picked, imported, exported, transported, cultivated or traded without a permit. It follows that the removal of any protected species in terms of the NCNCA requires a permit from the DENC. In terms of the NFA, protected tree species may not be cut, disturbed, damaged or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the DEFF.

Faunal habitat and Species

Mammals

The project activities are unlikely to have a significant impact of mammal habitat or diversity since these areas are located directly adjacent to existing mining areas and these areas were noted to be predominantly occupied by commonly occurring species which do not have restricted ranges or habitat requirement. Furthermore, constant disturbances from current mining have likely ensured that any SCC refrain from entering the study area, remaining in the surrounding more suitable habitat available around the active mining areas.

Birds

The avifaunal habitat sensitivity for the project area is considered to be intermediate. Although a large contingent of SCC are considered likely to utilise areas at the project areas for foraging, only one SCC was deemed to

potentially utilise the site for breeding: the African Rock Pipit – utilising the available rocky and grassy hillslopes created by the mining activities. The large contingent of raptors, (all known to have wide ranging) are considered unlikely to breed within the study area due to the lack of tall trees which would be required to build their nests.

Herpetofauna

The Kalahari Tree Skinks and Common Barking Geckos have been recorded at the MMT (NSS, October 2018). Additional reptile species known to occur in the project areas include the Spotted Bush Snake, Cape Cobra, Cape Gecko, Yellow-throated Plated Lizard, Bushveld Lizard, Spotted Sand Lizard, Mole Snake and Puff Adder. Suitable habitat for Common Flap-neck Chameleon and African Rock Python was observed and these species could occur within the study area.

Amphibians

No amphibians were observed within the study area during the field assessment. Moreover, no pans or ephemeral streams transverse the study area making it unlikely that locations of standing or running surface water necessary for most amphibian species survival and breeding occur on the site. The amphibian habitat sensitivity within the study area is considered moderately low. The freshwater habitats which suit the amphibian lifestyle are absent from the study area and the habitat that is available is completely artificial and formed/created from mining processes.

Terrestrial macro invertebrates

Butterfly species that have been recorded at the project areas (NSS, October 2018) included the Wandering Donkey Acraea, African Monarch, Painted Lady, Pea Blue, Broad-bordered Grass Yellow, African Migrant and Common Sandman. None of these butterfly species has a threatened or protected status.

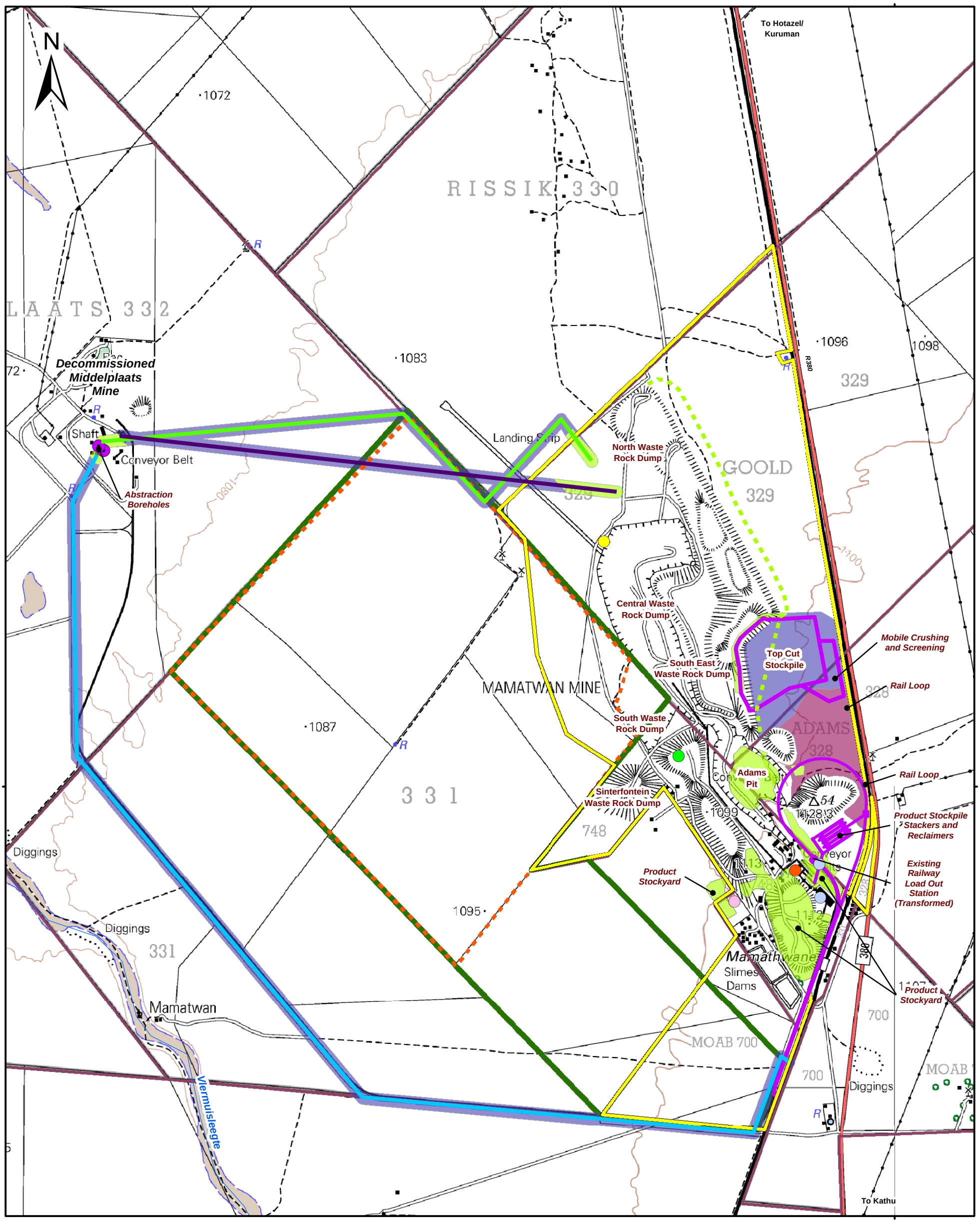
The exoskeleton of the *Uroplectes carinatus* scorpion was recorded at the MMT. The highly venomous *Parabuthus raudus*, and *Opistophthalmus carinatus*, are highly likely to also occur in the project areas. Other potentially occurring scorpion species include *Parabuthus granulatus*, *Opistophthalmus wahlbergii* and *Parabuthus mossambicensis*. All Opistophthalmus and Opistacanthus scorpion species are Protected Species in the Northern Cape.Remaining patches of natural vegetation at the MMT are dotted with the tangled bulbous nests of Community Nest Spiders (*Stegodyphus sp*.) and Banded Garden Spiders (*Argiope australis*).

The insect habitat sensitivity is considered moderately low to intermediate. The floral characteristics of the surrounding habitat types do not support a wide diversity of insect species yet offer suitable habitat for an abundant number of insects.

Faunal Species of Conservational Concern

Only one SCC listed, *Orycteropus afer* (Aardvark), was observed within the study area and its immediate surroundings. The Kathu Bushveld habitat unit is expected to support a number of faunal SCC. The following faunal SCC are considered to have a POC of 60% or higher and may occur within the study area, namely *Atelerix frontalis* (Southern African Hedgehog), *Felis nigripes* (Black-footed Cat), *Otocyon megalotis* (Bat-eared Fox), *Vulpes chama* (Cape Fox), *Mellivora capensis* (Honey Badger), Aquila verreauxii (Verreaux's eagle), *Anthus crenatus* (African Rock Pipit), *Ardeotis kori* (Kori Bustard) and *Sagittarius serpentarius* (Secretary bird. Three burrowing Scorpions (*Opistophthalmus ater* (CR), *Opistophthalmus carinatus* (NYBA) and *Opistophthalmus wahlbergii* (NYBA)) all have suitable habitat located within the study area and have distributions which overlap the study area. Suitable habitat for *Chamaeleo dilepis* (Common flap-neck chameleon) and *Python sebae* (African rock python) was observed and these species could occur within the study area.

Due to the highly degraded nature of the Transformed Habitat Unit resulting from mining activities, sufficient suitable habitat is not available to support faunal SCC.



Legend

- Mamatwan Mining Right Area
- Proposed Layout Changes
- Proposed Dewatering Boreholes
- Expansion of Existing Road (Transformed)
- Catchment Tanks and Overflow Tanks
- JoJo Process Water Tanks (Transformed)
- JoJo Potable Water Tanks (Transformed)
- Potable Water Tank and Process Water Tank (Transformed)
- Aqua Tanks
- Farm Boundaries
- Tshipi Surface Use
- Tshipi Mining Right

Vegetation Communities

- Senegalia melliefera - Stipagrostis Open Kathu Bushveld
- Senegalia mellifera - Vachellia haematoxylon - Grewia flava Bushveld
- Transformed

Alternatives

- Alternative Pipeline Route 1
- Alternative Pipeline Route 2
- Alternative Pipeline Route 3

0 300 600 Meters

Scale: 1:30 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 9-7

Habitat Units

SLR

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

710.20008.00072 | 2021/03/11

9.4.1.6 Surface water

INTRODUCTION

Surface water resources include drainage patterns and paths of preferential flow of stormwater runoff. Water quality and quantity are key indicators of the resource value and status and can have significant effect on downstream hydrology, aquatic ecology and suitability for use. Mine related activities have the potential to influence the natural drainage of surface water through the collection of run-off from stormwater management infrastructure and collection in the partially open pit. The project also has the potential to result in the contamination of the surface water resources through seepage and/or runoff from WRDs and operational areas.

DATA SOURCES

Information pertaining to catchments, mean annual runoff and water management areas was sourced from the Water Resources of South Africa Manual WR2012 (WR 2012). Information regarding the relevant rivers surrounding the mine was sourced from the review of topographical data and on-site observations.

DESCRIPTION

Regional Hydrology

The project areas are located within the Lower Vaal Water Management Area. The major rivers associated with this water management area include the Molopo River, Harts River and the Vaal River, which ultimately drain into the Orange River. The project areas fall within the quaternary catchment D41K which has a gross total catchment area of 4 216 km^2, with a net mean annual runoff (MAR) of 6.53 million cubic meters. The entire Moloto catchment, which includes D41K, is classified as endoreic (i.e. catchments with large areas which do not contribute to runoff). The major river within quaternary catchment D41K is the Gamogara drainage channel, which is located approximately 8 km north-west of MMT (see Figure 9-8). The Gamogara drainage channel forms a tributary of the Kuruman River. The Kuruman River flows west joining the Molopo River approximately 250 km from the confluence of the Ga-Mogara drainage channel and Kuruman River. The Molopo River drains in a southerly direction eventually joining the Orange River.

Local hydrology

The nearest watercourses to the MMT are the ephemeral Vlermuisleegte River (located approximately 3 km west of MMT) and the ephemeral Witleegte River (located approximately 4 km northeast of MMT). The nearest watercourse to the decommissioned Middelplaats Mine is the Vlermuisleegte River (located approximately 1.5 km west of the project area. These flow rarely and only after periods of prolonged wet weather and during wetter than average years. Both the Vlermuisleegte and the Witleegte Rivers are tributaries of the Ga-Mogara River. Any natural runoff from the project areas will drain in a north and north west direction towards the Ga-Mogara River. The catchment characteristics of the Witleegte and the Vlermuisleegte Rivers are provided in Table 9-12 below.

No true watercourses as defined by the NWA were observed within the project areas (SAS, 2019). The robust vegetation response observed within the upgradient portion of Adams pit, is as a result of the mining activities taking place in the area. Prior to these activities no wetness signatures are observable in the satellite imagery. It is therefore evident that as a result of altered natural flow patterns linked to the activities within the investigation area, the wet response is artificial and is entirely driven by regular water inflow into the upgradient portion of the Adams pit.

TABLE 9-12: CATCHMENT CHARACTERISTICS

Catchment	Catchment area (km^2)	MAR (nett) (million m^3/annum)	Watercourse length (km)	Drainage density (km/km^2)
Witleegte catchment	661	0.73	70 350	106.4
Vlermuisleegte catchment	487	0.54	47 250	97

Surface water quality

No water sampling within the project area has been conducted because there are no permanent surface water features. Thus, no surface water quality data is available.

Surface water use

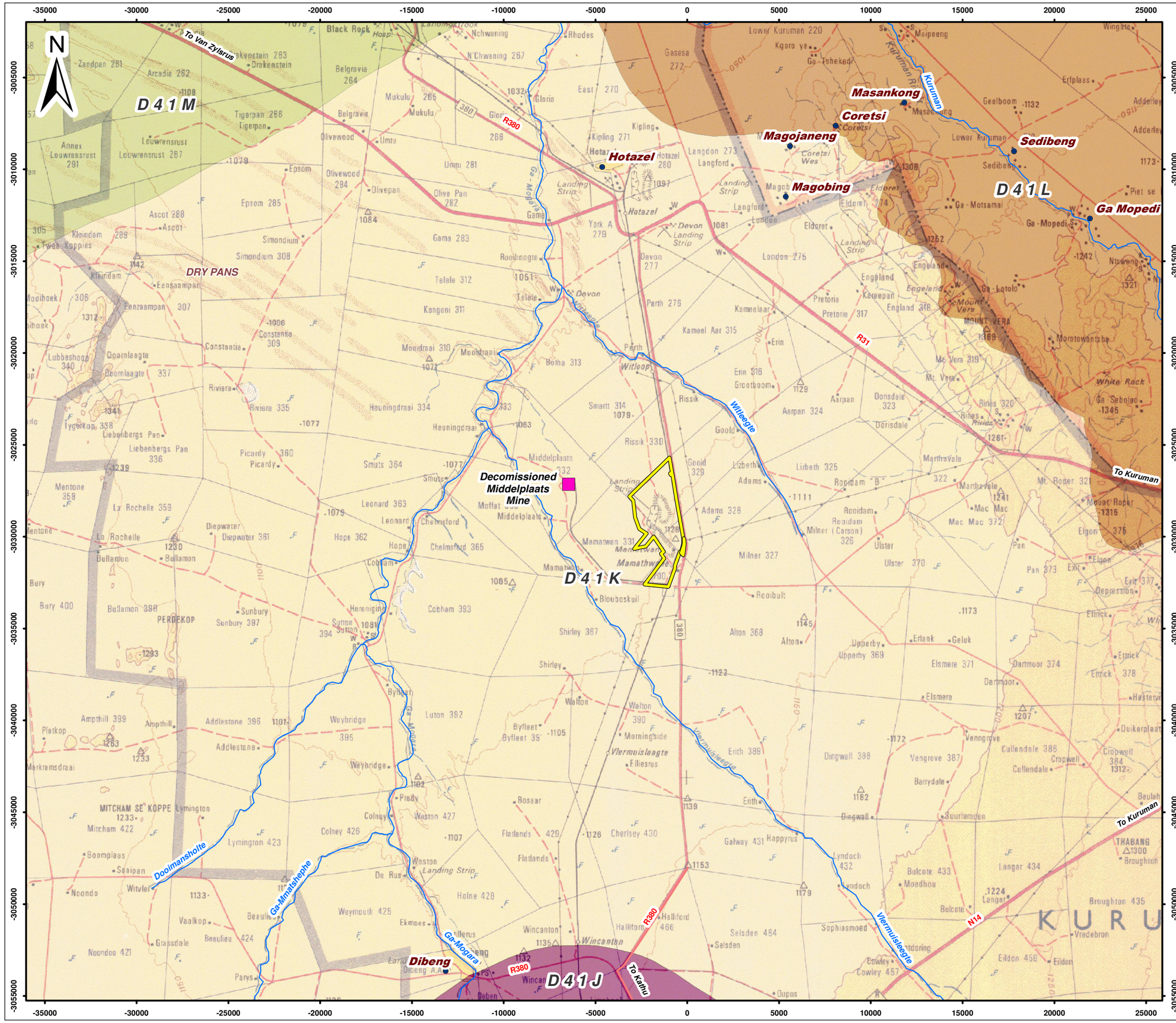
Due to the ephemeral nature of the Witleegte and Vlermuisleegte Rivers, there is no third-party reliance on surface water.

Floodlines

No floodlines were determined, as no watercourses are located within the project area.

Wetlands

No wetlands are located within the project area.



Legend

- Mamatwan Mining Right Area
- Main Roads
- Rivers

Quaternary Catchments

- D41J
- D41K
- D41L
- D41M

0 4 8 Kilometers

Scale: 1:200 000 @ A3

Projection:Transverse Mercator
Datum: Hartebeeshoek, Lo 23

Mamatwan Mine

Figure 9-8

Hydrological Features

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

720.19136.00001 | 2020/08/05

9.4.1.7 Groundwater

INTRODUCTION

Groundwater is defined as water which is located beneath the ground surface in soil/rock pore spaces and in the fractures of lithological formations and is a valuable resource. In arid areas groundwater is frequently the sole source of water and thus essential to agriculture and other development. Groundwater quality and quantity are key indicators of the resource value and status and can have significant effect on the suitability and availability for use. Mine related activities have the potential to influence the quality and availability of groundwater through seepage of contaminants that may reach underlying aquifers and through abstraction of water.

DATA SOURCES

Information pertaining to aquifer characteristics was sourced from the Aquifer Classification Map of South Africa. Groundwater quality data was sourced from the MMT's monitoring programme.

DESCRIPTION

Aquifer characterisation

Four aquifer units occur in the region, namely the Ongeluk, Hotazel, Mooidraai, and Kalahari Formations. These formations are described as follows (GHT, 2018):

- The Ongeluk Formation: older geological formation, the aquifer is primarily associated with weathered horizons and zones adjacent to regional scale structures, although the aquifer is generally not favoured as a potential water supply source because of its low yield characteristics.
- Hotazel Formation: typically have higher yields with the groundwater stored in voids that developed following bed separation, within faults and periphery fractures, and along the dolerite dykes that have partially filled regional faults. The high number of dykes and fractures interpreted for the site suggest vertical hydraulic connection throughout much of the formation above an intrusive sill, with horizontal interconnection provided along bedding planes. The formation is regarded as semi-confined on the Smartt-Rissik and Mamatwan prospects where it sub-crops at shallow depth. The higher aquifer yields are associated with the preferentially fractured, brittle BIF's adjacent to regional faults. With increasing depth, however, the Hotazel Formation aquifer can be confined, particularly when the overlying Kalahari Formation contains thick inter-beds of highly plastic red clay as observed along the southern edge of the MMT property.
- Mooidraai Formation: a dolomitic aquifer occurring in the southwest of the study area in the vicinity of the now-derelict Middelplaats Mine. This aquifer is of significance locally due to its high yielding characteristics (>10 L/s) and is currently exploited by MMT as an emergency supply source. It is noted that there is no evidence to suggest that these aquifers have been recharged in recent time.
- Kalahari Formation: On a regional scale the Kalahari Formation behaves as a semi-confined aquifer, which is hydraulically connected with aquifers in underlying formations at those sites where extensive red clay or clay-bearing Dwyka Formation beds are absent. While the aquifer is generally more porous than other site aquifers, characteristics of the aquifer vary from site to site. Yields vary significantly spatially. A paleochannel deposit has been identified to the north of the MMT pit, contain significant quantities of groundwater, however this aquifer contains high nitrate concentrations and therefore it cannot be classed as an important groundwater resource. Of significance, however, is that the inferred tributaries, which developed parallel to the contact between the older Ongeluk and Hotazel Formations, appear to have higher yields than the paleochannel itself.

With reference to the above list, aquifers underlying the MMT include the Hotazel and Kalahari formations. The Aquifer Classification Map of South Africa (DWS, 1999) indicates that the local aquifer associated with the project areas is classified as minor (poor). A minor aquifer is described as a moderately-yielding aquifer system of variable water quality.

Regional recharge

The project areas lie within a semi-arid climate and according to GHT has a relatively thick unsaturated zone (>25m deep on average) which is apparently not conducive to active recharge. GHT therefore calculated regional recharge to be between 1% and 4% of the average annual rainfall. Groundwater is estimated to be up to 25,000 years old in deeper, confined aquifers, although surficial unconfined/semi-confined aquifers have been recharged in recent time (GHT, 2018). The aquifers at the project areas are believed to be recharged directly from rainfall, through the relatively permeable Kalahari Formation.

Groundwater levels and flow

Results of the 2018 hydrocensus indicate that water levels ranged between 18 and 74 metres below ground level. GHT has determined the direction of groundwater flow to be towards the north-west at a gradient of about 1V: 200H (although this ignores the compartmentalizing effects of the intrusive structures).

Groundwater use

Results of the 2018 hydrocensus indicate that the majority of the groundwater in the broader region is used in the form of third-party boreholes. Use is primarily for livestock water, but also supplies potable water to local farms.

Groundwater quality at the project areas

The monitoring of groundwater at the MMT has been undertaken on a quarterly basis over several years. GHT has collated and reported on the groundwater quality data and compared the results to various guidelines and standards. Key conclusions drawn from the MMT water quality data include (GHT, 2020):

- Water quality at the monitoring points at MMT has elevated concentrations of Electrical Conductivity (EC), Calcium (Ca), Magnesium (Mg), Chloride (Cl), Sulphate (SO4) Nitrate (NO3-N), Manganese (Mn) and Boron (B). The water is unsuitable for lifetime human consumption in terms of SANS241:2015;
- The elevated nitrate concentration has been determined to be of a natural origin, and this was confirmed with two background hydrocensus sampling exercises of private properties around the MMT and further afield (GHT, 2018). This is thought to be the result of rainfall recharge to the Kalahari Formation mobilizing soil nitrates, particularly at sites that have been overgrazed or stripped of vegetation;
- Bacteriological sampling results of the groundwater underlying the sewage plant indicates that bacteriological contaminants (Total Plate Count and Total Coliform Count) from the MMT sewage plant are impacting on the site aquifer currently (GHT, 2018);
- Hydrocarbon testing found no hydrocarbon contamination to be present in the pit water or at the Barlows workshop (GHT, 2018); and
- The water quality results exceed the DWS WRQOs for the following parameters: EC, Sodium (Na), Ca, Mg, Cl, SO4, NO3-N and Total Alkalinity (GHT, 2018).

The water quality at the decommissioned Middelplaats Mine was monitored in November 2020 by GHT (GHT, 2020). The monitoring results indicated that the historical shaft, plant and discard piles at the decommissioned Middelplaats Mine are historical sources of pollution affecting groundwater quality. The inorganic water quality of Middelplaas Derelict Mine is classified as above the recommended standard limit or "ARS. "ARS" waters quality is described as water that is unsuitable for lifetime human consumption, SANS241:2015. The water quality is classified as "ARS" in general due to elevated concentrations of Electrical Conductivity (EC), Total dissolved Solids (TDS), Calcium (Ca), Magnesium (Mg), Chloride (Cl), Sulphate (SO4), Nitrate (NO3-N), Iron (Fe), Boron (B) and Manganese (Mn) as observed in the groundwater chemistry. The elevated nitrate concentration is of a natural origin as can be expected for most semi-arid regions. Hydrocensus data of the regional area (farms) surrounding the MMT and decommissioned Middelplaats Mine confirmed elevated concentrations of Nitrate (NO3-N) existing in background areas or farms. The recharge front through the Kalahari Formation mobilizes soil nitrates, especially in areas that have been over-grazed or stripped of vegetation. Mining however does contribute to higher concentration locally.

Background Groundwater Quality

The 2018 hydrocensus of third-party boreholes included boreholes located between one and 15 km from the project areas. When comparing these hydrocensus water quality results to the same standards and guidelines used to compare mine borehole quality, the following key conclusions can be made (GHT, 2018):

- 25 of the 42 boreholes sampled were unsuitable for life-time human consumption in terms of SANS241:2015 due to elevated concentrations of EC, Na, Cl, nitrite (NO_3-N) and NO_3-N, iron (Fe) and Mn; and
- The 2018 water quality results exceed the WQROs in 32 of the 41 boreholes sampled, for the following parameters: pH, Na, Calcium Ca, Mg, Cl, SO4, Fluoride (F), NO_3-N and T.Alk.

The 2002 and 2005 hydrocensus water quality data shows elevated concentrations of EC, Na, Cl, SO4, and NO_3-N which resulted in 48 out of 80 samples being unfit for lifetime human consumption in terms of SANS241:2015. GHT compared the background groundwater quality derived from the hydrocensus water quality sampling to that of the mine monitoring boreholes and found that EC, Na, Ca, SO_4 and NO_3-N concentrations were higher at the mine. With regards to NO_3-N concentrations, it should be noted that naturally occurring $N0_3$-N levels exceed the SANS241-1:2015 standard.

9.4.1.8 Air Quality

INTRODUCTION

Existing sources of emissions in the region and the characterisation of existing ambient pollution concentrations is fundamental to the assessment of cumulative air impacts. A change in ambient air quality can result in a range of impacts which in turn may cause a disturbance and/or health impacts to nearby receptors.

DATA SOURCES

Information in this section was sourced from a review of available literature. Dust fallout monitoring data and stack emissions monitoring data was sourced from the MMT's monthly monitoring programme.

DESCRIPTION

Ambient air quality within the region

The following regional sources of emissions were identified:

- Fugitive dust: Occur as a result of vehicle entrainment of dust from local paved and unpaved roads, wind erosion from open areas and dust generated by agricultural activities. Given that the agriculture in the area is primarily restricted to livestock and game farming, agriculture is not anticipated to contribute significantly to ambient dust rates. Vehicle entrainment from the various unpaved farm and public roads is anticipated to be a significant, but localised source of dust;
- Current mining operations in the area: Particulates represent the main pollutant of concern at mining operations, whether it is underground or opencast. The amount of dust emitted by these activities depends on the physical characteristics of the material, the way in which the material is handled and the weather conditions. Current mining operations in relatively close proximity to the mining area include Kalagadi, Tshipi, Black Rock, Gloria, Wessels, Sebilo, United Manganese of Kalahari (UMK) and Kudumane;
- Biomass burning: Biomass burning emissions include with carbon monoxide (CO), methane (CH_4) and nitrogen dioxide (NO_2) gases;
- Veld burning: Represent significant sources of combustion-related emissions in many areas of the country;
- Rail related emissions: Emissions from diesel generated locomotives include particulates, nitrogen oxides (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO) and various volatile organic compounds including polycyclic aromatic hydrocarbons;
- Household fuel combustion: It is likely that households within the district municipality utilise coal or wood for cooking and space heating (during winter) purposes. Emissions from domestic burning include PM_{10}, nitrogen dioxide (NO_2), carbon dioxide (CO_2), carbon monoxide (CO), polycyclic aromatic hydrocarbons, particulate benzo(a)pyrene and formaldehyde; and
- Vehicle tailpipe emissions: Significant primary pollutants include carbon dioxide (CO_2), carbon monoxide (CO), hydrocarbons (HCs), sulphur dioxide (SO^2), oxides of nitrogen (mainly NO_x), and particulates. Secondary pollutants include NO^2, photochemical oxidants (ozone), sulphur acid, sulphates and nitric acid.

Emission sources associated with the project areas

The activities associated with MMT that contribute to ambient air quality include:

- Open pit drilling and blasting activities, the excavation of ore and waste and removal of topsoil;
- Haulage of ore, waste and topsoil;
- Exposed surface of WRDs and product stockpiles and disturbed areas;
- Primarily and secondary crushing and screening;
- Conveyors transporting product;
- Disposal/storage of material in Adams pit; and
- Explosives magazine.

The main sources of ambient air contribution at the decommissioned Middelplaats Min includes exposed surfaces from disturbed areas.

Dust fallout

A dust fallout monitoring network is in place at MMT. Dust fallout collected at locations at and around the MMT during 2018 and 2019 indicate low dust fallout rates, well below the NDCR limit for residential areas (600 mg/m²/day) and non-residential areas (1 200 mg/m²/day).

PM, SO_2 and NOx

MMT is classified as a Subcategory 4.6 (Sinter Plants) listed activity in terms of Section 21 of the NEM: AQA. As part of the plant's Atmospheric Emission Licence (AEL), the facility is required to undertake annual stack emission testing for: PM, SO_2 and NOx. The stack emissions monitoring results for the period March 2019 to November 2019 shows exceedances of the AEL emission limits for the Sinter Waste Gas Stack for SO_2 and PM_{10} for De-dust 2.

Potential Air Quality receptors

Air quality sensitive receptors (AQSRs) in the immediate vicinity of the decommissioned Middelplaats Mine include the farm workers and A. Pyper (see Table 9-16). The closest AQSR from the MMT include Michael Kruger (see Table 9-15).

9.4.1.9 Noise

INTRODUCTION

Noise generating activities associated with the project could cause an increase in ambient noise levels in and around the mining area. This may cause a disturbance to nearby receptors.

DATA SOURCES

Sampling was undertaken to determine the daytime and night-time background environmental noise levels in and around the MMT in accordance with the IFC General EHS Guidelines on noise and the SANS 10103 (2008) which is fully aligned with the WHO guidelines for Community Noise (WHO, 1999). The sampling points were located in close proximity to sensitive receptors. Sampling was undertaken during normal operations.

DESCRIPTION

Potential noise sensitive receptors

These sensitive receptors include a combination of neighbouring industrial sites (Adams solar farm) and residential sites (isolated farmsteads). Further information on these receptors is provided in the Land use section (see Section 9.4.3.3). The closest Noise Sensitive Receptors (NSR) in the immediate vicinity of the decommissioned Middelplaats Mine include the farm workers and A. Pyper (see Table 9-16). The closest AQSR from the MMT include Michael Kruger (see Table 9-16). The other identified isolated farmsteads located to the northwest, west and south of the neighbouring Tshipi Borwa Mine are likely to be influenced by both Tshipi and MMT mining operations. Based on the prevailing wind field, noise impacts are expected to be more notable to the east and south of the MMT during the day and to the north and north-northwest of the MMT during the night.

Current Ambient Noise

Background environmental noise levels were sampled in July 2019 both near MMT and near sensitive noise receptors. In this regard, daytime L_{Aeq}'s ranged between 32.1 dBA and 62.2 dBA and night-time L_{Aeq}'s ranged between 34.4 dBA and 66.3 dBA. The noise sampling results undertaken both near the MMT and near sensitive noise receptors indicate that SANS 10103 (2008) residential and industrial night-time noise levels were exceeded at the sensitive receptors Nic Fourie, the decommissioned Middelplaats Mine and the Adams Solar farm. This is due to insects and background mining operations.

9.4.1.10 Visual aspects

INTRODUCTION

The visual character of an area is determined by considering landscape character, scenic quality, sensitivity of the visual resource, sense of place and visual receptors. Mining related infrastructure and activities has the potential to alter the visual aspects in a project area and surrounding area.

DATA SOURCES

Information in this section was sourced from aerial imagery and site visits undertaken by the project team.

DESCRIPTION

Landscape character

The landscape character to the immediate east and south of the current MMT and west of the decommissioned Middelplaats Mine can be described as relatively flat terrain with the bushveld vegetation composition being homogenous with the surrounding area. The landscape character associated with the undisturbed proposed project areas (proposed top-cut stockpile, and Middelplaats water pipeline routes 2 and 3), resemble characteristics similar to that of undisturbed areas to the east of the MMT and the west of the decommissioned Middelplaats Mine.

Areas to north and west of the MMT and north east and south east of the decommissioned Middelplaats mine are characterised by mining activities. The UMK borders the northern boundary of the MMT, while the Tshipi Borwa Mine is located along the western boundary of the MMT. WRDs form the backdrop to these areas from many viewpoints. The landscape character associated with the remaining project components is fundamentally altered due to mining characteristics.

Scenic quality

The scenic quality is linked to the type of landscapes that occurs within an area. In this regard, scenic quality can range from high to low as follows:

- High – these include the natural features such as mountains and koppies and drainage systems;
- Moderate – these include agricultural activities, smallholdings, and recreational areas; and
- Low – these include towns, communities, roads, railway line, industries and existing mines.

The landscape to the immediate east and south of MMT and west of the decommissioned Middelplaats Mine which has not been disturbed by existing and surrounding mining activities provides limited topographical variety since the terrain is relatively flat with limited distinguishing topographical features and is not considered scarce as it is representative of the greater landscape and common in the area. This scenic quality also applies to the

undisturbed proposed project areas (proposed top-cut stockpile, and Middelplaats water pipeline routes 2 and 3).

The scenic quality to the west and north of the MMT, north east and south east of the decommissioned Middelplaats mine, including the remaining project components is fundamentally changed by mining operations. It follows that the overall scenic quality is low.

Sense of place

The sense of place results from the combined influence of landscape diversity and distinctive features. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area. The project areas are located within a "mining belt". Surrounding existing mining operations and the infrastructure that supports these mines dominates the area to the west and north of the MMT and north east and south east of the decommissioned Middelplaats mine. It follows that the immediate area within and surrounding the project areas has a relatively weak sense of place (when the viewer is within the mining belt). However, seen in context with the site surrounded by large open spaces of arid vegetation, the harsh nature of the mining activities is "softened". When the viewer views the area from outside the "mining belt", the larger area has a stronger sense of place.

Visual receptors

When viewed from the perspective of tourists and residents of the area, mining operations could be associated with a sense of dissatisfaction. However, the project areas are situated in a remote area where a very limited number of sensitive receptors (isolated farmsteads) are present. The great majority of traffic on the adjacent road is linked with services to the mines. Much of the project infrastructure would merge with the existing facilities and is not expected to stand out. Since the visual intrusion is already present in the area, most receptors to the east have grown accustomed to the features.

9.4.2 Baseline Cultural Environment Affected by the Project

9.4.2.1 Heritage / Cultural and Palaeontological Resources

Introduction

This section describes the existing status of the heritage and cultural environment that may be affected by the project. Heritage (and cultural) resources include all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

Paleontological resources are fossils, the remains or traces of prehistoric life preserved in the geological (rock stratigraphic) record. They range from the well-known and well publicized (such as dinosaur and mammoth bones) to the more obscure but nevertheless scientifically important fossils (such as palaeo-botanical remains, trace fossils, and microfossils). Paleontological resources include the casts or impressions of ancient animals and plants, their trace remains (for example, burrows and trackways), microfossils (for example, fossil pollen, ostracodes, and diatoms), and unmineralised remains (for example, bones of Ice Age mammals).

DATA SOURCES

Information pertaining to heritage resources was sourced from the review of available literature and field surveys. Information pertaining to palaeontological sensitivity was obtained from the review of available literature.

DESCRIPTION

The MMT is situated in an area that, as a whole, has had a relatively low human presence due to the dryness of the region, and as such if there were human settlements they tended to be located on or near watercourses. The MMT has been an operational mine for the past 60 years and has substantial infrastructure on surface. It follows that mining has transformed the landscape within the project areas. No heritage resources have been identified within the project areas.

The project areas are completely underlain by the Cenozoic Kalahari Group, underlying Griqualand West Basin rocks of the Transvaal Supergroup. According to the PalaeoMap of SAHRIS, the Palaeontological Sensitivity of the Kalahari Group is low, and the Griqualand West rocks of the Transvaal Supergroup are moderate.

9.4.3 BASELINE SOCIO-ECONOMIC ENVIRONMENT AFFECTED BY THE PROJECT

9.4.3.1 Socio-economic

INTRODUCTION

Typically mining projects have the potential to result in both positive and negative socio-economic impacts. The positive impacts are usually economic in nature with projects contributing directly towards employment, procurement, skills development and taxes on a local, regional and national scale. In addition, projects indirectly contribute to economic growth in the national, local and regional economies. The negative impacts can be both social and economic in nature and related to the influx of people seeking job opportunities (with related social ills and pressures on existing services) and a change to existing land uses (with related changes to social structures and way of life).

DATA SOURCES

Information in this section was sourced from the Joe Morolong Local Municipality IDP of 2016 and (tatistics South Africa (StatsSA).

DESCRIPTION

The MMT is located in the John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality of the Northern Cape Province. The nearest community to the mine is the town Hotazel, located approximately 25km north of the MMT. No informal or rural type settlements occur within the surrounding areas.

The Hotazel community has a very low population of 1 755 people when compared to the local municipality population of 89 531 and the Northern Cape Province population of 1 145 861. This provides an indication of the remoteness of the project area.

In general, statistics throughout the identified regions indicate poor educational profiles. Significant numbers of the population within the municipalities and province have received no schooling or only limited primary education. The average number across the regions profiled of people completing high school education were relatively consistent; however, there is greater disparity when considering Grade 12 education, further education and training and tertiary education. The education profile within Hotazel is more positive in terms of the percentage of the population that have received further education and tertiary education when compared to the province and district and local municipalities.

The majority of the population within the Northern Cape, John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality are not economically active, while 48% of the Hotazel population is employed. There is a large dependency on subsistence agriculture, the public sector, seasonal workers and employment in the mining sector.

The population profile of the Northern Cape Province, John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality demonstrates a consistent average household size of four people per household despite the significant decline in population numbers between the regional levels. The local community of Hotazel has an average of three members per household.

These results are relatively typical of rural or semi-rural developing communities, however the low household density within Hotazel may be attributed to the fact that the town is largely a mining community established for and servicing surrounding mines.

The most dominant type of dwelling utilized within the Northern Cape Province, the John Taolo Gaetsewe District Municipality, the Joe Morolong Local Municipality and Hotazel is a formally constructed house or brick structure. Traditional dwellings (e.g. huts/ structures made of traditional material) are the second highest used dwelling type in the district and local municipalities with informal dwellings (e.g. shacks) being the second highest dwelling type within the Northern Cape Province. No traditional dwellings are located within the town of Hotazel; rather the second highest used dwelling type is flats.

In general, despite the relatively formalized housing infrastructure, basic services infrastructure appears to be far less formalized when considering the province and municipalities as a whole. In general, Hotazel is well formalised in terms of basic services. This may be attributed to the Hotazel area being more urbanized having been developed and supported by surrounding mines in recent years.

9.4.3.2 Traffic

INTRODUCTION

Traffic from mining projects has the potential to affect the capacity of existing road networks, as well as result in public road safety issues.

DATA SOURCES

Information in this section was sourced through the review of available literature and traffic counts.

DESCRIPTION

The existing road network comprises:

- The provincial R380 road which lies to the east of the MMT and traverses in a south-north direction between Kathu and Hotazel;
- The R31 road which crosses the R380 north of MMT and provides access to the UMK and Kudumane Mines; and
- The D3457 road which lies to the south of MMT and provides access to both MMT and the decommissioned Middelplaats Mine and the Tshipi Borwa Mine. The D3457 traverse in an easterly direction towards Kuruman.

Based on information sourced from traffic counts undertaken at intersections along the R380 road and at the MMT access road, peak traffic hours occur between 06h00 and 07h15 in the morning, and 13h00 and 16h30 in the afternoons. All intersections are considered to be operating at a good level of service.

9.4.3.3 Current land uses

INTRODUCTION

Mining-related activities have the potential to affect land uses both within the mine area and in the surrounding areas. This can be caused by physical land transformation and through direct or secondary impacts. The key related potential environmental impacts are loss of soil, loss of biodiversity, air pollution, noise pollution and visual impacts.

DATA SOURCES

Mining Right and land ownership details were sourced from South32 and a deed search undertaken by SLR. On-site and surrounding land use data was sourced from site observations and the review of topographical maps and satellite imagery. Additional information will be derived from specialist studies such as the Soil, Land Use, Land Capability and Land Potential Assessment.

DESCRIPTION

Mining rights within the proposed project areas

HMM, holds a Mining Right (NC 256 MR) to mine manganese ore over portion 1, and portion 2 of the farm Mamatwan 331, the farm Sinterfontein 748, portion 3 of the farm Moab 700, portion 4 of the farm Adams 328 and portion 5 and 9 of the farm Goold 329. The mining rights boundary is illustrated in Figure 9-9.

Other rights and authorisations

The following applies to properties directly adjacent to the MMT (see Figure 9-9):

- Tshipi holds a Mining Right over on a portion of portion 1 (Currently portion 16) and a portion of portion 2 (Currently portion 17) of the farm Mamatwan 331;
- UMK holds the Mining Right over the farm Botha 313, the remaining extent of the farm Smartt 314, and portions 1 and 3 (a portion of RE) of the farm Rissik 330;
- Enel Green Power (Pty) Ltd holds an environmental authorisation over the remaining extent of the farm Adams 328 (Adams Solar Farm); and
- Danax Energy (Pty) Ltd holds an environmental authorisation for the establishment of a new solar farm on portion 1 of the farm Shirely 367.

Surface rights

The surface right owners and corresponding title deeds numbers of the land in and adjacent to the and the decommissioned Middelplaats Mine is tabulated below.

TABLE 9-13: LAND OWNERSHIP WITHIN THE MMT MINING RIGHT AREA

Portion	Landowner	Title deed number
Mamatwan 331		
Portion 16 (Portion of Portion 1)	Hotazel Manganese Mines (Pty) Ltd	T416/2014
Portion 17 (Portion of Portion 2)	Hotazel Manganese Mines (Pty) Ltd	T416/2014
Sinterfontein 748		

Portion 0	Hotazel Manganese Mines (Pty) Ltd	T2426/2010
Moab 700		
Portion 3	Hotazel Manganese Mines (Pty) Ltd	T953/2009
Adams 328		
Portion 4	Hotazel Manganese Mines (Pty) Ltd	T338/2009
Goold 329		
Portion 5	Hotazel Manganese Mines (Pty) Ltd	T2426/2010
Portion 9	Hotazel Manganese Mines (Pty) Ltd	T3211/2015

TABLE 9-14: LAND OWNERSHIP AT THE DECOMMISSIONED MIDDELPLAATS MINE

Portion	Landowner	Title deed number
Middelplaats 332		
Portion 4	Hotazel Manganese Mines (Pty) Ltd	T2426/2010

TABLE 9-15: LAND OWNERSHIP ADJACENT TO THE PROJECT AREAS

Portion	Landowner	Title deed number
Mamatwan 331		
Remaining extent	Andries Mathys Van Den Berg	T594/ 1987
Portions 1 and 2	Hotazel Manganese Mines (Pty) Ltd	T2426/2010
Remaining extent of Portion 3		T953/2009
Portion 7	Transnet	T666/1965
Portion 8	Tshipi é Ntle Manganese Mining (Pty) Ltd	T515/1992
Portion 16 (Portion of Portion 1)	Tshipi é Ntle Manganese Mining (Pty) Ltd	T416/2014
Portion 17 (Portion of Portion 2)	Tshipi é Ntle Manganese Mining (Pty) Ltd	T416/2014
Portion 18 (Portion of Portion 3)	Tshipi é Ntle Manganese Mining (Pty) Ltd	T416/2014
Moab 700		
Portion 1	Transnet	T250/1983
Remaining extent	Machiel Andries Kruger	T594/1987
Middelplaats 332		
Remaining Extent	Saltrim Ranches (Pty) Ltd	T2297/2006
Portion 1	Terra Nominees (Samancor Manganese)	T2397/1996
Middleplaats 184		
Whole farm	Abraham Johannes De Klerk	T1135/1965
Adams 328		
Remaining Extent	Saltrim Ranches (Pty) Ltd	T2297/2006
Portion 1	Eskom Holdings	T347/1971
Portion 2		T1162/1982

Portion	Landowner	Title deed number
Portion 3	Transnet	T1107/1992
Rissik 330		
Portion 0	Gideon Poolman Familie Trust	T3211/2015
Portion 1	Terra Nominees (Samancor Manganese)	T2395/1996
Portion 2	Transnet	T515/1992
Portion 3	United Manganese of Kalahari Pty Ltd	T2092/2009
Goold 329		
Portion 1	Kruger Machiel Andries	T399/1977
Portion 2	Kruger Nicolaas Philippus Fourie	T455/2010
Portion 8	Transnet	T515/1992
Portion 9	Hotazel Manganese Mines (Pty) Ltd	T2821/2011
Shirley 367		
Portion 0	Leatitia Penny Trust	T3464/1997
Portion 1	Annalien Elizabeth Fourie	T730/1984
Portion 2	Pretorius Hester Johannes	T718/1979
Portion 3	Transnet	T43/1993
Smartt 314		
Portion 0	Terra Nominees (Samancor Manganese)	T2396/1996
Portion 1	Transnet	T221/1966
Alton 368		
Portion 0	Booysen Jacomina Maria	T285/1979
Portion 1	Andries Matthys Duvenhage Testamentere	T905/2009
Milner 327		
Whole Farm	Kruger Machiel Andries	T26/1931

Land claims

The Department of Rural Development and Land Reform: Land Claims Commissioner was contacted on 13 November 2019 to confirm if any land claims have been lodged on the farms on which the project activities are located. The Land Claims Commissioner has confirmed that no land claims have been lodged on the farms on which the project activities/infrastructure are located. Proof of correspondence is included in Appendix C.

Land use

Land use at the project sites includes existing mining activities and infrastructure associated with MMT mining right area. Where the activity and layout changes involve expansion of the footprint this is generally onto open space which comprises undisturbed natural vegetation. This is particularly the case for the top-cut stockpile and the Middeplaats pipeline routes 2 and 3. The remaining project activities are located in disturbed mining areas of the MMT.

Land uses further afield from the project areas include a mixture of agriculture, isolated residence/residential areas, infrastructure/servitudes, mining and solar activities. More detail is provided below.

Agriculture

Agricultural activities currently undertaken within the areas surrounding the MMT includes game farming and ad-hoc livestock grazing.

Isolated residence/ residential area

With reference to Figure 9-9, the nearest towns/residential areas to the MMT include:

- The Black Rock mining community located approximately 30 km north west of the MMT;
- Hotazel situated approximately 20 km north of the MMT;
- Kuruman located approximately 45 km south-east of the MMT; and
- Kathu located approximately 40 km to the south of the MMT.

There are sparsely situated residences and farmhouses on the surrounding farms. These are owned and/or occupied by farmers and farm workers. More information is included in Table 9-16 below.

TABLE 9-16: ISOLATED RESIDENCE/ RESIDENTIAL AREAS TO THE PROJECT COMPONENTS

Receptor	Distance from MMT boundary	Distance from the decommissioned Middelplaats Mine	Distance from Middelplaats pipeline routes (closest section of water pipeline)		
			Route1	Route 2	Route 3
Farm workers residence located on the Farm Middelplaats 332	3.5 km west	200 m south-west	60 m	300 m north-east	300 m north-east
Permanent farm homestead (A. Pyper) located on the Farm Middelplaats 332	4.7 km north-west	1.8 km south-west	1 km west	1.9 km north- east	1.9 km north- east
Permanent farm homestead (Andries van den Berg) located on the Farm Mamatwan 331	3 km west	4.1 km south	700 m west	4.3 km south	4.3 km south
Permanent farm homesteads (Nic Fourie) located on the Farm Shirley 367	3 km south	6 km south	891 m south	6 km north	6 km north
Permanent farm homestead (Michael Kruger) located on the remaining extent of the farm Moab 700	1.4 km south-east	8.1 km south-east	1.7 km east	6 km south-east	6 km south-east

Infrastructure and servitudes

The Sedibeng Vaal Gamagara water supply pipeline supplies the MMT with process and potable water. A pipeline connection to the Sedibeng Vaal Gamagara reservoir is located approximately 400 m east from the boundary of the MMT.

An existing D3457 road servitudesruns along the southern boundary of the MMT.

Surrounding mines

Mining operations located within a 7km radius of the MMT include the (see Figure 9-10):

- The Tshipi Borwa Mine (Tshipi é Ntle Manganese Mining (Pty) Ltd) is located directly west of the MMT and approximately 1.4 km south east of the decommissioned Middelplaats Mine; and
- The Sebilo Mine (Sebilo Resources (Pty) Ltd) – Located approximately 7 km north from the project areas.

Mining operations located further afield from the project areas include the (Figure 9-9):

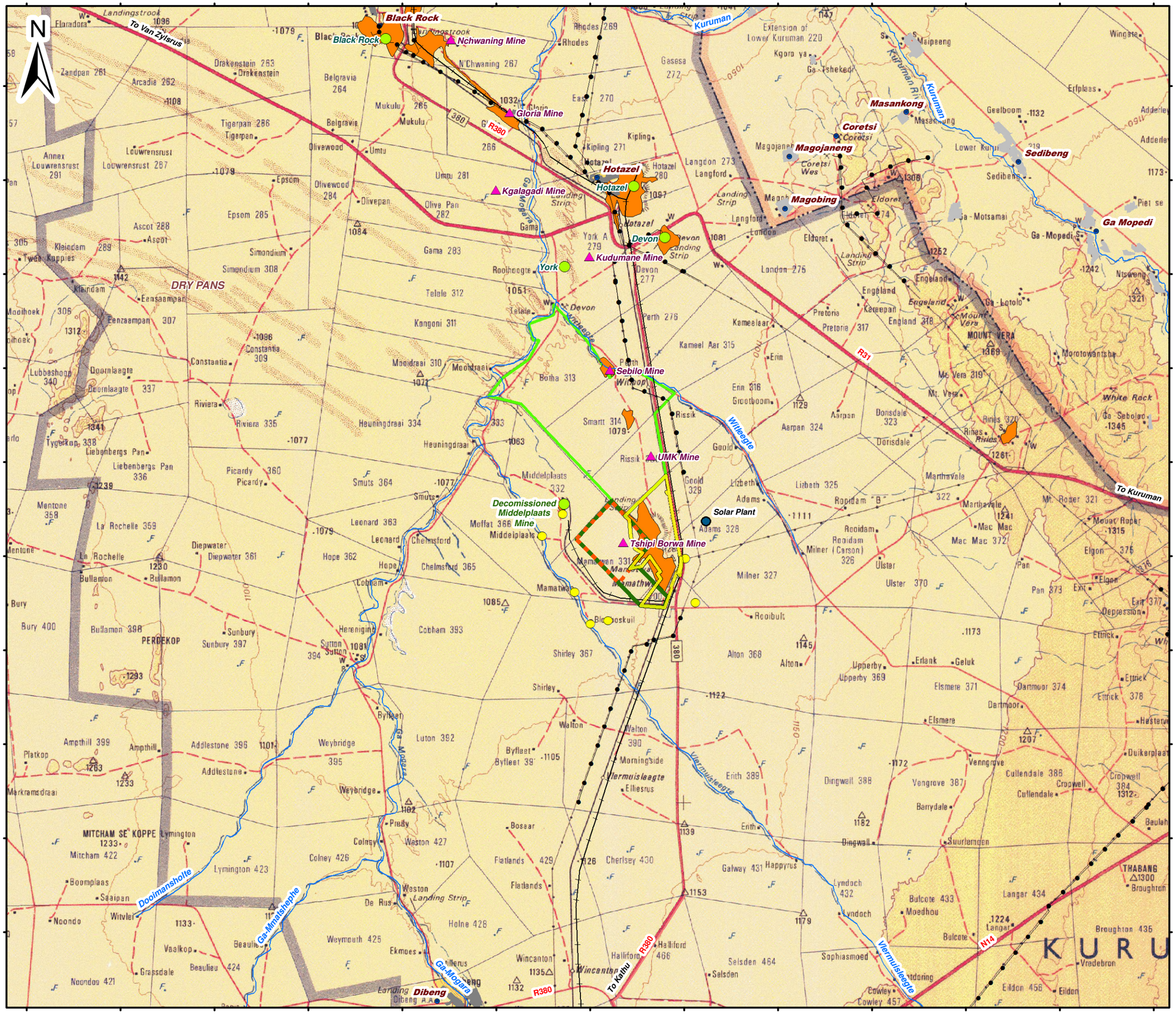
- The Wessels Mine (South32) – Located approximately 28 km north from the project areas;
- The Nchwaning/Black Rock Mine (Assmang) – Located approximately 26 km north from the project areas;
- The Gloria Mine (Assmang (Pty) Ltd) – Located approximately 21 km north from the project areas;
- The Kalagadi Mine (Kalagadi Manganese (Pty) Ltd) – Located approximately 17 km north west from the project areas;
- The Kudumane Mine (Kudumane Manganese Resources (Pty) Ltd) – Located approximately 13 km north from the project areas;
- The old Hotazel Mine (dormant/closed) – Located approximately 15 km north east from the project areas;
- The old Devon mine (dormant/closed) – Located approximately 14.7 km north east from the project areas; and
- The old York Mine (dormant/closed) – Located approximately 12.8 km north from the project areas.

Industries

The Adams Solar Plant (Adams Solar PV Project Two (Pty) Ltd), owned by Enel Green Power (Pty) Ltd, is situated east of the MMT Mining Right boundary and approximately 1.5 km east of the project areas (Figure 9-10). The Adams Solar Plant will aid the new renewable generation capacity of the national grid and contribute to the 42% share targeted by the Department of Energy for renewable energy (Integrated Resource Plan, 2010-2030). According to the strategy, 8.4 GW of new generation capacity in South Africa will be obtained from the Adams Solar Plant over the next twenty years.

Danax Energy (Pty) Ltd holds an environmental authorisation for the establishment of a new solar farm on portion 1 of the farm Shirely 367. This solar farm has not been established. It is anticipated that the new solar farm will generate a capacity 75 MW and will be connected to the Eskom grid. The MMT borders the farm Shirley 367.

An Eskom sub-station is located approximately 320 m from the boundary of the MMT.



Legend

- Mamatwan Mining Right Area
- Tshipi Surface Use Area
- Tshipi Mining Right Area
- UMK Mining Right Area
- Operating Manganese Mines
- Closed/Dormant Mines
- High Urban Density
- Low Urban Density
- Mines & quarries*
- Main Roads
- Rivers and Streams
- Railway
- Powerline
- Potential Receptors

Note:
* Sourced from SANBI

0 4 8 Kilometers

Scale: 1:200 000 @ A3

Projection:Transverse Mercator
Datum: Hartebeeshoek, Lo 23

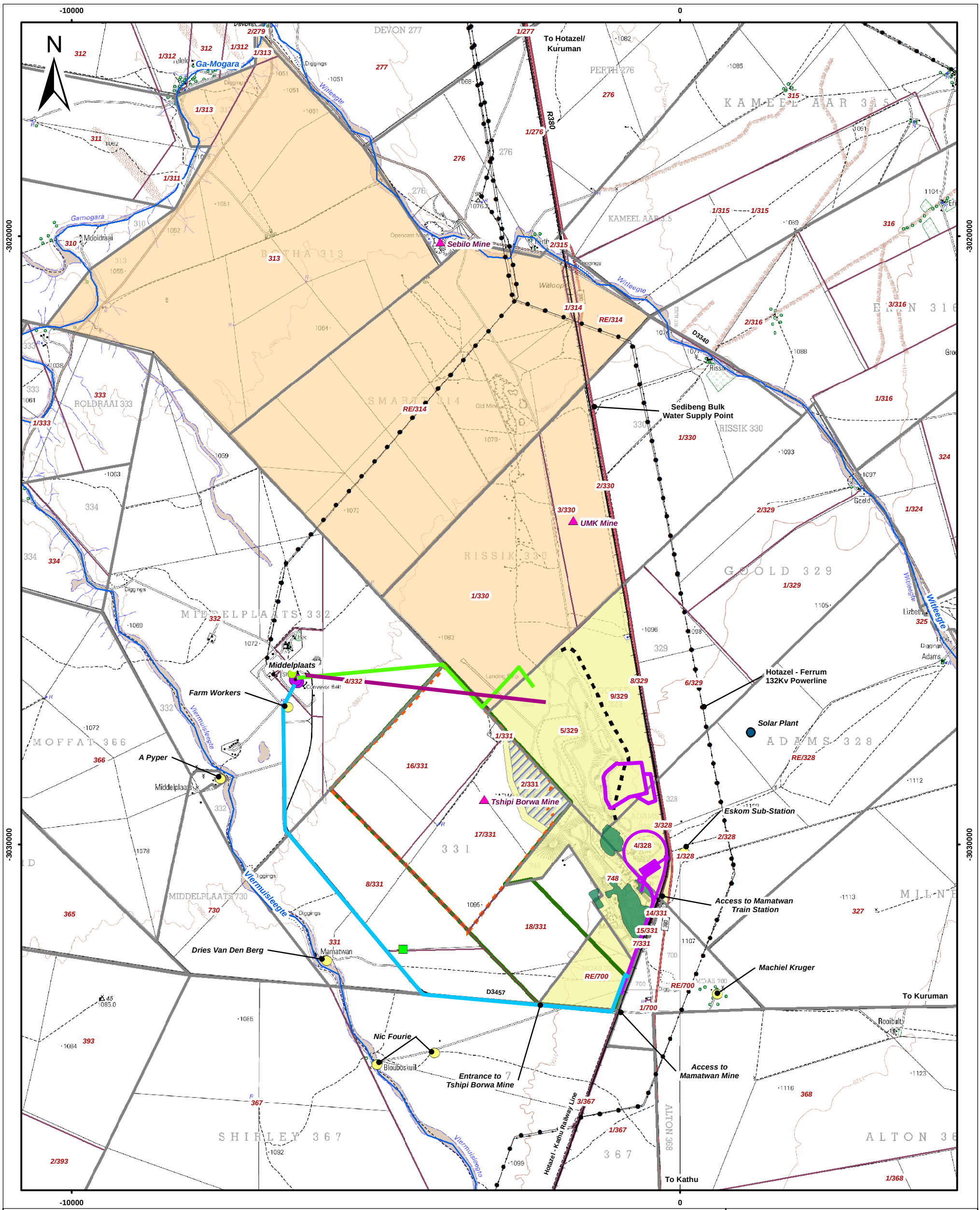
Mamatwan Mine

Figure 9-9

Regional Land Use Map

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

720.19136.00002 | 2020/08/05



Legend

- Mamatwan Mining Right Area
- Proposed Layout Changes
- UMK Mining Right Area
- Tshipi Surface Use Area
- Tshipi Mining Right Area
- Boundary Pillar
- Operating Manganese Mines
- Closed/Dormant Mines
- Potential Receptors
- Main Roads
- Secondary Roads
- Power Line
- Rivers and Streams
- Railway
- Farm Boundaries
- Farm Portions
- Approved Eskom 33/11/kV 10mVA Substation

Alternatives

- Alternative Pipeline Route 1
- Alternative Pipeline Route 2
- Alternative Pipeline Route 3

0 1 000 2 000 Meters

Scale: 1:60 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 9-10

Local Land Use

SLR

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

720.19136.00002 | 2021/03/11

9.4.4 Description of Specific Environmental Features and Infrastructure on the Site

The environmental features and infrastructure in the project area are described in Section 9.4.1. In summary:

- The project areas are located within the Kathu Bushveld habitat unit, and transformed to degraded versions thereof;
- No watercourses or wetlands are located at the MMT;
- Regional groundwater levels range between 18 and 74 metres below ground level. Groundwater flow is towards the north-west.
- Air quality, noise and aesthetics within and surrounding the MMT has already been influenced through the presence of mining activities and associated infrastructure;
- Undisturbed areas surrounding the MMT are characterised by bushveld, relatively flat terrain with the vegetation composition being homogenous. The visual landscape within the MMT area has been transformed due to the presence of existing and surrounding mining infrastructure and activities;
- There is a low possibility of palaeontological resources occurring in the project area. No heritage/cultural resources are associated with the project areas;
- The notable infrastructure surrounding the project areas includes roads (R380), a railway line, powerline and a water pipeline (Vaal Gamagara). The existing road network provides a fair level of service. The project activities do not alter the level of service; and
- There area surrounding the project areas is sparsely populated and is characterised by isolated farmsteads located within a 5 km radius of the MMT, with the closes town (Hotazel) located approximately 20 km from the MMT. The areas surrounding the project areas have also been influenced by surrounding dormant and active mines within a 7 km radius. This includes mines such as the Sebilo Mine, the dormant Middelplaats Mine, the UMK mine and the adjacent Tshipi Borwa Mine.

9.4.5 Environment and Current Land Use Map

A map illustrating the key features of the current environment and land use is included in Figure 9-2 to Figure 9-10.

9.5 IMPACTS AND RISKS WHICH HAVE INFORMED THE IDENTIFICATION OF EACH ALTERNATIVE

This section provides a list of potential impacts on the biophysical, cultural and social aspects that have been identified in respect of each of the project activities and for each of the reasonable and feasible alternatives identified. A discussion of each of the impacts identified is provided in Section 9.7. The preliminary ratings for consequence, probability and significance of each of the impacts in the unmitigated scenario (which assumes that no consideration is given to the prevention or reduction of environmental and social impacts) are also provided in the table below in accordance with the DMRE report template. In this regard it must be noted that a conservative approach has been applied to these ratings in the absence of specialist studies. Once all the site-specific specialist studies have been completed the assessment and related ratings may change. The final ratings will be included in the EIA and EMPr.

See Table 9-17 for consideration of the impacts and risks for each project component and the available alternatives. Alternatives were not considered for the activities which have already taken place. With reference to Section 9.1 alternatives are being considered for the following proposed infrastructure and activity changes:

- The establishment of stormwater management infrastructure;
- The establishment of a water pipeline from the decommissioned Middelplaats Mine to the MMT;
- Upgrading the railway loadout station;
- The sale of waste rock as aggregate; and
- Optimization to improve water recovery within the plant area

TABLE 9-17: PRELIMINARY LIST OF IMPACTS IDENTIFIED FOR THE PROPOSED PROJECT

Note: The preliminary assessment ratings provided in this table are for the unmitigated scenario only which assumes that no consideration is given to the prevention or reduction of biophysical, social and socio-economic impacts. Furthermore, a conservative approach has been applied to these ratings in the absence of site-specific studies. Once all the site-specific studies have been completed the assessment and related ratings may change. Moreover, once the mitigation/management measures have been incorporated into the assessment as part of the EIA, a determination of residual impact will be provided.

Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
				Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
Potential biophysical impacts											
Loss of soil and land capability through physical disturbance	N/A	Expanded WRD footprints, product stockyard and road	Construction Operation Decommissioning Closure	M	VH	VL	H	M	Unlikely for WRDs that remain in perpetuity All other project components - Can be reversed with mitigation	Possible	Can be manged/mitigated to acceptable levels
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	N/A	Establishment of stormwater management infrastructure									
	1,2,3	Establishment of the Middelplaats water pipelines									
	3	Upgrading the railway and loadout station									
	3	Optimization to improve water recovery within the plant area									
	1 and 2	Optimization to improve water recovery within the plant area (slimes dam or dry staking facility)		H	VH	M	H	H	Cannot be reversed for facilities that remain in perpetuity	Possible	Can be manged/mitigated to acceptable levels
Loss of soil resources and land capability through contamination	N/A	Expanded WRD footprints, product stockyard and road	Construction Operation Decommissioning Closure	M	VH	VL	H	M	Can be reversed with mitigation	Possible	Can be manged/mitigated to acceptable levels
	N/A	Established potable and process water facilities									
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	N/A	Establishment of stormwater management infrastructure									
	N/A	WRD height increase									

Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
				Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
	1,2,3	Establishment of the Middelplaats water pipelines									
	3	Upgrading the railway and loadout station									
	N/A	Sale of waste rock as aggregate (with and without crushing and screening)									
	1,2,3	Optimization to improve water recovery within the plant area									
Physical destruction of biodiversity	N/A	Expanded product stockyard	Construction Operation Decommissioning Closure	VL	VH	M	VH	M	Can be reversed to a certain extent with mitigation	Possible	Can be manged/mitigated to acceptable levels
	N/A	Established potable and process water facilities									
	N/A	Expanded WRD footprints and road		M	VH	M	VH	H			
	N/A	Establishment of stormwater management infrastructure									
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	3	Upgrading the railway and loadout station									
	1,2,3	Establishment of the Middelplaats water pipelines									
	3	Optimization to improve water recovery within the plant area									
	1 and 2	Optimization to improve water recovery within the plant area (slimes dam or dry staking facility)		H	VH	M	H	H	Cannot be reversed for facilities that remain in perpetuity	Possible	Can be manged/mitigated to acceptable levels
	N/A	Expanded WRD footprints, product stockyard and road	Construction Operation	M	VH	M	VH	H		Possible	
	N/A	Established potable and process water facilities									

Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
				Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
General disturbance of biodiversity	N/A	Establishment of top-cut stockpile and associated crushing and screening plant	Decommissioning Closure						Can be reversed to a certain extent with mitigation		Can be manged/mitigated to acceptable levels
	N/A	Establishment of stormwater management infrastructure									
	N/A	WRD height increase									
	1,2,3	Establishment of the Middelplaats water pipelines									
	3	Upgrading the railway and loadout station									
	N/A	Sale of waste rock as aggregate (with and without crushing and screening)									
	N/A	Re-processing of material located in Adams pit									
	1,2,3	Optimization to improve water recovery within the plant area									
Contamination of surface water resources affecting third party use	N/A	Expanded WRD footprints, product stockyard and road	Construction Operational Decommissioning Closure	L	H	VL	VL	Insignificant	Can be reversed with mitigation	Possible	Can be manged/mitigated to acceptable levels
	N/A	Established potable and process water facilities									
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	N/A	Establishment of stormwater management infrastructure									
	N/A	WRD height increase									
	1,2,3	Establishment of the Middelplaats water pipelines									
	3	Upgrading the railway and loadout station									
	N/A	Sale of waste rock as aggregate (with and without crushing and screening)									
	N/A	Re-processing of material located in Adams pit									
	1,2,3	Optimization to improve water recovery within the plant area									

Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
				Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
Alteration of natural drainage patterns	N/A	Expanded WRD footprints, product yard and road	Construction Operational Decommissioning Closure	VL	VH	M	VL	VL	Can be reversed with mitigation	Possible	Can be manged/mitigated to acceptable levels
	N/A	Established potable and process water facilities									
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	N/A	Establishment of stormwater management infrastructure									
	3	Upgrading the railway and loadout station									
	N/A	Sale of waste rock as aggregate (with and without crushing and screening)									
	N/A	Re-processing of material located in Adams pit									
	1,2,3	Optimization to improve water recovery within the plant area									
Contamination of groundwater affecting third party use	N/A	Expanded WRD footprints and product stockyard	Construction Operational Decommissioning Closure	H	VH	M	L	M	Can be reversed with mitigation	Possible	Can be manged/mitigated to acceptable levels
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	N/A	Establishment of stormwater management infrastructure									
	3	Upgrading the railway and loadout station									
	N/A	WRD height increase									
	N/A	Sale of waste rock as aggregate (with and without crushing)									
	N/A	Re-processing of material located in Adams pit									
	1,2,3	Optimization to improve water recovery within the plant area									
Dewatering that could influence	N/A	Abstraction of groundwater from the decommissioned Middelplaats Mine	Operational	H	H	M	H	H	Reversable at end of life of mine	Possible	Can be manged/mitigated to acceptable levels

Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
				Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
availability of the third-party supply									when groundwater levels rebound		
Increase in ambient air concentrations	N/A	Expanded WRD footprints, product stockyard and road	Construction Operational Decommissioning Closure	M	H	M	H	M	Can be reversed at closure with mitigation	Possible	Can be manged/mitigated to acceptable levels
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	N/A	Establishment of stormwater management infrastructure									
	N/A	WRD height increase									
	1,2,3	Establishment of the Middelplaats water pipelines									
	3	Upgrading the railway and loadout station									
	N/A	Sale of waste rock as aggregate (with and without crushing and screening)									
	N/A	Re-processing of material located in Adams pit									
	1,2,3	Optimization to improve water recovery within the plant area									
Increase in disturbing noise levels affecting potential human receptors	N/A	Expanded WRD footprints, product stockyard and road	Construction Operation Decommissioning Closure	L	H	M	M	L	Can be reversed at closure once activities stop	Possible	Can be manged/mitigated to acceptable levels
	N/A	Established potable and process water facilities									
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	N/A	Establishment of stormwater management infrastructure									
	N/A	WRD height increase									
	1,2,3	Establishment of the Middelplaats water pipelines									
	1,2,3	Upgrading the railway and loadout station									

Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
				Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
	N/A	Sale of waste rock as aggregate (with and without crushing and screening)									
	N/A	Re-processing of material located in Adams pit									
	1,2,3	Optimization to improve water recovery within the plant area									
Potential cultural impacts											
Loss or damage to heritage and/or paleontological resources	N/A	Expanded WRD footprints, product stockyard and road	Construction Operational Decommissioning Closure	VL	VH	VL	VL	Insignificant	Any loss of a heritage and or paleontological resource cannot be reversed.	Possible	Can be avoided with mitigation
	N/A	Established potable and process water facilities									
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	N/A	Establishment of stormwater management infrastructure									
	1,2,3	Establishment of the Middelplaats water pipelines									
	1,2,3	Upgrading the railway and loadout station									
	1,2,3	Optimization to improve water recovery within the plant area									
Potential socio-economic impacts											
Disturbance to third party road users by project related traffic	N/A	Establishment of top-cut stockpile and associated crushing and screening plant	Construction Operational Decommissioning	VL	VL	M	VL	Insignificant	Injury and third-party accidents cannot be reversed	Unlikely in the event of injury or death	Can be manged/mitigated to acceptable levels
	N/A	Establishment of stormwater management infrastructure									
	1,2,3	Establishment of the Middelplaats water pipelines									
	2,3	Upgrading the railway and loadout station									
	N/A	Sale of waste rock as aggregate (with and without crushing and screening)									
	N/A	Re-processing of material located in Adams pit									

Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
				Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
	1,2,3	Optimization to improve water recovery within the plant area		H	M	M	H	H			
Alteration of the visual environment	N/A	Expanded WRD footprints, product stockyard and road	Construction Operational Decommissioning Closure	L	VH	M	L	L	Can be reversed at closure with mitigation	Possible	Can be manged/mitigated to acceptable levels
	N/A	Change in WRD rehabilitation criteria									
	N/A	Established potable and process water facilities									
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	N/A	Establishment of stormwater management infrastructure									
	N/A	WRD height increase									
	1,2,3	Establishment of the Middelplaats water pipelines									
	3	Upgrading the railway and loadout station									
	N/A	Sale of waste rock as aggregate (with and without crushing and screening)									
	N/A	Re-processing of material located in Adams pit									
	3	Optimization to improve water recovery within the plant area									
	1 and 2	Optimization to improve water recovery within the plant area (slimes dam or dry staking facility)		H	VH	M	H	H	Cannot be reversed for facilities that remain in perpetuity	Possible	Can be manged/mitigated to acceptable levels
Positive socio-economic impact	N/A	Project as a whole regardless of the chosen alternatives	Construction Operational Decommissioning Closure	M+	H	VH	M	M+	Not applicable	Not applicable	Not applicable

Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
				Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
(economic impact)											
Negative socio-economic impact (inward migration)	N/A	Establishment of top-cut stockpile and associated crushing and screening plant	Construction Operational Decommissioning	L	VH	M	M	M	Can be reversed	Possible	Can be manged/mitigated to acceptable levels
	N/A	Establishment of stormwater management infrastructure									
	1,2,3	Establishment of the Middelplaats water pipelines									
	1,2,3	Upgrading the railway and loadout station									
	1,2,3	Optimization to improve water recovery within the plant area									
Loss and sterilisation a mineral resource through the placement of infrastructure	N/A	Expanded WRD footprints, product stockyard and road	Construction Operational Decommissioning Closure	Negligible					Not applicable	Not applicable	Not applicable
	N/A	Established potable and process water facilities									
	N/A	Establishment of top-cut stockpile and associated crushing and screening plant									
	N/A	Establishment of stormwater management infrastructure									
	1,2,3	Establishment of the Middelplaats water pipelines									
	1,2,3	Upgrading the railway and loadout station									
	1 and 3	Optimization to improve water recovery within the plant area (slimes dam and dry staking facility)		H	H	H	H	H	Cannot be reversed	Possible	Can be manged/mitigated to acceptable levels
Safety to third parties and	N/A	Expanded WRD footprints, product stockyard and road	Construction Operational						Cannot be reversed in the	Possible	
	N/A	Established potable and process water facilities									

Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
				Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
animals through the presence of hazardous excavations and infrastructure	N/A	Establishment of top-cut stockpile and associated crushing and screening plant	Decommissioning Closure	Negligible as project components are within the Mining Right are which is access controlled.					unlikely event of injury or death		Can be manged/mitigated to acceptable levels
	N/A	Establishment of stormwater management infrastructure									
	1,2,3	Establishment of the Middelplaats water pipelines									
	1,2,3	Upgrading the railway and loadout station									
	1,2,3	Optimization to improve water recovery within the plant area									
Change in land use	N/A	Project as a whole regardless of the activity or chosen alternatives	Construction Operational Decommissioning Closure	M	H	M	H	M	Can be reversed at closure with mitigation	Possible	Can be manged/mitigated to acceptable levels

9.6 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The method to be used for the assessment of impacts is set out in the table below. This assessment methodology enables the assessment of environmental impacts including: cumulative impacts, the intensity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

TABLE 9-18: SLR IMPACT ASSESSMENT METHODOLOGY

PART A: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE		Significance = consequence x probability
Definition of CONSEQUENCE		Consequence is a function of intensity, spatial extent and duration
Criteria for ranking of the INTENSITY of environmental impacts	**VH**	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	**VL**	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years (likely to cease at the end of the operational life of activity).
	VH	Very long, permanent, +20 years (Irreversible, Beyond closure).
	VL	A part of the site/property.

Criteria for ranking the EXTENT of impacts	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours.
	H	Local area, extending far beyond site boundary.
	VH	Regional/National

PART B: DETERMINING CONSEQUENCE							
INTENSITY = VL							
DURATION	Very long	**VH**	**Low**	**Low**	**Medium**	**Medium**	**High**
	Long term	**H**	**Low**	**Low**	**Low**	**Medium**	**Medium**
	Medium term	**M**	**Very Low**	**Low**	**Low**	**Low**	**Medium**
	Short term	**L**	**Very low**	**Very Low**	**Low**	**Low**	**Low**
	Very short	**VL**	**Very low**	**Very Low**	**Very Low**	**Low**	**Low**
INTENSITY = L							
DURATION	Very long	**VH**	**Medium**	**Medium**	**Medium**	**High**	**High**
	Long term	**H**	**Low**	**Medium**	**Medium**	**Medium**	**High**
	Medium term	**M**	**Low**	**Low**	**Medium**	**Medium**	**Medium**
	Short term	**L**	**Low**	**Low**	**Low**	**Medium**	**Medium**
	Very short	**VL**	**Very low**	**Low**	**Low**	**Low**	**Medium**
INTENSITY = M							
DURATION	Very long	**VH**	**Medium**	**High**	**High**	**High**	**Very High**
	Long term	**H**	**Medium**	**Medium**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**Medium**	**High**	**High**
	Short term	**L**	**Low**	**Medium**	**Medium**	**Medium**	**High**
	Very short	**VL**	**Low**	**Low**	**Low**	**Medium**	**Medium**
INTENSITY = H							
DURATION	Very long	**VH**	**High**	**High**	**High**	**Very High**	**Very High**
	Long term	**H**	**Medium**	**High**	**High**	**High**	**Very High**
	Medium term	**M**	**Medium**	**Medium**	**High**	**High**	**High**
	Short term	**L**	**Medium**	**Medium**	**Medium**	**High**	**High**
	Very short	**VL**	**Low**	**Medium**	**Medium**	**Medium**	**High**
INTENSITY = VH							
DURATION	Very long	**VH**	**High**	**High**	**Very High**	**Very High**	**Very High**
	Long term	**H**	**High**	**High**	**High**	**Very High**	**Very High**
	Medium term	**M**	**Medium**	**High**	**High**	**High**	**Very High**
	Short term	**L**	**Medium**	**Medium**	**High**	**High**	**High**
	Very short	**VL**	**Low**	**Medium**	**Medium**	**High**	**High**

VL	**L**	**M**	**H**	**VH**
A part of the site/ property	Whole site	Beyond the site, affecting neighbours	Extending far beyond site but localised	Regional/ National
EXTENT				

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	**VH**	Medium	Medium	High	Very High	Very High
	Probable	**H**	Low	Medium	Medium	High	Very High
	Possible/ frequent	**M**	Low	Low	Medium	Medium	High
	Conceivable	**L**	Very Low	Low	Low	Medium	Medium
	Unlikely/ improbable	**VL**	Negligible	Very Low	Low	Low	Medium
			VL	**L**	**M**	**H**	**VH**
			CONSEQUENCE				

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Negligible	Inconsequential, not requiring any consideration.

***VH = very high, H = high, M= medium, L= low and VL= very low and + denotes a positive impact.**

9.7 POSITIVE AND NEGATIVE IMPACTS OF THE PROPOSED ACTIVITY AND ALTERNATIVES

Potential biophysical, cultural and social impacts that were identified during the scoping process, in consultation with I&APs, are discussed under environmental component headings in this section. These discussions should be read with the corresponding descriptions of the baseline environment in Section 9.4.1 of the Scoping Report. In accordance with the DMRE report template this section requires a discussion of the potential impacts taking into consideration all project related alternatives. The potential impacts associated with the project phases (construction, operations, decommissioning and closure) have been identified and described. The section below also references studies/investigations that are required to provide the necessary additional information. **In the absence of specialist studies the assessment conclusions are conservative. It follows that the assessment provided below is a preliminary assessment which will be refined/changed in the EIA and EMPr with specialist input, as appropriate**.

9.7.1 POTENTIAL BIOPHYSICAL IMPACTS

9.7.1.1 Issue: Loss of soil and land capability through physical disturbance

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

* The crosshatch is the phase in which the impact is likely to occur.

DISCUSSION

Topsoil is a resource of high value as it is a non-renewable growth medium containing a gene bank of vegetation seeds and other organisms. Soil resources can be lost through physical disturbance such as removal, erosion and compaction which can result in a loss of soil functionality as an ecological driver.

Some project activities that have already taken place have resulted in the physical disturbance of soil resources. These include the expanded WRD footprints, product stockyard and road. Some proposed project activities and

infrastructure, particularly during the construction/ clearing phase, have the potential to result in the loss of soils. These include the top-cut stockpile and associated crushing and screening, stormwater management infrastructure, Middleplaats water pipelines (all three options), upgraded railway and loadout station (option 3 only) and the proposed establishment of a filter press. The proposed establishment of either a slimes dam or dry staking facility alternatives will result in a permanent loss as these facilities are likely to remain in perpetuity. The loss of soils in turn has the potential to impact on the related land capability. The remaining project footprints comprise disturbed soil forms. The conservation of topsoil, sound soil management practises and focused use during rehabilitation are critically important in achieving a sustainable post-closure land use.

In the absence of soil conservation and management measures and a rehabilitation plan that supports the post closure land use, the intensity of the potential impact associated with the project is expected to be medium to high (slimes dam and dry staking facility alternatives). Without mitigation the loss of soil and related land capability would definitely occur for all project components except the slimes dam or dry staking facility alternatives and would extend beyond the life of the mine but would be localised to parts of the MMT Mining Right area. For WRDs where the footprint has been extended, the slimes dam or staking facility alternatives, the loss associated with the extended footprint (although relatively small – approximately 10 ha) would remain in perpetuity. When considering all project components collectively the unmitigated significance scenario is expected to be medium to high (slimes day and dry staking facility alternatives). This impact significance could be reduced to low to medium with the implementation of mitigation measures focused on minimising impacts during operations and remedying any negative impacts at closure. A change in the WRD rehabilitation criteria that addresses long term erosion control is seen as a positive change that supports a reduced mitigated significance and is aligned with meeting the objectives of the approved EMPr 2005.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.1.2 Issue: Loss of soil and land capability through contamination

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

Soil is a valuable resource that supports a variety of ecological functions. Mining projects in general have the potential to damage soil resources through contamination. A loss of soil resources would result in a decrease in the natural rehabilitation and future land use potential of any land. The project includes a number of likely contamination sources in all phases that have the potential to contaminate soil resources regardless of the chosen alternatives (where applicable). Contaminants could include accidental spills of hydrocarbons, dirty stormwater and hazardous wastes, silt from exposed surfaces and run-off from increased WRDs, slimes dam or dry staking facility alternatives and product stockpiles.

In the absence of pollution containment and spill management measures the intensity of the potential impact is expected to be medium. Without mitigation the loss of soil and related land capability through contamination would definitely occur and would remain long after closure but would be localised to parts of the MMT Mining Right area. The unmitigated significance scenario is expected to be medium. In the mitigated scenario that focuses on avoiding impacts through containment of potential contamination at source and implementation of spill management procedures, the significance could be reduced to low. A change in the WRD rehabilitation criteria that addresses long term erosion control is seen as a positive change that supports a reduced mitigated significance and is aligned with meeting the objectives of the approved EMPr 2005.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.1.3 Issue: Physical destruction of biodiversity

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

The placement of mining infrastructure and activities in all phases has the potential to destroy biodiversity through the physical destruction of specific biodiversity areas, of linkages between biodiversity areas and related species which are considered to be significant because of their status, and/or the role that they play in the ecosystem.

The project infrastructure and activities that have already taken place have contributed to the loss of biodiversity. The clearance of vegetation for the proposed infrastructure and activities would impact on vegetation and fauna. Various protected species have been recorded, in the Kathu Bushveld habitat unit. This unit comprises most of the footprint of the top-cut stockpile, rail siding (option 3) and all three water pipeline alternatives routes that are being considered. It is also likely that the establishment of additional stormwater management infrastructure, filter press (location dependant), slimes dam or dry staking facility alternatives would occur within the same habitat unit. The remaining proposed project footprints comprise degraded bushveld or are fully transformed by historic or current mining activities.

In the absence of mitigation and a rehabilitation plan that supports the post closure land use, the intensity of potential impacts is expected to be medium for the extended footprints of the WRDs and road, top-cut stockpile, rail siding (option 3), filter press and all three water pipeline alternatives routes due to the loss of habitat and protected species. The unmitigated intensity is expected to be high for the slimes dam or dry staking facility alternatives as these are permanent facilities and will remain in perpetuity. The unmitigated intensity is predicted to be very low for the remaining project components as these areas have been disturbed and transformed. Given that biodiversity processes are not confined to the MMT, the potential impact will extend beyond this boundary of the MMT. Without mitigation the loss of biodiversity is definite and would extend beyond the life of the mine. Due to the sensitivity of the biodiversity the unmitigated significance scenario is expected to be high for the extended footprints of the WRDs and road, top-cut stockpile, rail siding (option 3) and all three water pipeline alternative routes, filter press, slimes dam or staking facility alternatives. The unmitigated significance scenario for the remaining project components is expected to be medium given the disturbed nature of the degraded habitat and transformed habitat units. This impact significance could be reduced with the implementation of mitigation measures focused on minimising impacts during operations and remedying any negative impacts at closure. Addressing long term erosion control as part of rehabilitating the WRDs is seen as a positive change that supports the sustained establishment of vegetation and a reduced mitigated significance.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.1.4 Issue: General disturbance of biodiversity

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

All project activities/infrastructure that have either already taken place or are proposed have the potential to directly disturb vegetation, vertebrates and invertebrates in all project phases and for all alternatives that are being considered. Potential disturbances may include:

- People may hunt/ gather various types of species for food, for sport, for firewood etc.;

- People may illegally collect and remove vegetation, vertebrate and invertebrate species;
- Excessive dust fallout from various dust sources may have adverse effects on the growth of some vegetation, and it may cause varying degrees of stress on the teeth of vertebrates that have to graze soiled vegetation;
- Noise and vibration pollution (from vehicle movement and materials handling) may scare off vertebrates and invertebrates. In some instances the animals may be deterred from passing close to noisy activities which can effectively block some of their migration paths. In other instances, vertebrates and invertebrates that rely on vibration and noise senses to locate for, and hunt, prey may be forced to leave the vicinity;
- An increased presence of vehicles in the area can result in road kills, especially if drivers speed;
- The presence of water containment facilities may lead to drowning of fauna; and
- An increase in pollution emissions and general litter may indirectly impact on the survival of individual plants, vertebrates and invertebrates.

In the absence of mitigation focussed on preventing or mitigating the impact to acceptable levels, the intensity of the potential impact is expected to be medium. Given that biodiversity processes are not confined to the MMT, the potential impact will extend beyond this boundary of the MMT. For the expanded WRD footprints and road, these disturbances may have already taken place. For the Middleplaats water pipelines these disturbances would be temporary and limited mainly to the construction phase. For all other project components, without mitigation the disturbance of biodiversity would definitely occur and could extend beyond the life of the mine. In the unmitigated scenario, the significance of this potential impact is high as the probability is definite. In the mitigated scenario, the significance is reduced to medium with a reduction in the probability of the impact. A change in the WRD rehabilitation criteria that addresses long term erosion control and supports the sustained establishment of vegetation is seen as a positive change that supports a reduced mitigated significance.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.1.5 Issue: Contamination of surface water resources affecting third party use

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

During all phases of the project potential contaminant sources exist regardless of the chosen alternatives. Runoff from exposed areas (i.e. stripped areas, product stockyard, WRDs, slimes dam or dry staking facility) could result in the transport of sediments and contaminants. Accidental spills of hydrocarbons, dirty stormwater and hazardous wastes could release contaminants that could reduce water quality. The proposed measures to improve the rehabilitation of WRDs (i.e. control long term erosion) and the implementation of formal stormwater management infrastructure would reduce the risk. The sale of aggregate would remove potential contamination sources and is seen as a positive change. The related intensity of any potential impacts is expected to be low.

The nearest watercourses to the project infrastructure include the ephemeral Vlermuisleegte River (located approximately 3 km west of MMT and 1 km from the option 1 Middelplaats pipeline route) and the ephemeral Witleegte River (located approximately 4 km northeast of the MMT).

In an unmitigated scenario the duration of any contamination could be long term but would be localised. Given the distance and ephemeral nature of these watercourses and that no third parties abstract water from these

watercourses the probability of any impacts occurring is unlikely. The significance of project activities contributing to the contamination of surface water resources is therefore insignificant.

The additional work required to verify the above is described in Section 10.4 of this Scoping Report.

9.7.1.6 Issue: Alteration of natural drainage patterns affecting flow of water in downstream systems

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

The MMT falls within the quaternary catchment D41K which has a gross total catchment area of 4 216 km^2, with a net MAR of 6.53 million cubic metres. Natural drainage across the project areas is via sheet flow. The project infrastructure already established and proposed has the potential to alter drainage patterns by reducing the volume of run-off into the downstream catchments regardless of the alternatives that are being considered. The implementation of formal stormwater management infrastructure would reduce runoff to the environment but is needed to meet the requirements of South African regulations. The sale of waste rock as aggregate and reduction of WRDs at the mine would contribute positively to the overall rehabilitation of the mine and restoration of drainage patterns.

In the absence of mitigation, the intensity of unmitigated impacts is expected to be very low due to the high evaporation rates and low rainfall with the additional loss of run-off to the catchment expected to be negligible. The duration of any loss of runoff to the catchment will extend post-closure in the absence of rehabilitation and the extent is expected to impact downstream areas beyond the site boundary but still remain localised. The probability of substantial runoff reduction to downstream systems in the unmitigated case is expected to be unlikely. The unmitigated significance of this impact is therefore expected to be very low. Where the project plan considers the findings of specialist studies, applies the necessary mitigation to avoid, minimise or remedy impacts in line with the mitigation hierarchy and operates under a water use license, the significance of potential impacts can be reduced further.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.1.7 Issue: Contamination of groundwater affecting third party use

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

There is the potential for groundwater contamination where contaminants can be connected to underlying aquifers. Certain project components have the potential to contaminate groundwater resources if materials are not adequately stored, handled and disposed. The addition of more residue to the WRDs, an increased product and waste rock handling footprints, a slimes dam or dry staking facility alternatives could increase the source load. The removal of materials from Adams pit for re-processing should reduce the risk to groundwater, although the additional handling could mobilise contaminants in a location that is in close proximity to groundwater. The sale of waste rock could reduce the risk to groundwater through the removal of a contaminant source. The proposed implementation of stormwater management infrastructure and containment of contaminated stormwater should reduce risks to groundwater through the containment of dirty water. In the region, as

groundwater is an important resource for domestic use the risk is heightened where external groundwater users are exposed to these contaminants. Although, the low rainfall and relatively deep groundwater levels provide limited pathways for contaminant transport.

In the absence of mitigation, the intensity of unmitigated impacts is expected to be high. Potential health impacts could extend beyond the site boundary and beyond closure if contaminated groundwater resources are used by third party users for an extended period of time. This is in the unmitigated scenario. Without mitigation the impact is conceivable, and the related significance is therefore expected to be medium. Where the project plan considers the findings of specialist studies, applies the necessary mitigation to avoid, minimise or remedy impacts in line with the mitigation hierarchy and operates under a water use license, the significance of potential impacts can be reduced.

The alternatives being considered for the project do not present significant groundwater contaminant sources and are therefore not applicable to this potential impact.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.1.8 Issue: Dewatering that could influence availability for third-party supply

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure
Not applicable		Not applicable	Not applicable

DISCUSSION

Groundwater levels could be reduced through the abstraction of groundwater from the decommissioned Middelplaats Mine during the operational phase of the MMT. The abstraction of groundwater from the decommissioned Middelplaats Mine could cause a temporary reduction or loss of water to third party users. Should groundwater users experience a reduction or loss in water supply the intensity of this dewatering would be considered high in the unmitigated scenario. The duration of the impact is linked to the duration of the activity which is expected to be for the remaining life of mine with the reduction of groundwater levels extending beyond the site boundary. Using a conservative approach in the absence of modelling, the probability of a reduction in groundwater levels to third party users is probable and as such the significance of the unmitigated scenario is also high. The significance can be reduced to low with mitigation.

The alternatives being considered for the project do not influence groundwater levels and are therefore not applicable to this potential impact.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.1.9 Issue: Increase in ambient air concentrations

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

The project activities present emission sources that can have a negative impact on ambient air quality and surrounding land uses in all project phases regardless of the alternatives that are selected. The increase in materials handling operations (e.g. top-cut handling, expanded product stockyard, increased train loading capacity, sale of waste rock as aggregate and re-processing of material in Adams pit) and storage facilities (slimes

dam or dry staking facility alternatives) could result in an increase in particulate emissions. Certain of the materials are particularly fine, thereby having a higher risk of potential health impacts to third party receptors if airborne. Additionally, the reworking of the WRD slopes and the increased height of the WRDs would increase both vehicle and wind entrainment of particulates. Other emission sources include land clearing activities for construction, wind erosion of disturbed areas, vehicle movement along unpaved roads and exhaust emissions. The sources are expected to be associated with the use of the expanded internal haul road, the establishment of stormwater management infrastructure, the establishment of the water pipelines from the decommissioned Middelplaats Mine to MMT and the establishment of a slimes dam or dry staking facility alternatives. The main contaminants of concern, as a result of the project, include particulate matter (PM) and dustfall.

The closest potentially sensitive receptors from the decommissioned Middelplaats Mine include the farm workers and A. Pyper (refer to Table 9-16). The closest receptor from the MMT is Michael Kruger (refer to Table 9-16).

In the absence of mitigation measures that focus on the control of emissions at source and a rehabilitation plan that allows for stabilising and vegetating surfaces, the intensity is expected to be medium for all project components except for the slimes dam or dry staking facility alternatives. The unmitigated intensity for the slimes dam or dry staking facility alternatives are expected to the high due to the fine nature of the material and given that the facilities would remain in perpetuity. Where third parties are exposed to project-related emissions, without mitigation, there could be related health and nuisance impacts. Air pollution impacts would extend beyond the site boundary with the potential to continue until all activities on site cease. Without mitigation the impact is probable for all project components except for the slimes dam or dry staking facility alternatives, and the significance is therefore determined to be medium. Without mitigation the impact is definite for the slimes dam or dry staking facility alternatives due to the permanent nature of the facilities and as such the significance is deemed to be high. With mitigation that focuses on controlling emissions sources, the significance could be reduced to low (medium for the slimes dam or dry staking facility alternatives) as the intensity, duration, extent and probability would reduce. The sale of waste rock and change in rehabilitation criteria that addresses long term erosion are seen as positive changes that would contribute to a reduced significance.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.1.10 Issue: Increase in disturbing noise levels affecting potential human receptors

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure
			Not applicable

DISCUSSION

Mining projects in general have the potential to contribute to an increase in ambient noise levels during all phases prior to closure. For this project current ambient noise levels would be related to mining operations (at MMT and adjacent mines), handling and processing of mineral resources, traffic on mine roads and the R 380, train noise and some community noise. Project-related noise sources would include:

- The movement of machinery and equipment as part of land clearing activities and construction. This is expected to primarily be associated with the establishment of the top-cut stockpile, stormwater infrastructure, the water pipelines from the decommissioned Middelplaats Mine to the MMT (regardless of the alternative considered),Option 3 railway upgrade (new railway loop, product stockpile and stacker), filter press, slimes dam or dry staking facility alternatives; and
- The movement of machinery and equipment as part of ongoing materials handling. This is expected to primarily be associated with the reworking of the WRD slopes, the increased height of the WRDs, re-processing of material in Adams pit, Option 3 railway upgrade (operation of the new railway loop,

product stockpile and stacker) and sale of waste rock as aggregate (regardless of alternative considered albeit crushing and screening would exacerbate the impact).

The closest potentially sensitive noise receptors from the decommissioned Middelplaats Mine are the farm workers and A. Pyper (refer to Table 9-16) and from the MMT, Michael Kruger (refer to Table 9-16).

In the absence of mitigation measures that consider potential receptor sites in relation to project activities the intensity is expected to be low due to the distance of receptors from the MMT and the decommissioned Middelplaats Mine. Noise pollution impacts would extend beyond the site boundary and would occur until decommissioning is complete. The likelihood of the impact occurring as a result of the project, in the unmitigated scenario, is possible and the related significance would therefore be low. With mitigation that focuses on minimising impacts through the application of noise control measures, the significance could be reduced further.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.2 Potential Cultural Impacts

9.7.2.1 Issue: Loss or damage to heritage and/or paleontological resources

Project phases in which impact could occur

Construction	Operational	Decommissioning	Closure

Discussion

The placement of infrastructure and mining activities in general, in all phases, have the potential to remove, damage or destroy heritage/cultural and palaeontological resources, either directly or indirectly, and result in the loss of the resource for future generations. Based on preliminary specialist work as outlined in Section 9.4.2.1, it is unlikely that any heritage and palaeontological resources are associated with the proposed project components including the alternatives that are being considered.

Even though it is unlikely that any loss or damage of these resources will occur this has been preliminary assessed as a precautionary approach. The intensity in the unmitigated scenario is considered to be very low. The loss of resources would be limited to the footprint of operational activities but would be felt beyond the life of mine. The overall significance even without mitigation is therefor considered to be insignificant.

The additional work required to confirm the above is described in Section 10.4 of this Scoping Report.

9.7.3 Potential Socio-economic Impacts

9.7.3.1 Issue: Disturbance to third party road users by project related traffic

Project phases in which impact could occur

Construction	Operational	Decommissioning	Closure
Limited		Limited	Not applicable

Discussion

The key potential traffic related impacts are on road capacity and public safety when additional traffic is added to the existing transport network.

During the construction phase of the project for all project components except the slimes dam or dry staking facility alternatives, there could be a slight increase in traffic, for example delivery of construction materials and

contractors to the site. Generally, however the bulk of the project components have few requirements for external materials or labour. The same would apply to the decommissioning phase. The volumes, frequency and duration of construction and decommissioning traffic is likely to be immaterial to the current baseline and any impact would be negligible. During the construction phase of a slimes dam or dry staking facility alternatives, an increase in traffic increase for example delivery of construction materials and contractors is expected.

During operations the planned changes to production (i.e. processing of top-cut, increased product output, operation of filter press, slimes dam or dry staking facility) would require a few additional personnel for the operations which would result in a small increase to private vehicles on the road. The increase in rail capacity is likely to reduce the requirements for road haulage of product. This would result in fewer heavy vehicles on the road which is anticipated to limit inconvenience to current road users, reduce accident rates (for people and animals), limit effects on road service levels and/or reduce road damage.

As there are only very minor changes to the current traffic levels the intensity is assumed to be very low, and of very short duration for all project components except the slimes dam or dry staking facility alternatives. Although the impact could occur beyond the site boundaries the probability is unlikely and as such the impact is considered to be insignificant. For the slimes dam or dry staking facility alternatives a change in traffic volumes is expected to be noticeable particularly during the construction phase (short term) and as such the intensity is deemed to be medium. The impact could extend beyond the site boundary and in the unmitigated scenario without mitigation the impact is probable. This is a medium significance without mitigation and could be reduced to low with mitigation.

As no substantial traffic related impacts are anticipated, additional work is not proposed in order for this to be assessed qualitatively by SLR.

9.7.3.2 Issue: Alteration of the visual environment affecting sense of place

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

Mining related activities and infrastructure have the potential to alter the visual environment and aesthetics of an area. Visual impacts on the receiving environment may be caused by activities and infrastructure associated with the proposed activities, as well as night-time illumination at these sites. Visual/aesthetic value is the emotional response derived from the experience of the environment with its natural attributes.

The establishment of certain proposed infrastructure has the potential to result in additional structures (top-cut stockpile and option 3 railway upgrade (new railway loop, product stockpile and stacker)), heightened structures (increased WRD height) and the slimes dam or dry staking facilities. These structures would have a physical presence with the potential to contribute to a change in the character of the existing landscape. However, within the context of existing mining activities at the MMT, neighbouring mines and industries along the R380 and D3457 roads, the proposed infrastructure would not contrast strongly with existing activities or facilities. Other project components are expected to blend in with the existing mining activities and operations, regardless of alternatives that are selected. The most prominent public views of the MMT and decommissioned Middelplaats Mine are from the R380 and the D3457 roads. The users of these roads are likely to be sensitised to mining developments in this area. Other than for local road users, the visual exposure to the project would generally be from more distant views.

In the absence of mitigation measures that provide for rehabilitation, the intensity in the unmitigated scenario is expected to be low. Potential impacts would extend beyond the project area boundary to the visual receptors and would continue post-closure. The potential for additional visual impacts is considered conceivable and as

such the related unmitigated significance would be low. The sale of waste rock and change in rehabilitation criteria that addresses long term erosion are seen as positive changes that would contribute to a reduced significance. At closure, when rehabilitation is completed in a manner that supports the post-closure land use, the significance could be reduced further.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.3.3 Issue: Positive socio-economic impact (economic impact)

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

Mining projects have the potential to have positive socio-economic impacts in all mine phases, which may benefit local, regional and national economies.

The project activities and infrastructure that already take place forms part of the existing approved operations and would not have specifically generated any additional employment opportunities, and as such a direct increase in economic benefits due to these project activities and infrastructure would have been negligible.

The establishment of the top-cut stockpile, stormwater management infrastructure, the Middelplaats water pipeline (regardless of alternatives being considered), the railway upgrade (regardless of alternatives being considered), the filter press, slimes dam or dry staking alternatives will create additional job opportunities . This can result in direct benefits derived from wages, taxes and profits. Indirect benefits occur through the procurement of goods and services, and the increased spending power of employees. The sale of waste rock and the re-processing of material located in Adams pit for sale to third parties will generate revenue for the MMT.

The project as a whole will support and enable continuation of current operations of the MMT, which will in turn sustain economic and social development. This ensures continued contribution to the SA economy.

In the absence of enhancement measures the unmitigated intensity could be a medium positive. The duration will be for the life of mine and would have an impact beyond the site boundary. The likelihood is considered to be possible and as such the related unmitigated significance would be a medium positive. Where the project planning considers enhancement measures the significance of the positive impact could increase.

The additional work required to address this issue is described in Section 10.4 of this Scoping Report.

9.7.3.4 Issue: Negative socio-economic impact (inward migration)

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure
			Not applicable

DISCUSSION

Mining projects tend to bring with them an expectation of employment. This expectation can lead to:

- An influx of people into the area in search of work, leading to informal settlements and associated problems of crime, disease, and social disruption;
- Increased pressure on housing and related services (water, power, sanitation);

- Reduced quality of life for surrounding landowners and land users influencing health and safety (noise, dust pollution, increased traffic volumes); and
- Possible reduced property values.

Given that the project components may result in job opportunities the potential for the impact to occur is possible.

The additional work required to address this issue is described in Section 10.3 of this Scoping Report.

9.7.3.5 Issue: Hazardous excavations and infrastructure that pose a safety risk to third parties and animals

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

The project activities present infrastructure that has altered the natural topography and in turn creates the potential risk of injury and/or death to both third parties (people) and animals (livestock and wild animals). The project components and alternatives (except for the slimes dam or dry staking facility alternatives) within the MMT Mining Right area do not present new safety risks in the context of the existing MMT operations. The slimes dam or dry staking facility alternatives would present new infrastructure that may pose a potential risk to third parties and animals. The likelihood of occurrence is however unlikely, particularly in the mitigated scenario as these proposed alternatives are all located within the existing MMT Mining Right area, which is an access-controlled site.

Project components outside of the MMT Mining Right area, such as the Middleplaats water pipeline (regardless of the chosen route), would cross properties either owned by HMM or the Tshipi Borwa Mine and UMK mine and as such do not present new safety risks to third parties.

It is considered unlikely that any impacts would occur and therefore additional work is not proposed in order for this to be assessed qualitatively by SLR (Section 10.3 of this Scoping Report).

9.7.3.6 Issue: Sterilisation of a mineral resource

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

Discussion

Mineral resources can be sterilized and/or lost through the deposition of minerals onto waste disposal facilities such as the slimes dam or dry staking facility alternatives. The intensity of sterilising mineral resources is considered to be high because of the associated potential economic value that is lost when sterilisation occurs. If sterilisation of resources occurs it is likely that the related impact will extend beyond the life of mine and will extend beyond the site boundary if one considers the economic nature of the impact.

Without mitigation the probability is definite, and the associated significance is high. In the mitigated scenario, with planning and co-ordination to prevent the unacceptable sterilisation of resources the impact can be reduced to low.

The additional work required to address these issues (noise, dust and groundwater) is described in Section 10.3 of this Scoping Report.

9.7.3.7 Issue: Change in current land use

PROJECT PHASES IN WHICH IMPACT COULD OCCUR

Construction	Operational	Decommissioning	Closure

DISCUSSION

Land use impacts on the receiving environment may be caused by activities and infrastructure directly displacing current land uses, as well as by project activities rendering adjacent land use less viable or attractive. All project components are located within mining properties. Land use within these properties has largely been wilderness and is not linked to economic activity. The development and use of these land parcels for mining related activities will have little direct impact on land use. Adjacent land use comprises mining and agriculture. The project activities would not affect adjacent mining activities. Agriculture on adjacent farms comprises wilderness and livestock grazing at low densities. Aspects such as increased noise and dust could reduce the palatability of veld and thus reduce stocking densities. Further reduction in groundwater levels, or contamination, could limit water abstraction and further constrain land use.

The additional work required to address these issues (noise, dust and groundwater) is described in Section 10.3 of this Scoping Report.

9.8 POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK

A preliminary list of the impacts identified by the EAP or raised by interested and affected parties, as well as the possible management and mitigation measures is provided in the Table below. The level of residual risk after management or mitigation is also estimated. This will be refined during the EIA phase with specialist input as appropriate.

TABLE 9-19: POSSIBLE MANAGEMENT ACTIONS AND THE ANTICIPATED LEVEL OF RISK

Activity	Potential impact	Potential mitigation type	Potential for residual risk
Layout/activity changes that have already taken place			
Expansion of the north and south eastern WRDs.	• Loss of soil resources through physical disturbance • Loss of soil resources through contamination • Physical destruction of biodiversity • Contamination of surface water resources affecting third party use • Alteration of natural drainage patterns affecting flow of water to downstream systems • Contamination of groundwater affecting third party use • Increase in ambient air concentrations • Increase in disturbing noise levels affecting potential human receptors • Alteration of the visual environment • Loss or damage to heritage and/or paleontological resources • Disturbance to third party road users by project related traffic • Change in land use affecting sense of place • Positive socio-economic impact (economic impact)	• Continued implementation of soil conservation management plan and waste management plan • Continued implementation of biodiversity controls and management plan • Continued use of stormwater controls and/or implementation of new controls • Continued use of groundwater controls and groundwater monitoring • Continued implementation of air emission controls and monitoring • Continued implementation of noise controls • Continued implementation of visual controls • Implement chance find procedure • Continued implementation of procurement and employment policies and procedures • Continued use of access controls • Closure planning to incorporate rehabilitation objectives • Implementation of an emergency response procedures when required	Possible for WRDs that remain in perpetuity where the pollution plume can extend post closure.
Changes to all WRD heights *(excluding rehabilitated WRDs).*			
Expansion of the product stockyard.			Unlikely
Establishment of potable and process water storage facilities.			

Activity	Potential impact	Potential mitigation type	Potential for residual risk
Expansion of an existing road.	• Negative socio-economic impact (inward migration) • Hazardous excavations and infrastructure that pose a safety risk to third parties and animals • Change in land use.		
Proposed layout/activity changes			
Establishment of a top-cut stockpile and associated crushing and screening plant Establishment of stormwater management infrastructure Upgrading the railway loadout station.	• Loss of soil resources through physical disturbance • Loss of soil resources through contamination • Physical destruction of biodiversity • Contamination of surface water resources affecting third party use • Alteration of natural drainage patterns affecting flow of water to downstream systems • Contamination of groundwater affecting third party use • Increase in ambient air concentrations • Increase in disturbing noise levels affecting • Alteration of the visual environment • Loss or damage to heritage and/or paleontological resources • Disturbance to third party road users by project related traffic • Change in land use affecting sense of place • Positive socio-economic impact (economic impact) • Negative socio-economic impact (inward migration) • Hazardous excavations and infrastructure that pose a safety risk to third parties and animals • Change in land use.	• Implementation of soil conservation management plan and waste management plan • Implement biodiversity controls, management plan and monitoring • Appropriate design and development of stormwater controls • Appropriate design and development of groundwater controls and groundwater monitoring • Continue implementing traffic safety programme • Implement air emission controls and monitoring • Implement noise controls • Implement visual controls • Avoidance of heritage resources • Continued implementation of procurement and employment policies and procedures • Closure planning to incorporate rehabilitation objectives • Access control • Implementation of an emergency response procedure when required	Unlikely

Activity	Potential impact	Potential mitigation type	Potential for residual risk
Sale of waste rock as aggregate. Changes to WRD height *(excludes rehabilitated WRDs)*.	• Contamination of groundwater affecting third party use • Increase in ambient air concentrations • Increase in disturbing noise levels affecting • Alteration of the visual environment • Disturbance to third party road users by project related traffic • Change in land use affecting sense of place • Positive socio-economic impact (economic impact) • Negative socio-economic impact (inward migration) • Hazardous excavations and infrastructure that pose a safety risk to third parties and animals	• Appropriate groundwater controls and groundwater monitoring • Continue implementing traffic safety programme • Implement air emission controls and monitoring • Implement noise controls • Implement visual controls • Continued implementation of procurement and employment policies and procedures • Implementation of an emergency response procedure when required • Access control	Possible for WRDs that remain in perpetuity where the pollution plume can extend post closure.
Re-processing of material located in Adam's pit.	• Loss of soil resources through physical disturbance • Loss of soil resources through contamination • Contamination of surface water resources affecting third party use • Alteration of natural drainage patterns affecting flow of water to downstream systems • Contamination of groundwater affecting third party use • Increase in ambient air concentrations • Increase in disturbing noise levels affecting • Positive socio-economic impact (economic impact) • Negative socio-economic impact (inward migration) • Hazardous excavations and infrastructure that pose a safety risk to third parties and animals • Change in land use.	• Access control • Implementation of soil conservation management plan and waste management plan • Appropriate use of stormwater controls • Appropriate use of groundwater controls and groundwater monitoring • Continue implementing traffic safety programme • Implement air emission controls and monitoring • Implement noise controls • Continued implementation of procurement and employment policies and procedures • Closure planning to incorporate rehabilitation objectives • Implementation of an emergency response procedure when required	Unlikely

Activity	Potential impact	Potential mitigation type	Potential for residual risk
Establishment of a pipeline to transport abstracted water from the decommissioned Middelplaats Mine to MMT.	• Loss of soil resources through physical disturbance • Loss of soil resources through contamination • Physical destruction of biodiversity • Contamination of surface water resources affecting third party use • Alteration of natural drainage patterns affecting flow of water to downstream systems • Contamination of groundwater affecting third party use • Dewatering that could influence third party supply • Increase in ambient air concentrations • Increase in disturbing noise levels affecting • Loss or damage to heritage and/or paleontological resources • Disturbance to third party road users by project related traffic • Change in land use affecting sense of place • Positive socio-economic impact (economic impact) • Negative socio-economic impact (inward migration) • Hazardous excavations and infrastructure that pose a safety risk to third parties and animals • Change in land use.	• Implementation of soil conservation management plan and waste management plan • Implement biodiversity controls, management plan and monitoring • Implementation of stormwater controls • Implementation of groundwater controls and groundwater monitoring • Continue implementing traffic safety programme • Implement air emission controls and monitoring • Implement noise controls • Implement visual controls • Avoidance of heritage resources • Continued implementation of procurement and employment policies and procedures • Access control • Closure planning to incorporate rehabilitation objectives • Implementation of an emergency response procedure when required	Unlikely as groundwater levels will re-bound once dewatering activities cease at closure.
Optimization of water recovery within the plant area	• Loss of soil resources through physical disturbance • Loss of soil resources through contamination • Physical destruction of biodiversity • Contamination of surface water resources affecting third party use • Alteration of natural drainage patterns affecting flow of water to downstream systems	• Continued planning to prevent the unnecessary loss of mineral resources • Access control • Continued implementation of soil conservation management plan and waste management plan • Continued implementation of biodiversity controls and management plan	

Activity	Potential impact	Potential mitigation type	Potential for residual risk
	• Contamination of groundwater affecting third party use • Increase in ambient air concentrations • Increase in disturbing noise levels affecting potential human receptors • Alteration of the visual environment • Loss or damage to heritage and/or paleontological resources • Disturbance to third party road users by project related traffic • Change in land use affecting sense of place • Positive socio-economic impact (economic impact) • Negative socio-economic impact (inward migration) • Hazardous excavations and infrastructure that pose a safety risk to third parties and animals • Sterilisation of mineral resources • Change in land use.	• Continued use of stormwater controls and/or implementation of new controls • Continued use of groundwater controls and groundwater monitoring • Continued implementation of air emission controls and monitoring • Continued implementation of noise controls • Continued implementation of visual controls • Implement chance find procedure • Continued implementation of procurement and employment policies and procedures • Continued use of access controls • Closure planning to incorporate rehabilitation objectives • Implementation of an emergency response procedures when required	

9.9 OUTCOME OF THE SITE SELECTION MATRIX

Three routing options were considered for the water supply pipeline (refer to Section 9.1.4) and three configuration for the rail siding upgrade (refer to Section 9.1.5). Based on the outcome of the site selection matrix, the preferred design or layout is Option 1 for the water supply pipeline Option 2 for the rail siding upgrade.

9.10 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

This section is not applicable as alternatives are being considered for the proposed project.

9.11 THE PREFERRED ALTERNATIVE

Refer to Section 9.9.

10 PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT

This chapter describes the nature and extent of further investigations to be conducted by SLR in the EIA phase and sets out the proposed approach to the EIA phase.

10.1 EIA OBJECTIVES

The main objectives of the EIA phase will be to:

- Assess the potential biophysical, cultural and socio-economic impacts of the project;
- Liaise with I&APs including relevant government departments on issues relating to the proposed development to ensure compliance with existing guidelines and regulations;
- Identify and describe procedures and measures that will mitigate potential negative impacts and enhance potential positive impacts;
- Undertake consultation with I&APs and provide them with an opportunity to review and comment on the outcomes of the EIA process and acceptability of mitigation measures;
- Develop an EMPr and a conceptual closure/decommissioning plan; and
- Provide measures for ongoing monitoring (including environmental audits) to ensure that the project plan and proposed mitigation measures are implemented as outlined in the detailed EIA.

10.2 ALTERNATIVES TO BE CONSIDERED

The alternatives and the site layout considered during Scoping are detailed in the Section 9.1. The preferred alternative to be considered in the EIA is described in Section 9.11.

10.3 ASPECTS TO BE ASSESSED QUALITATIVELY

This section lists the environmental aspects that will be considered and qualitatively assessed by SLR in the EIA phase. These are as follows:

- Geology;
- Topography;
- Traffic;
- Social;
- Sterilisation of mineral resources; and
- Land use

The assessment of these aspects, and the determination of detailed management and mitigation measures will be undertaken by SLR and provided in the EIA report.

10.4 ASPECTS TO BE ASSESSED BY SPECIALISTS

The aspects to be assessed by the various specialists are included in Table 10-1. This list specialist studies has been identified on the basis of SLR's knowledge of mining related projects and through the results of the DEDEFFA screening tool (see Section 12). Each specialist study will undertake the following steps:

- Define the baseline environment through review of available information from past studies and additional field studies, where required for the preferred layout and alternatives;
- Define relevant laws and regulations that apply to the specific specialist study;
- Identify specific issues of concern through an understanding of the project and the sensitivity of the affected environment as well as review of all issues raised by I&APs;
- Interact with other specialists, where required, to ensure the integration of issues of concern and appropriate assessment;
- Assess the direct, indirect and cumulative impacts;
- Provide mitigation measures to reduce impacts to an acceptable level i.e. residual impact. Where necessary provide recommendations to address residual impacts i.e. biodiversity offsets; and
- Where required, provide detailed monitoring plans.

All specialist studies will be aligned with Appendix 6 (content of specialist studies) of NEMA EIA Regulations 2014, as amended (GNR 982) or the DEFF protocols (see Table 12-1), whichever is relevant.

TABLE 10-1: PLAN OF STUDY FOR ASPECTS TO BE ASSESSED BY SPECIALISTS

Specialist Study		Plan of Study
Biophysical environment	Soil, Land Use, Land Capability and Land Potential Study	The study will be prepared by SAS and will include the following: • Results of a desktop review of existing soil and land capability databases, to establish broad baseline conditions and to identify areas of environmental sensitivity and sensitive agricultural areas; • Results of a field survey where soil samples will be collected within the project area and to classify the dominant soil types according to the South African Soil Classification System (Soil Classification Working Group, 2018); • Results of an alternatives analysis; • Illustrations of the spatial distribution of various soil types and land capability within the project area based on the results of the desktop review and the field survey; • An identification and assessment of potential impacts on the receiving environment as a result of the project activities; and • Mitigation measures identified to manage the potential impacts.

Biophysical environment	Biodiversity – Terrestrial Study	The study will be prepared by STS and will include the following:
		• Results of a desktop review against all relevant biodiversity databases. This desktop review will:
		  ○ Provide faunal and floral inventories of species as encountered on site;
		  ○ Determine and describe habitats, communities and ecological state of the project area based on conservation importance and ecological sensitivity;
		  ○ Identify the likelihood of Red Data Listed (RDL) species as well as SCC to occur within the project area; and
		  ○ Identify and consider all sensitive landscapes and any other ecologically important features, if present.

Specialist Study		Plan of Study
		• Results of a field survey that documents the floral and faunal species observed; • Results of an alternatives analysis; • Illustrations of the spatial distribution of various habitat types and ecological sensitivity within the project area based on the results of the desktop review and the field survey; • An identification and assessment of potential impacts on the receiving environment as a result of the project activities; and • Mitigation measures and monitoring programme identified to manage the potential impacts.
	Biodiversity – Aquatic Study	STS are appointed to provide a site verification and expert opinion on aquatic resources associated with the MMT and, if present, to advise on additional mitigation requirements.

	Surface Water Study	The study will be prepared by SLR and will include the following:
		• Results of a baseline and situational analysis that will provide information pertaining to:
		  ○ Rainfall, evaporation data and design storm intensities;
		  ○ The baseline hydrology of the site;
		  ○ Results of available water quality data (where available); and
		  ○ Results of topographical conditions.
		• Results of an alternatives analysis;
		• A conceptual stormwater management plan, including:
		  ○ Clean and dirty water classification, catchment delineation and stormwater routing;
		  ○ Hydraulic calculations through peak flow estimation for conveyance infrastructure and storage infrastructure; and
		  ○ Conceptual designs for stormwater infrastructure.
		• A Dynamic Water Balance through a daily time step water balance model for the major water components of the mine;
		• A daily salt balance model for the major water components of the mine;
		• An identification and assessment of potential impacts on the receiving environment as a result of the project activities; and
		• Mitigation measures and monitoring programme identified to manage the potential impacts.

	Groundwater Study	The study will be prepared by SLR and will include the following:
		• Results of a baseline and situational analysis of all existing hydrogeological data that will be used to develop the conceptual model for the mine. The conceptual model will provide information pertaining to:
		  ○ Aquifer characterisation, recharge and interaction between surface water and groundwater resources;
		  ○ Presence of geological structures;
		  ○ Results of water quality and quantity data informed by the monitoring and hydrocensus programmes for the mine; and
		  ○ Groundwater use as informed by the hydrocensus programme.
		• A groundwater numerical model that will provide information pertaining to:
		  ○ The cone of drawdown as a result of MMT's operations. The model will cater for all current and proposed activities, the life of mine including an additional 100 years to understand latent impacts; and
		  ○ The contamination plume as a result of MMT's operations. The model will cater for all current and proposed activities, the life of mine including an additional 100 years to understand latent impacts.
		• An identification and assessment of potential impacts on the receiving environment as a result of the project activities; and
		• Mitigation measures and monitoring programme identified to manage the potential impacts.

Specialist Study		Plan of Study
Biophysical environment	Waste Assessment and Geochemical Study	The study will be prepared by SLR and will include the following: • Results of the review of available literature and field work (inclusive of sample collection); • Results of a waste assessment and waste classification in terms of Regulation 635 of NEM: WA); • Leachate and acid base accounting results; and • Source term geochemical modelling, which results will be used to inform the numerical contamination modelling of the Groundwater Study.
	Air Quality Study	The Air Quality Study will be prepared by Airshed and will include the following: • Results of a baseline and situational analysis through the review of available literature, meteorological data and monitoring data for the MMT; • An atmospheric source and emissions inventory detailing the source description, source locations, emission rates and the emission factors; • Results of an alternatives analysis; • An identification and assessment of potential impacts, using dispersion modelling, on the receiving environment and sensitive receptors as a result of the project activities; and • Mitigation measures and monitoring programme identified to manage the potential impacts.
	Noise Study	The Noise Study will be prepared by Airshed and will include the following: • Results of a baseline and situational analysis through the review of available literature and noise sampling; • A noise source inventory • Results of an alternatives analysis; • An identification and assessment of potential impacts, using dispersion and noise propagation simulations, on the receiving environment and sensitive receptors as a result of the project activities; and • Mitigation measures and monitoring programme identified to manage the potential impacts.
	Visual Study	The Visual Study will be conducted by SAS and will include the following: • Results of a baseline and situational analysis through the review of available literature and field surveys; • Results of an alternatives analysis; • An identification and assessment of potential impacts, using viewshed analysis, on the receiving environment and sensitive receptors as a result of the project activities; and • Mitigation measures identified to manage the potential impacts.
Cultural environment	Heritage Study	The Heritage Study will be prepared by PGS and will include the following: • Results of a baseline and situational analysis through the review of available literature and field surveys; • Results of an alternatives analysis; • An identification and assessment of potential impacts, on heritage resources (if present) as a result of the project activities; and • Mitigation measures identified to manage the potential impacts.
	Palaeontology Desktop Study	The Palaeontological Desktop Study will be prepared by PGS and will include the results of a baseline and situational analysis through the review of available literature and databases.

Specialist Study		Plan of Study
Socio-economic environment	Economic Study	The Economic Study will be prepared by Mercury Financial Consultants (Pty) Ltd and will include the following: • Baseline characterization through the review of available literature. • An identification and assessment of potential impacts on the receiving socio-economic environment as a result of the project activities; and • Mitigation measures identified to manage the potential impacts.

Rehabilitation	Financial Provision	The Financial Provision Study will be prepared by SLR and will include the following:
		• An updated closure plan which will include:
		  ○ The closure strategy, closure objectives and mechanisms, design principals and motivations for achieving the closure objective;
		  ○ An environmental risk assessment;
		  ○ An assessment of any long-term latent impacts and mitigation strategies (to be informed by specialist input); and
		  ○ The planned closure monitoring, auditing and reporting procedures.
		• Updated quantities and cost estimate associated with the closure activities as per the Financial Provisioning Regulations (GNR. 1147 of 2015) as amended.
		• An updated preliminary annual rehabilitation plan.

10.5 METHOD OF ASSESSING THE ENVIRONMENTAL ASPECTS INCLUDING ALTERNATIVES

Refer to sections 9.6 and 10.4.

10.6 METHOD OF ASSESSING IMPACT SIGNIFICANCE

Refer to Section 9.6.

10.7 CONSULTATION WITH THE COMPETENT AUTHORITY

The EIA and EMPr, including comments received during the I&AP review process, will be prepared and submitted to the DMRE for their review and decision-making. A site visit and meeting will be held, if requested.

10.8 PUBLIC PARTICIPATION PROCESS IN THE EIA

10.8.1 NOTIFICATION OF I&APS

All registered I&APs included on the project database will be involved in the EIA process of the project. Notifications will be in the form of emails and bulk SMS notifications. The relevant I&APs identified for the project are listed below:

- Competent authority:
  - DMRE
- Commenting authorities:
  - DHSWS;
  - Department of Environment and Conservation;
  - SAHRA;

  - Department of Agriculture and Land Affairs ;
  - DEFF;
  - The Northern Cape Department of Rural Development and Land Reform ;
  - Department of Public Works, Roads and Transport;
  - John Taolo Gaetsene District Municipality;
  - Joe Morolong Local Municipality; and
  - Ward councillor (Ward 4).
- Parastatals:
  - Telkom;
  - Transnet; and
  - Eskom.
- Non-government organisation
  - Kalagadi Water User Forum.
- Others:
  - Landowners and land users; and
  - Surrounding mines and industries.

10.8.2 Details of the Public Participation Process to be Followed

The table below outlines the details of the public participation process that will be followed during the EIA phase of the project. This process is aligned with the public participation plan approved by the DMRE.

TABLE 10-2: DETAILS OF THE PUBLIC PARTICIPATION PROCESS TO BE FOLLOWED DURING THE EIA PHASE

Task	Description
Scoping Report DMRE decision	
Notification of DMRE decision of the Scoping Report	All I&APs will be notified via email and SMS notifications of the DMRE's decision of the Scoping Report. Once the Scoping Report is accepted, the EIA phase can be initiated.
Review of the EIA and EMPr	
I&APs review of the EIA and EMPr	The EIA and EMPr will be made available for public review for 30 calendar days. I&APs will be notified when the EIA and EMPr will be available for review via email and SMS notifications. Full copies of the EIA and EMPr will be uploaded onto the SLR website. The link to this website will be distributed to all I&APs via email and SMS notifications. A Non-Technical Summary of the EIA and EMPr, available in English, Afrikaans and Setswana, will also be made available to all I&APs via email.
Submission of the EIA and EMPr to the DMRE.	The EIA and EMPr will be updated to include any comments received during the review of the report by I&APs. The updated reports will be uploaded onto SAMRAD for consideration by the DMR.
Notify I&APs of the DMRE's decision.	Notify I&APs of the decision taken by DMR and applicable appeals processes.

10.8.3 Information to be Provided to I&APS

During the EIA phase of the project, I&APs will be provided with an opportunity to review the EIA and EMPr. The EIA and EMPr will include the following information:

- Detailed description of the current biophysical, cultural and socio-economic environments;
- Detailed description of the project including information pertaining to the scale, extent and duration of the project activities;
- Description of alternatives considered;
- A site layout of alternatives considered and the preferred layout;
- Details of authorisations required in terms of the MPRDA, NEMA, NEM: WA and NWA;
- Responses to issues and comments received from I&APs, commenting authorities and the competent authority;
- Copies of the specialist reports undertaken for the project;
- An assessment of the biophysical, cultural and socio-economic impacts identified during the EIA process, with input from I&APs, commenting authorities, the competent authorities and specialists; and
- An EMPr, with detailed management measures and mitigation to reduce and control identified impacts.

A Non-Technical Summary of the EIA and EMPr will also be prepared and provided to I&APs in English, Afrikaans and Setswana. The Non-Technical summary will include extracts from the EIA and EMPr. These extracts will include the executive summary of the EIA and EMPr and the summary of the issues and comments raised by I&APs.

Once the DMRE has issued a decision on the application, SLR will inform registered I&APs of the decision and the opportunity for appeal.

10.9 TASKS TO BE UNDERTAKEN DURING THE EIA PHASE

A description of the tasks that will be undertaken during the EIA phase is provided in Table 10-3 below. A preliminary schedule for the EIA phase that aligns with regulatory timeframes is also included.

TABLE 10-3: EIA TASKS AND TIMING

Phase	EAP activity	Opportunities for Public Participation		Schedule
		Competent Authority	I&AP's	
Specialist Assessments and Input	EAP to manage specialist activities and receive inputs for EIA and EMPr.	-	-	July 2019 to September 2020
	Specialists to be kept informed of issues raised by I&APs throughout the EIA process.	-	-	
EIA Phase	Assess environmental impacts and compile EIA and EMPr	-	-	April to May 2021
	Provide EIA report to I&APs and authorities for review.	Review of EIA and EMPr (30 days).	Review of EIA and EMPr (30 days).	May to June 2021

Phase	EAP activity	Opportunities for Public Participation		Schedule
		Competent Authority	I&AP's	
	Collate and respond to comments and finalise EIA Report	-	-	June 2021
Authority review	EIA and EMPr submitted to the DMRE for decision making purposes (106 days from acceptance of Scoping Report).	DMRE to acknowledge receipt of EIA and EMPr (10 days).	-	July to October 2021
		DMRE review (107 days).		
		Environmental Authorisation Granted / Refused.		
Decision	Notifications to I&AP's regarding environmental authorisation (granted or refused).	-	I&APs notifications within 14 days of receipt of DMRE decision.	November 2021

10.10 MEASURES TO AVOID, REVERSE, MITIGATE, OR MANAGE IDENTIFIED IMPACTS

Refer to Table 9-19 in Section 9.8. It should be noted that this table has been compiled with the information currently in hand and will be refined during the EIA phase.

11 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No additional requests for information have been received to date.

12 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) & (B) OF THE ACT

12.1 DEFF SCREENING TOOL

As of 4 October 2019, it is compulsory to use DEFF online screening tool. The report generated by the DDEFFEA screening tool was attached to the NEMA environmental authorisation application for the project and is included in Appendix C. The screening tool report outlines specialist studies that need to be considered as part of the project. In this regard, the table below outlines the specialist studies identified in the screening tool report along with an explanation pertaining to the applicability of these specialist studies in relation to the project.

TABLE 12-1: DEA SCREENING TOOL RESULTS

Theme	Sensitivity	Requirements
Agriculture	Medium	The screening tool protocol specifies that, for sites of medium significance, an **Agricultural Compliance Statemen**t is required. The Soil, Land Use and Land Capability Study (Table 10-1) for the project will cater for this requirement.
Archaeological and Cultural Heritage	Not specified in the screening tool report	As no specific sensitivity/assessment protocol has been prescribed, the required level of assessment must be based on the findings of the Initial Site Sensitivity Verification and comply with Appendix 6 of the EIA Regulations. The Heritage Study (Table 10-1) for the project will cater for this requirement.
Palaeontology	Medium	As no assessment protocol has been prescribed, the required level of assessment must be based on the findings of the Initial Site Sensitivity Verification and comply with Appendix 6 of the EIA Regulations. The Palaeontological Study (Table 10-1) for the project will cater for this requirement.
Terrestrial Biodiversity	Low	The screening tool protocol specifies that, for sites of low significance, a **Terrestrial Biodiversity Compliance Statemen**t is required. The Biodiversity Terrestrial Study (Table 10-1) for the project will cater for this requirement.
Animal Species Assessment	Not specified in screening tool report	As no specific sensitivity/assessment protocol has been prescribed, the required level of assessment must be based on the findings of the Initial Site Sensitivity Verification and comply with Appendix 6 of the EIA Regulations. The Biodiversity Terrestrial Study (Table 10-1) for the project will cater for this requirement.
Plant Species	Low	
Aquatic Biodiversity	Low	The screening tool protocol specifies that, for sites of low significance, an **Aquatic Biodiversity Compliance Statemen**t is required. The Aquatic Study (Table 10-1) for the project will cater for this requirement.
Air Quality	Not specified in screening tool report	As no specific sensitivity/assessment protocol has been prescribed, the required level of assessment must be based on the findings of the Initial Site Sensitivity Verification and comply with Appendix 6 of the EIA Regulations. The Air Quality Study (Table 10-1) will cater for this.
Ambient Air Quality	Not specified in screening tool report	
Climate	Not specified in screening tool report	

Theme	Sensitivity	Requirements
Noise	Not specified in screening tool report	As no specific sensitivity/assessment protocol has been prescribed, the required level of assessment must be based on the findings of the Initial Site Sensitivity Verification and comply with Appendix 6 of the EIA Regulations. The Noise Study (Table 10-1) for the project will cater for this requirement.
Hydrology	Not specified in screening tool report	As no specific sensitivity/assessment protocol has been prescribed, the required level of assessment must be based on the findings of the Initial Site Sensitivity Verification and comply with Appendix 6 of the EIA Regulations. The Surface Water Study (Table 10-1) for the project will cater for this requirement.
Landscape/Visual	Not specified in screening tool report	As no specific sensitivity/assessment protocol has been prescribed, the required level of assessment must be based on the findings of the Initial Site Sensitivity Verification and comply with Appendix 6 of the EIA Regulations. The Visual Study (Table 10-1) for the project will cater for this requirement.
Traffic	Not specified in screening tool report	The proposed project is not associated with an increase in traffic volumes and as such this study is not applicable to this project.
Civil Aviation	Low	Not applicable to the project activities. The proposed project will not present any tall structures that could influence flight paths. No further investigation is proposed.
Defence	Low	Not applicable to the project activities as the mine is not located near any areas of defence. No further investigation is proposed.
Geotechnical	Not specified in screening tool report	Depending on the outcome of the stormwater management investigation, geotechnical work may be required.
Health	Not specified in screening tool report	The need for a health assessment associated with the project is not deemed necessary. This may be considered depending on the findings of the air study. No further investigation is proposed at this stage.
Radioactivity	Not specified in screening tool report	Not applicable to the project activities as the mine does not produce or require the use of radioactive material. No further investigation is proposed.
Seismicity	Not specified in screening tool report	Not applicable to the project activities as the mine is not located in an area that is associated with seismic activity. No further investigation is proposed.

13 UNDERTAKING BY THE EAP

I, Natasha Smyth, the Environmental Assessment Practitioner responsible for compiling this report and Edward Perry, the project Reviewer/Director, undertake that:

- The information provided herein is correct;
- The comments and inputs from I&APs have been correctly recorded;
- Information and responses provided to I&APs by the EAP is correct to the best of SLR's knowledge at the time of compiling the report; and
- The level of agreement with I&APs has been correctly recorded and reported.

Natasha Smyth
(Signature of Environmental Assessment Practitioner)

12/03/21
Date

Edward Perry
(Signature of Reviewer/Director)

12/03/21
Date

Signature of commissioner of oath

12-03-2021
Date

OREN JAN VAN VREDE
COMMISSIONER OF OATHS
EX OFFICIO
PROFESSIONAL
ACCOUNTANT (S.A.)

FOURWAYS MANOR OFFICE PARK
UNIT 7, FOURWAYS
☎(011) 467 - 0945

14 REFERENCES

GHT Consulting. (2018). Hotazel Manganese Mines Geohydrological Report for Mamatwan Mine, August 2018.

GHT Consulting, Hotazel Manganese Mines, Mamatwan Mine, Phase 49, 4th Quarter 2019: Routine Groundwater and Surface Water Monitoring, 2020.

Jones and Wagner Consulting Civil Engineers, Hotazel Manganese Mine, Environmental Management Programme, Mamatwan Mine, June 2005.

Mucina, L., & Rutherford , M. C. (2006). The Vegetation of South Africa, Lesotho and Swaziland. South African National Biodiversity Institute.

Parsons, R. (1995). A South African Aquifer System Management Classification. Pretoria: Water Research Commission .

PGS. (2020a). Mamatwan Mine - Changes to Infrastructure Layout and Activities, Near Hotazel, Northern Cape Province. Heritage Impact Assessment. February 2020.

PGS. (2020b). Palaeontological Exemption Report of the Mamatwan Mine - Changes to Infrastructure Layout and Activities, Near Hotazel, Northern Cape Province, February 2020.

SANS 10103. (2008). The Measurement and Rating of Environmental Noise with respect to annoyance and to speech communication. Pretoria: Standards South Africa.

SAS. (2019a). Soil, Land Use, Land Capability and Land Potential as part of the Environmental Impact Assessment and authorisation process for the proposed Mamatwan Mine Project, Near Hotazel, Northern Cape Province (December 2019a).

SAS. (2019b). Wetland Verification as part of the Water Use Authorisation Process for the Proposed Mamatwan Mine Project, Near Hotazel, Northern Cape Province (December 2019b).

SAS. (2019c). Visual Impact Assessment as part of the Environmental Impact Assessment and Authorisation Process for the Proposed Mamatwan Mine Project, Near Hotazel, Northern Cape Province (November 2019c).

STS. (2020). Biodiversity Assessment as Part of the Environmental Impact Assessment and Authorisation Process for the Proposed Expansion activities at the Mamatwan Mine Project, Near Hotazel, Northern Cape Province (December 2020).

WR. (2012). Water Resources of South Africa 2012 Study.

AFRICAN OFFICES

South Africa

CAPE TOWN
T: +27 21 461 1118

JOHANNESBURG
T: +27 11 467 0945

Namibia

WINDHOEK
T: + 264 61 231 287